



CITY OF BREMERTON



Stormwater Comprehensive Plan Update

Prepared For:

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MAY 2023

City of Bremerton

2023 Stormwater Comprehensive Plan Update

CERTIFICATION

This 2023 Stormwater Comprehensive Plan Update for the City of Bremerton has been prepared under the direction of the following Registered Professional Engineer.



7/28/2023

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ACKNOWLEDGEMENTS

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ACRONYMS AND ABBREVIATIONS

AKART	All known, available and reasonable methods of prevention, control, and treatment
BMC	Bremerton Municipal Code
BMPs	Best Management Practices
City	City of Bremerton
CIP	Capital Improvement Program
CSO	Combined Sewer Overflow
CAO	Critical Areas Ordinance
CWA	Clean Water Act
Ecology	Washington State Department of Ecology
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FC	Fecal Coliform
FEMA	Federal Emergency Management Agency
ft, ft ²	Feet, Square feet
GASAB	Government Accounting Standards Board
GFC	General Facility Charge
GIS	Geographic Information System
GMA	Growth Management Act
HPA	Hydraulic Project Approval
IDDE	Illicit Discharge and Detection
ISWGP	Industrial Stormwater General Permit
ISU	Impervious Surface Unit
KPHD	Kitsap Public Health District
LID	Low Impact Development
LIO	Local Integrating Organization
MOU	Memorandum of Understanding
MS4	Municipal Separate Storm Sewer System
MEP	Maximum Extent Practicable
NEPA	National Environmental Policy Act
NBK	Naval Base Kitsap
NFIP	National Flood Insurance Program
NPDES	National Pollution Discharge Elimination System
O&M	Operation and Maintenance
PORT	Port of Bremerton
PSIC	Puget Sound Industrial Center
PSNS	Puget Sound Naval Shipyard

ACRONYMS AND ABBREVIATIONS (cont.)

PSP	Puget Sound Partnership
PW&U	City of Bremerton Public Works & Utilities Department
RCW	Revised Code of Washington
SEPA	State Environmental Policy Act
SMA	Shoreline Management Act
SMAP	Stormwater Management Action Plan
Utility	Stormwater Utility
SEPA	State Environmental Policy Act
SWMMWW	Stormwater Management Manual for Western Washington
SW Permit	Municipal Phase 2 NPDES Stormwater Permit
SWCP	Surface and Stormwater Comprehensive Plan
SWMP	Stormwater Management Plan
SWPPP	Stormwater Pollution Prevention Plan
TMDL	Total Maximum Daily Load
UGA	Urban Growth Area
USACE	United States Army Corps of Engineers
WDFW	Washington Department of Fish and Wildlife
WSDOT	Washington State Department of Transportation
WWSOG	Western Washington Stormwater Work Group
WWTP	City of Bremerton Wastewater Treatment Plant

EXECUTIVE SUMMARY

The City of Bremerton (City) owns and operates an extensive system of drainage pipes, treatment facilities, and other assets that convey and treat stormwater runoff. This infrastructure prevents damage to private property and public infrastructure and helps to protect water quality and wildlife habitat. This Stormwater Comprehensive Plan (SWCP) describes how the City will manage and operate stormwater infrastructure and related activities while also balancing rates and the financial resources available to the City. The Plan describes the City's stormwater infrastructure system, natural environment, regulatory context, financial status, and management plan for the City's stormwater utility (Utility). The SWCP covers actions and requirements for the six-year period 2022 through 2027.

The Utility provides the citizens of Bremerton and surrounding community with stormwater collection, conveyance, flood control, and water quality treatment services in compliance with federal, state, and local regulatory requirements. To provide these services, an adequate and stable funding program is required. In 1994, the City established a Stormwater Utility and stormwater rate structure. Rates and general facility charges (GFCs) are adopted by ordinance annually to support the Utility's needs and maintain level of service. The financial summary presented in this SWCP reflects the City's most recent Stormwater Utility rates, which were approved in November 2022.

Regulatory Requirements and NPDES Stormwater Permit

Compliance with stormwater related regulations is a central responsibility of the Utility. The City's stormwater program must comply with the Western Washington Phase II Municipal NPDES Stormwater Permit (SW Permit) issued by the Department of Ecology (Ecology), the City-wide Comprehensive Plan and a variety of federal, state, and local regulations designed to protect human health and the environment. The Utility is in a strong position to manage and mitigate the impacts of these regulations through proactive management and early adoption of practices recommended or required by state and federal regulations.

The SW Permit is the primary driver of the Utility's stormwater program. For example, the SW Permit requires approximately 3,300 facility inspections per year. The City must annually demonstrate compliance with the SW Permit through written reporting of status in 11 primary areas:

- Stormwater planning
- Public education and outreach
- Public involvement and participation
- Municipal separate storm sewer system (MS4) mapping and documentation
- Illicit discharge detection and elimination (IDDE)
- Controlling runoff from new development, redevelopment, and construction sites
- Operations and maintenance
- Source control program for existing development
- Compliance with TMDL requirements
- Monitoring and assessment
- Reporting

A SW Permit gap analysis was performed as part of this Plan update to evaluate status of the City's stormwater program relative to SW Permit requirements. The gap analysis shows the City is currently in compliance with all 75 individual SW Permit conditions. However, two significant future potential gaps were identified based on upcoming SW Permit requirements. These gaps consist of:

- Code development and staffing levels for the required Source Control program for existing development that includes education, inspection and enforcement elements. The Source Control program affects approximately 800 businesses in the City and is described in detail in Chapter 5. A new full time compliance inspector position was approved in 2022 and will be hired in 2023 to implement this new program.
- As detailed in Chapter 5, the SW Permit defines annual inspection and cleaning requirements for the City's 96-miles of stormwater piping, approximately 4,500 catch basins, and multiple roads, parking lots and treatment facilities that far exceeds how the City currently manages inspection and O&M of the system. An additional maintenance staff position was approved in 2022 and will be hired in 2023 for the Operations division to meet these SW Permit requirements. An additional maintenance staff position will be considered over the term of this Plan.

Refer to the Program Management section of this Executive Summary for additional detail on proposed staffing.

Potential Future SW Permit Requirements

The current SW Permit covers the 2019 – 2024 period, and it will be updated and re-issued in 2024. Ecology has issued a preliminary informal draft of the 2024-2029 SW Permit that indicates updates will likely address a range of operation and maintenance (O&M), treatment, source control and retrofit elements, including:

- Increased O&M requirements for street sweeping and private residential facility inspections.
- Enhanced source control requirements for management of building materials that contain PCBs.
- Guidance for identifying treatment locations and best management practices (BMPs) for chemicals from tire wear that have been shown to be highly toxic to coho salmon.
- Climate change guidance including considerations for predicting future rainfall.
- Management of tree canopy including tree retention and restoration components.
- Criteria for requiring treatment of existing impervious areas based on population.

Collectively, the proposed new SW Permit requirements represent a potentially significant increase in staffing needs. Existing SW Permit requirements will carry forward into the new SW Permit, so the new permit requirements represent an increment of new work. Stormwater program staff will continue to monitor and evaluate proposed SW Permit updates to ensure that program resources are adequate to meet regulatory requirements.

Other NPDES Permittees within Bremerton and Relationship to City's NPDES Permit

Individual NPDES Stormwater permits are issued to several entities within the City, as well as specific facilities operated by the City. These individual permits are associated with federal facilities (in the case

of Naval Base Kitsap [NBK]) and specific sites that meet the thresholds for an Industrial Stormwater General Permit from Ecology. Stormwater from NBK is regulated by an individual NPDES Stormwater Permit issued by the Environmental Protection Agency (EPA) that covers stormwater discharges from the Puget Sound Naval Shipyard and Jackson Park. The federal permit issued to NBK is generally consistent with the requirements of the City's SW Permit, and permit requirements are administered and enforced directly by EPA and outside of the City's SW Permit umbrella.

Industrial Stormwater General Permits (ISGP) and Conditional No-Exposure Exemptions are issued by Ecology to specific sites that conduct regulated industrial activities. These sites and activities include a broad range of public and private businesses including manufacturing, mining, waste management, transportation, and construction equipment storage. The City has one ISGP, the Wastewater Treatment Plant, and one site with a Conditional No-Exposure Exemption (CNE) for the Oyster Bay Public Works Complex. Several private businesses in the City limits have been issued an ISGP including businesses inside the Port of Bremerton (Port) Industrial Park. The largest area in the City that has been issued an ISGP is the Port of Bremerton Airport. As with all business or commercial sites, the City is responsible for inspection and enforcement of City codes and regulations to prevent stormwater pollution from these locations. The ISGP Permittee's are also responsible for compliance and reporting to Ecology as required by their specific IGSP.

The City works cooperatively with the Port on ISGP compliance and provides the Port with public education and outreach materials to support and assist with their program requirements and ensure tenants are educated in best management practices for their businesses. The ISGP's and the CNE issued to City operated industrial facilities (wastewater treatment plant, Oyster Bay Public Works & Utilities Operations Center) are administered by the facility managers and staff with support from the City's Stormwater Permit Coordinator. A complete list of private systems operating under the ISGP is included in the appendices.

Level of Service Policies and Standards

Level-of-service (LOS) policies and standards are generally defined as measures of the minimum services which must be provided to meet the community's basic needs and expectations. Stormwater LOS criteria are used as benchmarks to establish and assess the performance of existing facilities and management decisions related to the administration, operation, maintenance, and capitalization of stormwater assets. They are also used to assess whether existing capacity is adequate to serve new development, or to determine what facility improvements will be required to avoid overloading existing facilities. As the community grows in population, LOS standards help identify facility upgrades necessary to keep pace with growth without compromising service standards.

The goals and objectives of the City's Stormwater Program reflect LOS expectations for stormwater management facilities. Minimum LOS are generally established through the SW Permit requirements and consist of:

- Compliance with the SW Permit; and
- Land development compliance with the City's Stormwater Management code.

Service Area and Stormwater System Description

The Utility's service area includes the developed City as well as streams, wetlands, lakes, and groundwater resources located within the incorporated City Limits. The City includes drainage areas for several larger streams and lakes, including Gorst Creek, Kitsap Lake, and the Union River. Sinclair and Dyes Inlet are the primary receiving waters for the City's stormwater runoff, and Hood Canal is the receiving water for runoff from City lands in the Union River basin.

In general, stream water quality as measured by the Kitsap Public Health District (KPHD) shows stream monitoring stations in Bremerton typically do not fully meet water quality standards; however, water quality standards are met on the Union River within the city limits. Marine water quality monitoring by the KPHD shows marine water quality near Bremerton has a long-term improving trend, with all monitoring stations meeting applicable standards in 2017 when the last marine water monitoring was performed by KPHD.

The City owns and operates about 96 miles of piped conveyance, ranging from 4 to 84 inches in diameter; approximately 4,488 catch basins; and more than 70 stormwater quality treatment systems. The contributing area to the City's stormwater drainage system includes approximately 19 square miles of urban residential, commercial, and industrial lands within the City limits, and the City receives runoff from approximately five square miles of unincorporated Kitsap County and three square miles of the City of Port Orchard.

The City's stormwater facilities and service areas overlap with incorporated Kitsap County and Port Orchard, and interconnect with Washington State Department of Transportation (WSDOT) highway facilities, and Naval Base Kitsap facilities. The City is not responsible for stormwater compliance outside the City's municipal boundaries, or Naval Base Kitsap's permitted areas, and routinely collaborates with regional stakeholders and partners to ensure effective stormwater management for contributing areas that overlap jurisdictional boundaries.

Kitsap Lake Management Plan

Excessive total phosphorous (Tp) levels in Kitsap Lake are a primary cause of occasional toxic cyanobacteria blooms that create public health exposure risks and result in periodic closures of the lake to recreational activity. Excessive Tp also contributes to algae and weed growth, as well as depleted dissolved oxygen levels which can impact fish and other aquatic life.

The City has implemented a phosphorous treatment program in Kitsap Lake to help reduce recreational closures and aquatic weeds. To protect Kitsap Lake water quality in the long term, the City is designating Kitsap Lake as a phosphorous limited water body. This designation is consistent with the Ecology's listing of Kitsap Lake as not supporting beneficial uses due to excessive phosphorus. The City's designation will require all new development to meet the phosphorous treatment requirements of the most current version of Ecology's Stormwater Management Manual for Western Washington (SWMMWW).

Program Management

Management of the Stormwater Utility is within the Public Works and Utilities (PW&U) Department. Implementation of the stormwater program requires coordination with staff from other City departments including Community Development and Parks. This interdepartmental coordination is associated primarily with meeting SW Permit requirements and is executed in accordance with the City’s Stormwater Coordination Executive Policy, which established the roles and responsibilities of the City’s Stormwater Permit Coordinator.

On a day-to-day basis, staff are assigned to one or more of the following core services; Program Management, Capital Improvements, O&M and Administration/Finance. As of February 2023, there are a total of 16.14 full time equivalent (FTE) staff in the Utility.

The majority of the stormwater programs staffing needs are driven by requirements of the SW Permit. Due to increasing SW Permit requirements, staffing needs are expected to increase over the 2022-2027 planning term. SW Permit compliance is expected to require a total of 2 new FTEs in 2023, and 1 additional FTE for maintenance in the 2024-2027 planning period. These additional staff will be needed to ensure the City meets required SW Permit O&M activities and schedules. Specific staff additions are summarized in Table ES-1 below.

Table ES-1. Summary of Proposed New Stormwater Utility Staff.

Position	Year Added	SW Permit Requirement	Duties
Service Specialist, Senior	2023	Source Control Program for business and industrial sites	Site inventory (800+), inspection, education/outreach, enforcement.
Service Specialist	2023	Conveyance system inspection, maintenance, and repair.	Inspect and maintain 20% of conveyance system each year.
Utility Service Specialist	2024-27	Conveyance system inspection, maintenance, and repair. Treatment and flow control facility inspection and maintenance.	Inspect and maintain 20% of conveyance system each year. Inspect and maintain new facilities associated with system growth.

Capital Improvement Plan

The purpose of the Capital Improvement Plan (CIP) is to describe the capital facilities projects that are intended to improve stormwater management, infrastructure, flood control and water quality conditions in the City. In general, a capital project is a structure, improvement, restoration, piece of equipment, land, or other major asset that has a useful life of at least one year and a project cost that exceeds \$10,000. The Utility uses the CIP to strategically plan for investments in capital projects.

The City maintains and annually updates the 6-year CIP. Potential projects are identified and evaluated each year by Utility staff as part of the continuous process to address stormwater drainage, water quality

and aquatic habitat needs or deficiencies. Capital projects are prioritized each year and the highest priority projects are scheduled for implementation in the City's 6-year CIP.

The total cost for the existing 6-year CIP is approximately \$28,800,000 and the 20-year CIP cost is approximately \$39,000,000. The CIP is expected to increase as the City completes the basin assessments required by the SW Permit and better understands system needs and shortcomings. Refer to Chapter 9 for additional CIP details.

Financial and Rate Assessment

The primary sources of revenue funds for the Utility are monthly Utility rates and GFCs. Other sources of funding include grants and low interest loans. Utility expenses generally consist of a combination of O&M, equipment replacement, debt service, and capital improvement costs. The Stormwater Utility also pays a 20 percent utility tax to the City General Fund.

The financial assessment is based on a combination of these O&M costs, debt service requirements and CIP implementation. A stormwater rate and GFC sufficiency review was initiated in 2022 and is expected to be completed in 2023. On-going rate increases resulting from this review will ensure the Utility's projected financial needs are met including operations and maintenance, new staff, debt service, capital projects and financial reserves.

Implementation Plan

Plan recommendations include increases in Utility O&M staffing, and management strategies for addressing changes in regulatory requirements and costs of built stormwater infrastructure. Table ES-2 summarizes primary recommended implementation actions, priorities and schedule.



Table ES-2. Summary of Stormwater Plan Implementation Major Action Items.

DESCRIPTION	REQUIRED BY SW Permit?	SCHEDULE
Source control site inventory	Yes	2022
Update BMC to address Source Control and Private System maintenance requirements	Yes	2022-23
Develop and implement facility inspection and O&M record keeping system	Yes	2022
Update and implement SWPPPs for applicable City facilities	Yes	2022
Prepare Stormwater Management Action Plan	Yes	2022-23
Add 1.0 FTE staff position to implement SW Permit Source Control requirement	Yes	2023
Add 1.0 FTE Maintenance staff to meet increased O&M requirement	Yes	2023
Add 1.0 FTE Maintenance staff to meet increased O&M requirement	Yes	2024-27
Implement source control and private facility inspection and enforcement program	Yes	2023
Evaluate requirements of draft 2025-2029 SW Permit	Yes	2023-24
Update CIP	No	Annually

1 INTRODUCTION

This Stormwater Comprehensive Plan (Plan) describes how the City of Bremerton (City) will manage and operate stormwater related activities within the City limits. The Plan describes the City's stormwater infrastructure system, natural environment, regulatory context, and management plan for the City's stormwater utility (Utility). The SWCP covers actions and requirements for the six-year period 2022 through 2027.

1.1 Purpose and Scope

The purpose of this Plan is to guide how the City will address surface and stormwater management needs and requirements, including program management, operation, and maintenance (O&M), capital facilities and financial elements, while also balancing rates and the financial resources available to the City.

The Utility is responsible for providing surface and stormwater management within the Bremerton city limits (Figure 1-1). The Utility plans and manages the constructed and natural surface and stormwater systems in the City consistent with goals of the City-wide Comprehensive Plan, Shoreline Master Plan, critical areas ordinances, and requirements of the Western Washington Phase II Municipal NPDES Stormwater Permit (SW Permit) issued by the Department of Ecology (Ecology). The SW Permit coverage area is the "entire incorporated area of the city".

1.2 Goals and Objectives

The goal of the City's stormwater program is to protect both the public and the environment by ensuring that surface and stormwater runoff is collected and conveyed to streams and Puget Sound in a manner that reduces the frequency and severity of flooding and meets applicable water quality standards.

This Plan describes how the City will manage stormwater including policy, regulatory compliance, capital facilities, O&M and financial elements. This Plan describes programs and capital projects and presents the financial plan to implement recommended program and capital projects. These recommendations will inform the development of the stormwater program annual operating budget and capital facilities program. Specific objectives include:

- Compile and incorporate previous studies, plans and other information associated with the current and proposed City stormwater system;
- Evaluate status of compliance with the SW Permit including existing and future requirements;
- Identify specific operation and maintenance needs to implement the SW Permit requirements;
- Assess organizational structure and resources relating to current and future needs for SW Permit compliance, including staffing, equipment, and funding;
- Present the prioritized list of projects for the 6-year CIP and present the 20-year CIP;
- Assess historical and current funding levels and rates; and
- Develop implementation recommendations and proposed schedule.

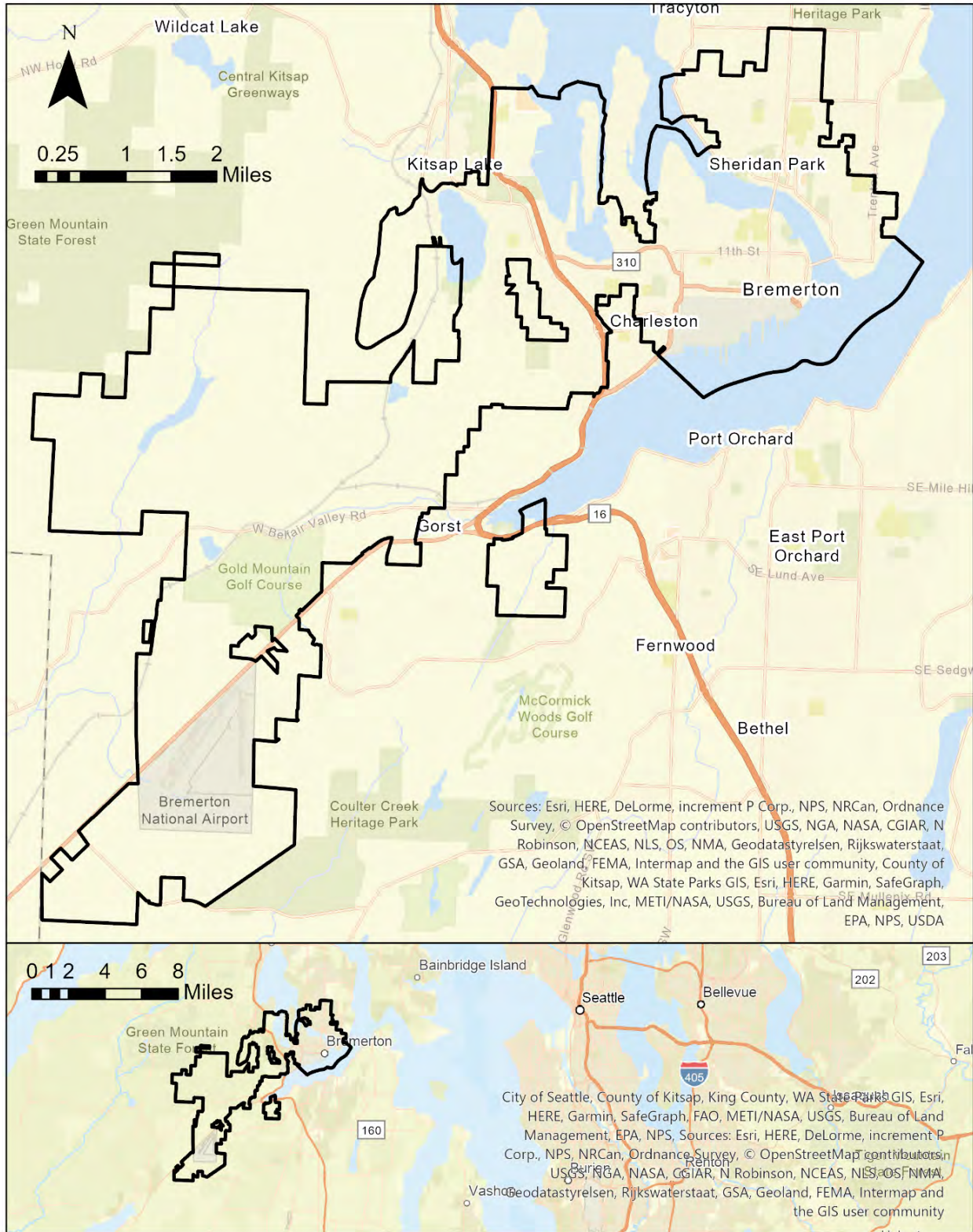


Figure 1-1. City of Bremerton Location
 Stormwater Comprehensive Plan
 City of Bremerton

1.3 Stormwater Utility Overview

The Utility provides the citizens of Bremerton with stormwater collection, conveyance, flood control, street sweeping, and water quality treatment services in compliance with federal, state, and local regulatory requirements. To provide these services, an adequate and stable funding program is required. In 1994, the City established the Stormwater Utility and stormwater rate structure. Rates are adopted by ordinance and adjusted annually to support the Utility's needs and maintain level of service.

The Utility operates within several divisions of the Public Works & Utilities division (PW&U). It works in cooperation with other City departments, Kitsap County, City of Port Orchard, state and regional agencies, and the public to respond to requests for service, implement applicable regulations and address regional water quality, flooding, and habitat restoration needs.

1.4 Plan Organization

The content and organization of the stormwater comprehensive plan is summarized below.

Executive Summary: The Executive Summary describes the main elements SWCP in a condensed manner.

Chapter 1 – Introduction: Chapter 1 provides an overview of plan purpose, scope, objectives, and organization.

Chapter 2 – Regulatory Requirements: Much of what is required in managing a stormwater utility is driven by federal, state, and local regulations. This chapter summarizes the federal, state, and local regulations that influence municipal stormwater management.

Chapter 3 – Service Area Description: This chapter describes the physical features, land use and primary natural resources in the Utility service area.

Chapter 4 – Stormwater System Description: Chapter 4 describes the City's stormwater infrastructure including number, type, and location of facilities.

Chapter 5 – NPDES Permit Compliance: Chapter 5 provides an evaluation of the City's activities to meet SW Permit requirements and identifies potential compliance gaps.

Chapter 6 – Program Management and Administration: Chapter 6 describes Utility organization, staffing levels and management responsibilities.

Chapter 7 – Fish Passage Barriers: This chapter describes fish passage barrier locations and proposed corrective actions.

Chapter 8 – Kitsap Lake Management Plan: Chapter 8 describes specific needs and actions related to management of Kitsap Lake.

Chapter 9 – Capital Improvement Plan: Chapter 9 describes the 2022-2027 Capital Improvement Plan (CIP) and the 20-year CIP.

Chapter 10 – Financial Assessment: The financial assessment evaluates if the level of revenue collected through rates and GFCs is sufficient to implement the plan including both SW Permit requirements and capital facilities.

Chapter 11 – Recommendations and Implementation Plan: Summary of proposed actions related to SW Permit compliance and plan implementation.

1.5 Public Involvement Conducted for This Plan

Public review and comment opportunities were provided as part of State Environmental Policy Act (SEPA) review of the draft plan (Appendix A), and in conjunction with City Council meetings where the Plan has been presented for the Council’s consideration and adoption.

A total of five public comments were received on the draft plan; four comments were received regarding flooding concerns on Rainier Avenue North, and one comment was received regarding drainage issues on East 16th Street. A capital project was added to the 20-year CIP in response to comments from Rainier Avenue citizens, and City staff will evaluate conditions on East 16th Street as part of CIP review in 2023-24. City Council review comments were received at the Council Study Session on August 09, 2023. The plan was updated with additional information on wetlands, rain gardens and other naturalistic treatment BMPs in response to City Council comments.

2 REGULATORY REQUIREMENTS

Compliance with stormwater regulations is a central responsibility of the Utility. The City's stormwater program must comply with the SW Permit, the City-wide Comprehensive Plan and support the current Puget Sound Partnership (PSP) Action Agenda. The Utility works to reduce the discharge of pollutants to the maximum extent practicable (MEP) by using all known, available, and reasonable methods of prevention, control, and treatment (AKART) to prevent and control pollution of waters of the state of Washington, consistent with the requirements of the SW Permit.

The City's Stormwater Program actively regulates new development and redevelopment through planning, permitting, inspection, operation and maintenance (O&M), planning and coordination of infrastructure upgrades, pollution prevention, and public education and outreach activities in accordance with the Bremerton Municipal Code (BMC).

2.1 Regulatory Framework

This section summarizes the federal and State regulations and programs that drive much of the Utility's work. The Utility must establish and maintain programs that comply with State and federal regulations pertaining to surface water, including natural water bodies and the constructed stormwater system, as well as groundwater and sediment standards. The City achieves compliance by incorporating these requirements into its policies, regulations, and ordinances (see Table 2-1).

The primary regulatory driver for the Utility is the SW Permit issued by Ecology. The SW Permit authorizes the Utility to discharge stormwater runoff from the City's municipal separate storm sewer system (MS4) into Washington State waters provided the Utility implements programs to protect water quality by reducing the discharge of nonpoint source pollutants to the MEP through application of SW Permit-specified BMPs. Some areas of Bremerton's stormwater system are combined with the sanitary sewer system where stormwater is treated at the wastewater treatment plan (WWTP), but all stormwater features are treated as though they are separate.

2.1.1 Other Permittees within Bremerton and Relationship to City's NPDES Permit

All properties within the City's jurisdictional boundary must comply with the regulations issued by Ecology's SW Permit except for NBK who has been issued a SW Permit by the EPA, and Bremerton's watershed lands that are actively used for forestry or source water protection and operate under the Forest Management Practices Act, Chapter 76.09 RCW. Sites inside the watershed areas that are used by others through lease options or developed sites must meet SW Permit requirements.

Industrial sites that meet the Industrial Stormwater General Permit (ISGP) criteria are issued an ISGP by Ecology and must meet both the ISGP and City's SW Permit requirements. This includes the Port of Bremerton (Port) Airport, Puget Sound Industrial Center (PSIC) sites, Kitsap Transit, fuel distributors, and others in the city. The list of individual SW Permittees in the City is provided in Appendix B.

NBK's EPA SW Permit covers stormwater discharges from the Naval Base Kitsap - Puget Sound Naval Shipyard, and Jackson Park areas. The NBK SW Permit is generally consistent with the requirements of the City's SW Permit. NBK staff manage compliance and reports directly to the EPA and are outside of the City's SW Permit umbrella.

Site-specific ISGPs are issued to a broad range of public and private businesses including manufacturing, mining, waste management, transportation, and construction equipment storage. The City's WWTP was issued an ISGP and the Oyster Bay Public Works Complex received a Conditional Non-Exposure (CNE) in lieu of an ISGP. The City facility managers and staff ensure compliance with their permits. The Port airport operates under an Ecology issued ISGP and several businesses in the PSIC area, which includes the Port Industrial Park (Figure 2-1), were recently issued an ISGP. The IGSP is issued directly by Ecology to these businesses and/or the Port, and it is their responsibility to comply with permit requirements.

An interlocal agreement between the City and Port defines responsibility for the operation and maintenance of the stormwater system inside Port properties. The Port reports activities to both the City and Ecology. The City works cooperatively with the Port and other ISGP permittees on compliance issues and provides public education materials and outreach support to assist with their program requirements to ensure tenants are aware of best management practices (BMPs) for their businesses. Individual ISGPs issued to City operated industrial facilities (wastewater treatment plant, maintenance shops, etc.) are administered by the facility managers and operations staff with support from the City's Stormwater Permit Coordinator.

Bremerton's Water Utility manages about 9,000 acres of forest lands with a focus on protecting water quality of the surface water drinking supply. These forest lands also provide timber sales revenue to that keep water rates low. The Forestry program follows regulations in Chapter 76.09 RCW (Forest Management Act), which meets SW Permit requirements. This forested area is restricted from public access to protect water quality. The City has some constructed facilities in this area such as Gold Mountain Golf Course and the UV Disinfection Plant. These facilities have SWPPP's that identify potential stormwater management needs and provide guidance and requirements for operation and maintenance of the facilities.



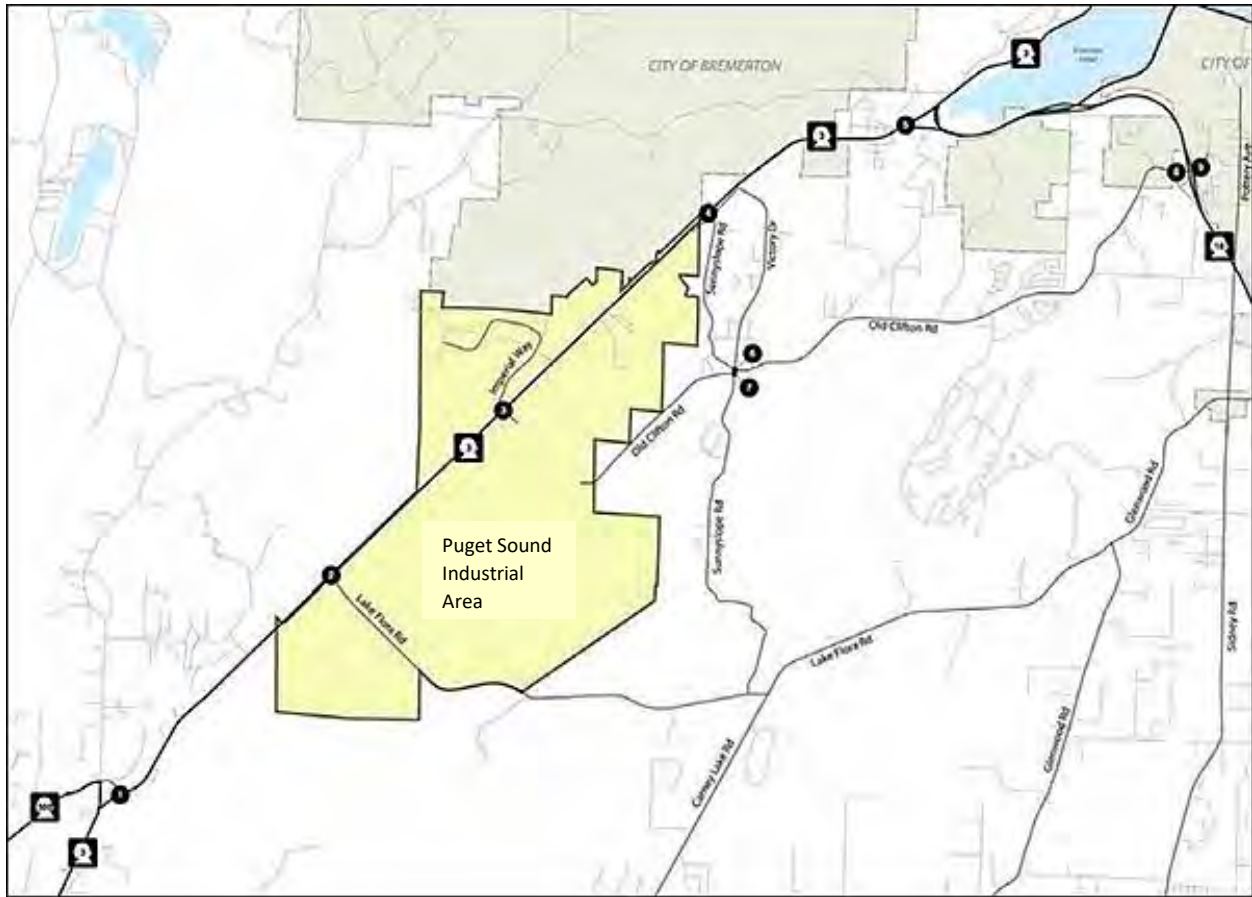


Figure 2-1. Puget Sound Industrial Area.

2.2 Federal Requirements

The Utility directly or indirectly adheres to the requirements of the following five federal government-based requirements:

- *National Environmental Policy Act (NEPA)*: requires documentation and evaluation of the potential environmental impacts of projects with federal funding and/or permits;
- *Clean Water Act (CWA)*: requires permits for work within waters of the United States and adherence to permit requirements to maintain or improve water quality and habitat;
- *Endangered Species Act (ESA)*: requires capital project features and O&M practices that support species and habitat protection;
- *National Flood Insurance Program (NFIP)*: requires cities to adopt and enforce ordinances that meet or exceed Federal Emergency Management Agency (FEMA) requirements to reduce the risk of flooding; and
- *Governmental Accounting Standards Board (GASB)*: requires the City to adhere to requirements of established governmental accounting and financial reporting.

Table 2-1. Federal and State Regulations Relevant to the Utility’s Responsibilities.

Title	Regulation or Program	Application to the City
<i>Federal</i>		
NEPA	Regulation	All projects with federal funding or needing federal permits are required to submit a NEPA review to describe environmental ramifications, disclose federal actions, provide a mechanism for public input, prepare an environmental assessment, and consider alternatives and mitigation for actions.
CWA	Regulation	Originally passed in 1972 to address point sources of pollution and to restore the chemical, physical, and biological integrity of the nation’s water (33 USC 1251 [a]). Several sections are administered by Ecology through permission of EPA including §303(d), §401, and §402-NPDES as described in RCW 90.48.260. Different sections of the CWA require permits and adherence to permit requirements to maintain or improve water quality.
CWA §404 Wetlands	Regulation	Permit program for capital projects that is administered by the U.S. Army Corps of Engineers to ensure no net loss of wetland areas. Permits are obtained when work occurs in or near a designated wetland area. The City’s designated wetlands are mapped in the City’s GIS.
ESA	Regulation	Stormwater capital improvement projects that involve federal permitting or funding could require consultation with federal agencies under §7 of the ESA. ESA consultation could increase project timelines and costs. For the Utility, ESA-regulated activities require O&M practices that are protective of ESA species and critical habitat conservation.
GASB Statement 34	Program	Requires the City to adhere to established governmental accounting and financial reporting such as accurate inventory of the City’s stormwater infrastructure.
<i>State and Regional</i>		
SEPA	Regulation	Each capital improvement project requires SEPA review prior to implementation unless that project qualifies as exempt under state law and BMC. Planning documents that outline proposed capital projects and programs such as the Capital Improvement Plan (CIP) require programmatic SEPA review to evaluate cumulative impacts.
CWA §303(d) TMDL listings ^a	Regulation	The Sinclair and Dyes Inlet Fecal Coliform TMDL identifies specific actions required in the SW Permit to meet the cleanup plan goals and water quality standards.
CWA §401 water quality Certification ^a	Regulation	Individual projects that require §404 permit (projects with the federal connection) or other federal permits also may require a §401 certification from Ecology. A §401 certification can include requirements for site-specific mitigation measures, which may affect capital improvement project design and costs.

Table 2-1. Federal and State Regulations Relevant to the Utility’s Responsibilities (cont).

Title	Regulation or Program	Application to the City
CWA §402 MS4 NPDES Permit ^a	Regulation	Includes requirements focused on stormwater quality management in the City. The SW Permit requires the reduction of pollutant loads to the MEP. Washington State may establish TMDLs for water bodies that violate the standards. TMDLs can become SW Permit requirements.
NFIP and Floodplain Management ^b	Regulation	Washington State’s RCW 86.16, “Floodplain Management,” establishes statewide authority for floodplain management as provided through the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Provides guidance and regulations for City’s Floodplain Development Permit and participation in NFIP.
GMA and City of Bremerton Comprehensive Plan	Regulation	The GMA is a significant driver for land use and permitting decisions. The 2016 City of Bremerton Comprehensive Plan (as amended in 2019) is required by the GMA and includes language preventing adverse surface water impacts from land development.
State Hydraulic Code	Regulation	Projects that involve work in waters of the state such as Puget Sound, streams and culverts that convey stream flow require an HPA permit. HPA permitting and mitigation measures often affect project costs and schedules.
Archaeological and Cultural Coordination	Regulation	If capital improvement projects or private development are near known or suspected archaeological sites, they must coordinate with the Department of Archaeology and Historic Preservation, and local Indian tribes.

^a Portions of the CWA are delegated to Ecology entities for administration.

^b The NFIP is a federal program administered by FEMA but is presented here with Washington State-administered floodplain management requirements.

The requirements from these federal and nationally based regulations and their potential impact on Utility operations and management are presented below.

2.2.1 National Environmental Policy Act (43 CFR 1500–1508)

Passed in 1970, NEPA requires that all proposed activities (such as capital projects) with federal funding or needing federal permits prepare documentation that describes the environmental impacts of proposed actions and perform public outreach and review opportunities. The documentation includes disclosure to the public of the following information: the federal-related actions and a mechanism for public input, preparation of environmental impact statements, and presentation of alternatives and mitigation for major project components that might impact the environment.

2.2.2 Clean Water Act (33 USC 1252 [a])

The CWA is the 1972 amendment to the 1948 Federal Water Pollution Control Act. The main purpose of the CWA is to achieve the goal of restoring and maintaining the chemical, physical, and biological integrity of the nation’s waters. To achieve that goal, the CWA directs the U.S. Environmental Protection Agency (EPA) to administer programs to (1) regulate the discharge of pollutants (e.g., through permits), and (2) implement water quality standards. The relevant portions of these two programs are summarized below.

In 1999, EPA adopted rules to implement Phase II of the MS4 Program, which applied to smaller communities. These smaller communities were identified as those located in urbanized areas as defined by the U.S. Census. The Phase II Permit is described in CWA 402-NPDES, CFR Title 40, Chapter 1, Subchapter D, Part 122.

2.2.3 Wetland-Related Permits (CWA §404)

Section 404 of the CWA regulates filling and dredging waters of the United States, particularly wetland areas, through a federal a permit program. The U.S. Army Corps of Engineers administers the permit program to ensure no net loss of wetland areas. Under this permit program, capital projects that impact wetlands need to include measures to avoid, minimize, or compensate for any wetland loss. In cases where a wetland area is impacted, the permit program regulates wetland compensation through a mitigation process.

2.2.4 Endangered Species Act

The ESA provides for both the conservation and protection of plant and animal species that face the threat of extinction, as well as for the supporting ecosystems. To prevent further decline of the species and to encourage restoration, the ESA prohibits “take” of listed animals, which includes significantly modifying its habitat. The ESA requires that a plan be developed and implemented to address recovery of the species.



The National Oceanic and Atmospheric Administration (NOAA) listed Puget Sound Chinook salmon and Puget Sound Steelhead as threatened species under the ESA on March 24, 1999, and May 11, 2007, respectively. Both species’ threatened status was confirmed on April 14, 2014.

Bremerton is located within Water Resource Inventory Area (WRIA) 15 (Kitsap Watershed) and participates in the Salmon Recovery Council and West Sound Watershed Council’s salmon conservation planning efforts for streams discharging to Puget Sound. The only streams in the City with documented Chinook presence are Gorst Creek and Parish Creek. Steelhead trout also have a documented presence in Union River, Chico Creek, Parish Creek, Anderson Creek and Gorst Creek (WDFW 2023). The City continues to protect Chinook, steelhead and other salmon with a range of habitat improvements, stormwater BMPs and public education

NOAA listed the southern resident population of Orca whales as an endangered species under the ESA on November 18, 2005 and updated their status on April 14, 2014. The southern resident population of killer whales spends summers and fall in Puget Sound, which is considered critical habitat. Urban surface runoff has been identified as one of several sources of pollution that degrades water quality and can affect killer whales through bioaccumulation of contaminants in prey. Bremerton discharges stormwater runoff to Puget Sound from several drainage basins and a small portion to Hood Canal from the Puget Sound Industrial Center region of the City. Activities such as road maintenance, culvert replacement, stormwater

asset O&M, and land use regulations have potential to impact aquatic habitat. These activities can therefore be subject to the requirements of the ESA.

2.2.5 National Flood Insurance Program and Floodplain Management (RCW 86.16)

In 1968, the U.S. Congress created the National Flood Insurance Program (NFIP) to provide financial protection to property owners from flood damage. The NFIP offers flood insurance to homeowners, renters, and business owners if their community participates in the NFIP. Participating communities agree to adopt and enforce ordinances that meet or exceed FEMA requirements to reduce the risk of flooding (see [FloodSmart.gov](https://www.floodsmart.gov) for details about the program). The City is a participating community in FEMA's NFIP. To participate in the program, the City adopted and enforces a floodplain management ordinance that regulates development, BMC Chapter 17.60 Floodplain Management.

The City updated BMC 17.60 in 2021 to provide consistency with updated FEMA regulations. The updates ensured that the City remains in compliance with FEMA regulations and maintains its eligibility for the NFIP. The current FEMA flood insurance rate maps (FIRMS) affect properties along the Puget Sound shoreline and Gorst Creek.



The Revised Code of Washington (RCW) Chapter 86.16, "Floodplain Management," establishes statewide authority for floodplain management as provided through the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Ecology is identified as the responsible State agency to carry out this program. Under Washington Administrative Code (WAC) Chapter 173-158, Ecology requires local

governments to adopt and administer regulatory programs compliant with the minimum standards of the NFIP. Ecology provides technical assistance to local governments for both identifying the location of the 100-year (base) floodplain and administering their floodplain management ordinances.

2.2.6 Governmental Accounting Standards Board Statement (GASB)

Financial reporting by public utilities must adhere to requirements set by the GASB, which is the agency responsible for developing standards of State and local governmental accounting and financial reporting. Most prominent is GASB Statement 34, "Basic Financial Statements—and Management's Discussion and Analysis—for State and Local Governments," which was issued in June 1999. The main objective of Statement 34 requirements is to develop financial reports that are more comprehensive and easier to understand by the public. Statement 34 consists of several components, which can be seen in full in paragraphs 3 through 166 of the GASB publications (GASB 2017). The City needs an accurate inventory of stormwater infrastructure to comply with GASB 34 requirements.

2.3 State Requirements

State regulatory requirements and federal requirements administered by the State that are relevant to the Utility are described below. Two sections of the federal CWA administered by the State through

Ecology include the SW Permit (CWA 402-NPDES) and TMDL Listing (CWA 303(d)). For convenience, the federal and State requirement for flood protection and mitigation are described together below. Other State requirements, such as the planning requirements associated with the Growth Management Act (GMA) and permitting requirements outlined in the state Hydraulic Code, are also discussed.

2.3.1 Phase II NPDES Permit

Bremerton is a Phase II permitted community and received its first SW Permit from Ecology in 2007. The SW Permit allows municipalities to discharge stormwater runoff from their MS4 into Washington State waters (e.g., Puget Sound, streams, rivers, lakes, and wetlands) under conditions specified in the SW Permit.

Municipalities must implement programs to protect water quality by reducing the discharge of pollutants to the MEP and by applying AKART. Stormwater pollution reduction is accomplished through the application of both structural and non-structural BMPs. The stormwater management activities specified in the Phase II Permit are documented in the City's annual Stormwater Management Program Plan (SWMP).

The 2007 SW Permit was updated and reissued to Phase II Permit holders in August 2012 with an effective date of August 2013. In January 2014, several modifications were made to the City's SW Permit. The SW Permit was issued for the period between 2013-2018 with a one-year extension that covered 2019. The current SW Permit was issued to the City in August of 2019 to run through 2024. The 2019–2024 SW Permit, issued in August of 2019, includes the following additional requirements relative to the earlier permit term:

Permit Condition S5.C.8: Business Inspection Source Control Program: To continue reduction of illicit discharges and build on existing public outreach and education efforts of Ecology's Local Source Control Partnership, the current SW Permit requires a source control program for existing development. The new source control program requires updates to the BMC as well as additional resources to manage the program and perform inspections.

Permit Condition S5.C.5: Illicit discharge tracking and documentation: The previous SW Permit provided guidance for tracking and documenting illicit discharges. To better review illicit discharge information, Ecology requires current SW Permit holders to document illicit discharge incidents and submit a file with the annual report containing the information in a format defined by Ecology. This requires Bremerton to use the Ecology system to document illicit discharge incidents and enter them into their system annually.

Permit Condition S5.C.4: Mapping and Monitoring: The current SW Permit includes minor modifications to mapping and monitoring requirements. For mapping, SW Permit holders are required to record size and material attributes for all known MS4 outfalls. This requirement has been completed by the City, and all outfalls are documented with size and material in the GIS system. SW Permit S.8 Monitoring and Assessment, requires the City to pay into an Ecology monitoring program or develop an independent monitoring program that meets Ecology's standards. The City elected to participate in the regional monitoring program in lieu of establishing and funding the city's own monitoring program. The City's

cost share has increased with the current SW Permit to support Ecology’s Regional Status and Trends monitoring program.

Language clarification: Although not resulting in substantive or actionable changes, the current SW Permit clarified language in the “Controlling Runoff from New Development, Redevelopment and Construction Sites” and “Public Education and Outreach” sections as described below.

Permit Condition S5.C.2: Public education and outreach:

Updates to education and outreach requirements resulted in “actionable changes,” to the requirements that include evaluation of the existing program,



implementing changes to the program or developing a new program, and correlating outreach efforts to water quality data. To meet some of these new requirements the City partners with local agencies through the West Sound Stormwater Outreach Group (WSSOG), funded by an interlocal agreement with Kitsap County’s *Clean Water Kitsap* program, to provide regional consistency in messaging to the public.

Permit Condition S5.C.1: Stormwater planning: The SW Permit includes a watershed-scale planning requirement for both Phase I and Phase II Permit holders. The planning effort requires the permittee to prioritize subbasins based on the needs of local receiving waters and prepare plans with targeted capital projects and BMPs that directly contribute to protecting water quality by preventing and reducing impacts to receiving waters.

Permit Condition S5.C.6: Stormwater Management Manual for Western Washington update: Ecology updated the 2014 Stormwater Management Manual for Western Washington (Stormwater Manual) to enhance usability and improve overall clarity. The new manual was released in August of 2019 which was adopted immediately per BMC 15.04.02 – Adoption of Manuals.

Permit Condition S9 - Reporting: On March 31 of each year, the SW Permit requires the City to submit a report to Ecology on the status of compliance with the SW Permit. The City must also submit a stormwater management program plan (SWMP) each year that describes the activities for the coming year. Implementation of specific Phase II Permit conditions are staggered throughout the 5-year Phase II Permit term.

2.3.1.1 Monitoring and Assessment

A Regional Stormwater Monitoring Program (RSMP) is included in the SW Permit covering collection of water quality, habitat, and biota monitoring information; program effectiveness tracking; a source identification information repository; publicly accessible monitoring data; and identification of Ecology as the program administrator for the 2013–2018 Phase II Permit term, with funding provided from each permittee. The RSMP named was changed in 2019 to the Stormwater Action Monitoring (SAM) program.

2.3.1.2 Sinclair and Dyes Inlet Total Maximum Daily Load Listing (CWA 303(d))

The SW Permit also requires compliance with established Total Maximum Daily Load plans (TMDLs). Ecology performs a statewide Water Quality Assessment every two to four years to identify water bodies that do not meet the State water quality standards. Water bodies that do not meet standards are placed on the CWA 303(d) list. Ecology then develops TMDLs for the water bodies on the 303(d) list to bring them into compliance with water quality standards. TMDLs typically apply to watershed areas that contribute flow to the 303(d)-listed streams, lakes, and marine waters.

TMDL requirements are a special condition of the SW Permit that was developed by Ecology and approved by EPA. Sinclair and Dyes Inlet's Fecal Coliform TMDL (Ecology 2012) lists fecal coliform limits for Sinclair and Dyes Inlets, Oyster and Ostrich Bays, Ostrich Creek, and Kitsap Lake.

2.3.2 Growth Management Act

The Washington State Legislature enacted the GMA in 1990 to address rapid population growth and concerns with suburban sprawl, environmental protection, quality of life, and related issues. The GMA provides a framework for regional coordination of land development. Under the GMA, local comprehensive plans, such as the City's Comprehensive Plan, must include the following elements: land use, housing, capital facilities, utilities, transportation, economic development, parks and recreation, and, for counties, a rural element.

The Comprehensive Plan requires consistency of capital facilities – including stormwater – with current and projected land use plans. The stormwater capital facilities element of the Comprehensive Plan must include:

- Inventory of existing capital stormwater facilities owned by the City;
- Level of service standards for stormwater management;
- Forecast of the future needs for stormwater capital facilities based on population growth targets;
- Proposed locations and capacities of expanded or new stormwater capital facilities; and
- A six-year plan that will finance stormwater capital facilities, within projected funding capacities and including sources of public moneys for facilities.

This Plan meets GMA requirements for capital facility plans and is expected to be adopted (as applicable and as may be amended) as an Appendix to the City's Comprehensive Plan.

2.3.3 State Hydraulic Code

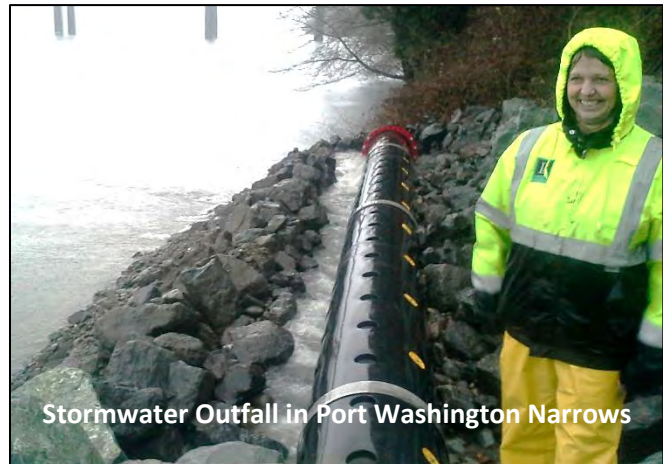
The Washington Department of Fish and Wildlife (WDFW) requires a Hydraulic Project Approval (HPA) for construction activities that use, divert, obstruct, or change the natural flow or bed of any waters of the state. The purpose of the requirement is to protect fish habitat in stream channels, prevent erosion, and protect freshwater and nearshore marine aquatic life. Construction activity such as bridge painting, channel improvements, stream restoration, or culvert replacements within the ordinary high-water mark of any stream would typically require an HPA. Flood-damage repair and prevention activities may be permitted as a 5-year plan, avoiding the need to permit each individual activity. WDFW generally may require modifications to plans and specifications that avoid or mitigate project impacts on fish ecology. If

it is more cost-effective, the applicant may be permitted to perform offsite mitigation, if it will generate equal or greater biological function and values as compared to onsite mitigation.

2.3.4 Shoreline Management Act

The Shoreline Management Act (SMA), like the State Environmental Policy Act (SEPA), was enacted in 1971, and its purpose is to manage and protect the shorelines of the state by regulating development in the shoreline area. A major goal of the Act is "to prevent the inherent harm in an uncoordinated and piecemeal development of the state's shorelines." Its jurisdiction includes the Pacific Ocean shoreline and the shorelines of Puget Sound, the Strait of Juan de Fuca, rivers, and streams and lakes above a certain size. It also regulates "wetlands" associated with these shorelines.

The primary responsibility for administering this regulatory program is assigned to local governments, with a significant oversight role by Ecology. Bremerton has adopted the shoreline master program plan and have adopted required updates pursuant to the state Shoreline Master Program Guidelines, Chapter 173-26 WAC. Shoreline master programs establish goals and policies that are implemented through use regulations. No substantial development is permitted on the state's shoreline unless a permit is obtained from the local jurisdiction that demonstrates consistency with the shoreline master program.



Stormwater Outfall in Port Washington Narrows

2.3.5 Dam Safety

Ecology regulates more than 1,100 dams in Washington state. Safety is their priority and they have rigorous procedures in place to protect people and property located downstream from dams. Ecology provides plan review and construction inspections to help ensure dams are properly designed and constructed. They also inspect existing dams to ensure proper operation and maintenance. In Washington, a dam owner is legally responsible to maintain, repair, or operate their dam in a safe and proper manner.

A structure that holds 10 or more acre-feet (3.2 million gallons) of water above the natural grade of the surrounding land is considered a regulated dam. Large stormwater detention structures can exceed this size threshold. Other agencies regulate dams in Washington State that include the Federal Energy Regulatory Commission, Bureau of Reclamation, U.S. Army Corps of Engineers, and the U.S. Department of Interior.

2.3.6 Puget Sound Partnership Plan

The Puget Sound Partnership (PSP) is the state agency leading the region's collective effort to restore and protect Puget Sound. The PSP brings together hundreds of partners to mobilize action around a common agenda, advance investments and advance priority actions by supporting partners. The PSP receives the bulk of its funding from federal Puget Sound National Estuary Program.

The PSP Action Agenda Plan is developed through collaboration with Local Integrating Organizations (LIOs), regulatory agencies, and panels that work together to develop priorities and goals. The greater Puget Sound ecosystem recovery effort is funded in number of ways, including local, state, tribal and federal government funding. Nonprofits, businesses, and foundations also make significant investments.

Bremerton is represented in the PSP through membership in the West Sound Partners for Ecosystem Recovery (WSPER) and the PSP Salmon Recovery Council.

2.4 Local Requirements

The Bremerton Municipal Code (BMC) and the City’s Comprehensive Plan (2016) provides local regulatory structure and policy for new and redevelopment, as well as general enforcement of requirements defined in state and federal laws.

2.4.1 Level of Service Policies, Goals and Standards

Level-of-service (LOS) policies and standards are defined in the City of Bremerton Comprehensive Plan (2016) as a measure of the current, expected and acceptable level of service quality for the local community. Stormwater LOS criteria are used as benchmarks to establish and assess the performance of existing facilities and management decisions related to the administration, operation, maintenance, and capitalization of stormwater assets. They are also used to assess whether existing capacity is adequate to serve new development, or to determine what facility improvements will be required to avoid overloading existing facilities. As the community grows in population, LOS standards help identify facility upgrades necessary to keep pace with growth without compromising service standards.

The goals and objectives of the City’s Stormwater Program reflect LOS expectations for stormwater management facilities. The minimum LOS is generally established through the NPDES Permit requirements and consist of:

- Compliance with the SW Permit; and
- Land development compliance with the BMC Chapter 15.04, Stormwater.

With increased regulatory attention on the potential impacts of surface water management and stormwater discharges to salmonids, stormwater LOS expectations may be expanded beyond these basic regulatory compliance goals to include a broader set of stormwater goals and objectives that generally consist of:

- Preservation of natural hydrology and reduction of stormwater flow volumes,
- Reduction of stormwater pollutant loading to ground and surface water,
- Greater infiltration of stormwater to improve aquifer recharge and stream base flow, and
- Integration of stormwater practices into the landscape, and utilization of land that supports



capital facilities for multiple purposes when feasible.

Based on the existing regulatory focused LOS, and the broad objectives defined above, the strategic level of service goals for the stormwater program can be defined by the following LOS measures:

- Coordinate stormwater regulatory review and implementation processes to address the potential impacts of stormwater from future development.
- Maintain and where feasible, reduce peak stormwater flows to streams necessary to prevent flood damage and support stream biological functions.
- Maintain and where feasible, reduce current pollutant loading from stormwater discharges necessary to sustain beneficial uses for humans, fish, and wildlife.
- Maintain and where feasible, increase stormwater infiltration to improve aquifer recharge and stream base flows.

New development will meet LOS criteria through compliance with applicable regulatory criteria.

2.4.2 City of Bremerton Critical Areas Ordinance

Bremerton Municipal Code 20.14 establishes Critical Areas Ordinance (CAO) provisions for the purpose of protecting fish and wildlife habitat, and public health, safety, and welfare by establishing provisions to classify, protect, and preserve Bremerton's critical areas and their functions and values by providing standards for development in association with these areas. The identification and protection of critical areas is required by the Washington State Growth Management Act of 1990 (Chapter 17, Laws of 1990). The CAO includes provisions that protect property, wildlife, fish, water quality, environment, and land use.

3 SERVICE AREA DESCRIPTION

This chapter describes the context for surface and stormwater planning in the City and summarizes the City's physical features and hydrologic setting.

3.1 Physical Setting

The City of Bremerton is located in western Puget Sound in the central portion of Kitsap County about 15 miles west of Seattle. Bremerton is located in the eastern portion of WRIA 15, or the East Kitsap watershed. Most of this area is comprised of numerous small drainages flowing directly into Puget Sound. Portions of the City to the west and southwest of Gorst drain into the Union River and ultimately into Hood Canal (Figure 3-1). The City includes the NBK-Bremerton, PSNS and Intermediate Maintenance Facility (NBK-Bremerton), the PSIC and more than 9,000 acres of Water Utility owned forest lands which span both the Hood Canal and Kitsap WRIA 15 sub-basins.

3.2 Land Use and Impervious Surfaces

Land uses in the City are shown in Figure 3.2. Land use patterns typically reflect relatively concentrated industrial, commercial, military, and residential land uses in urban areas along the marine shorelines, with lower density residential development in the upland interior. The military/industrial development of the NBK and PSNS occupies an area along the north shore of Sinclair Inlet. Between the PSNS and Ostrich Bay, land uses are primarily dense to moderately dense residential and commercial urban areas.

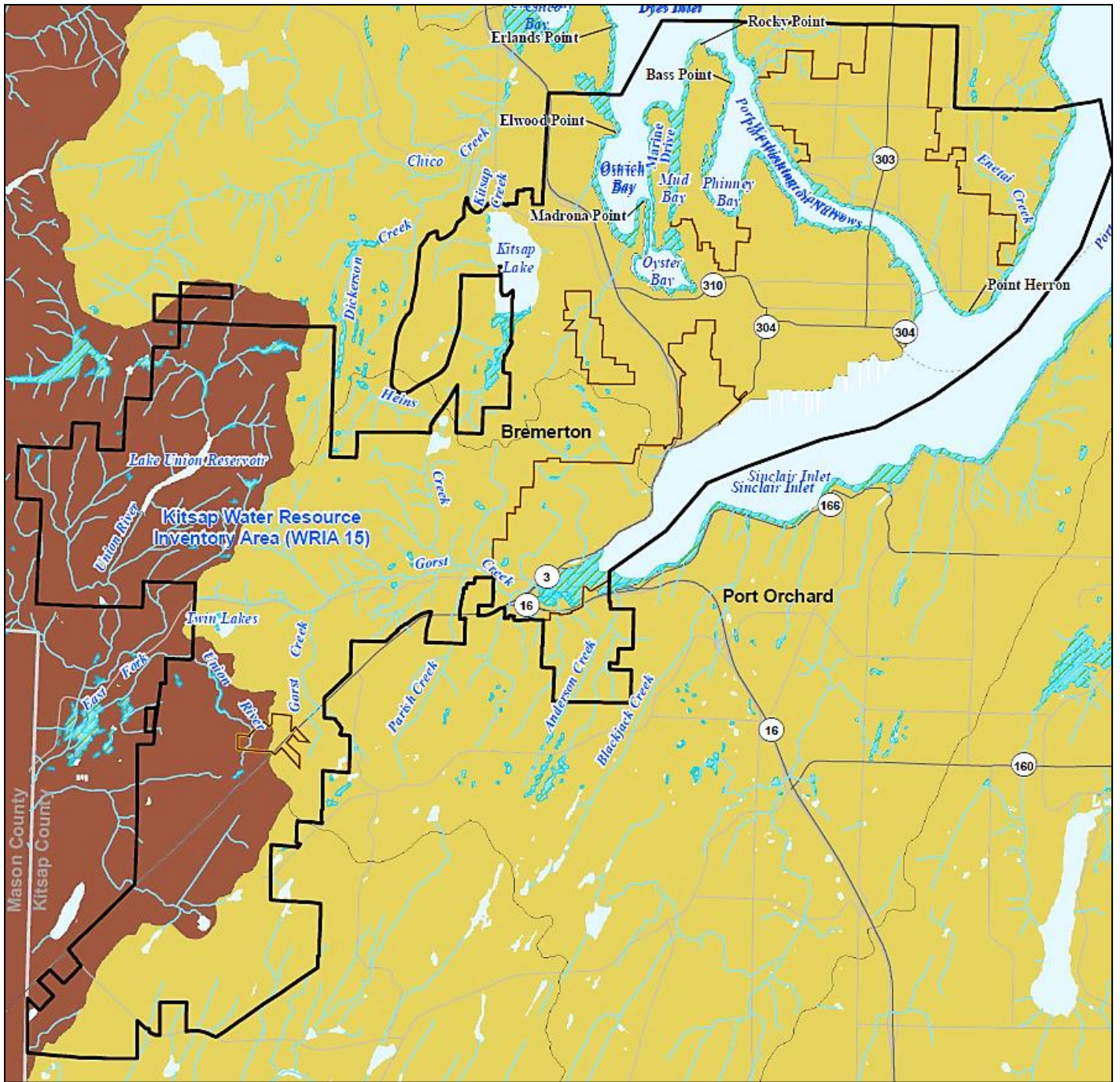
Largely forested and undeveloped lands are typical in the Union River and upper Gorst Creek watershed areas. Commercial and industrial land uses dominate in the Gorst urban growth area (UGA) just west of the mouth of Gorst Creek and in the PSIC. Impervious surface areas in the City reflect these existing development patterns (Figure 3.3).

3.3 Bremerton Water Utility Forest Lands

Bremerton's Water Utility owns and manages over 9,000 acres of forest lands that consist of headwaters for the Union River and Gorst Creek watersheds. The City owns approximately 95 percent of the Union River watershed above the City's water intake facility which is used to protect source water for the drinking water system and provides selective timber harvest to manage the program and provide funding for Water Utility programs. The Gorst Creek watershed areas are used for managed timber production and harvest as well as support a salmon hatchery operated by the Suquamish Tribe.

3.4 Water Resources and Drainage Basins

Water resources in the City consist of streams, wetlands, lakes, and groundwater (Figure 3-4). Larger drainage basins include Gorst Creek, Wright Creek, Ostrich Creek, Kitsap Lake, and the Union River. Streams in the City are typical of Puget Sound lowlands with generally moderate to low gradients that originate from headwater wetlands, perched groundwater, and lakes on upland plateaus and hills. With no large rivers or mountains containing snowpack, City streams are typically relatively short in length and carry surface pollutants from stormwater runoff rapidly to receiving waters. Due to the small size of most streams, extensive floodplains are not found in the City. Flood zones defined by the 100-year flood elevations and flood hazard factors occur along almost the entire marine shoreline and the Kitsap Lake shoreline (Figure 3-4).



Legend

- Study Area
- City Boundary
- Rivers and Streams
- Road
- County Boundary
- Wetland (WDFW/NWI)
- Waterbody
- WRIA 15 Subbasins (Hydrologic Unit Code (HUC) Subbasin)
 - Hood Canal
 - Kitsap

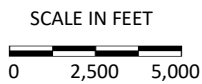


Figure 3-1. Watershed Location
 Stormwater Comprehensive Plan
 City of Bremerton

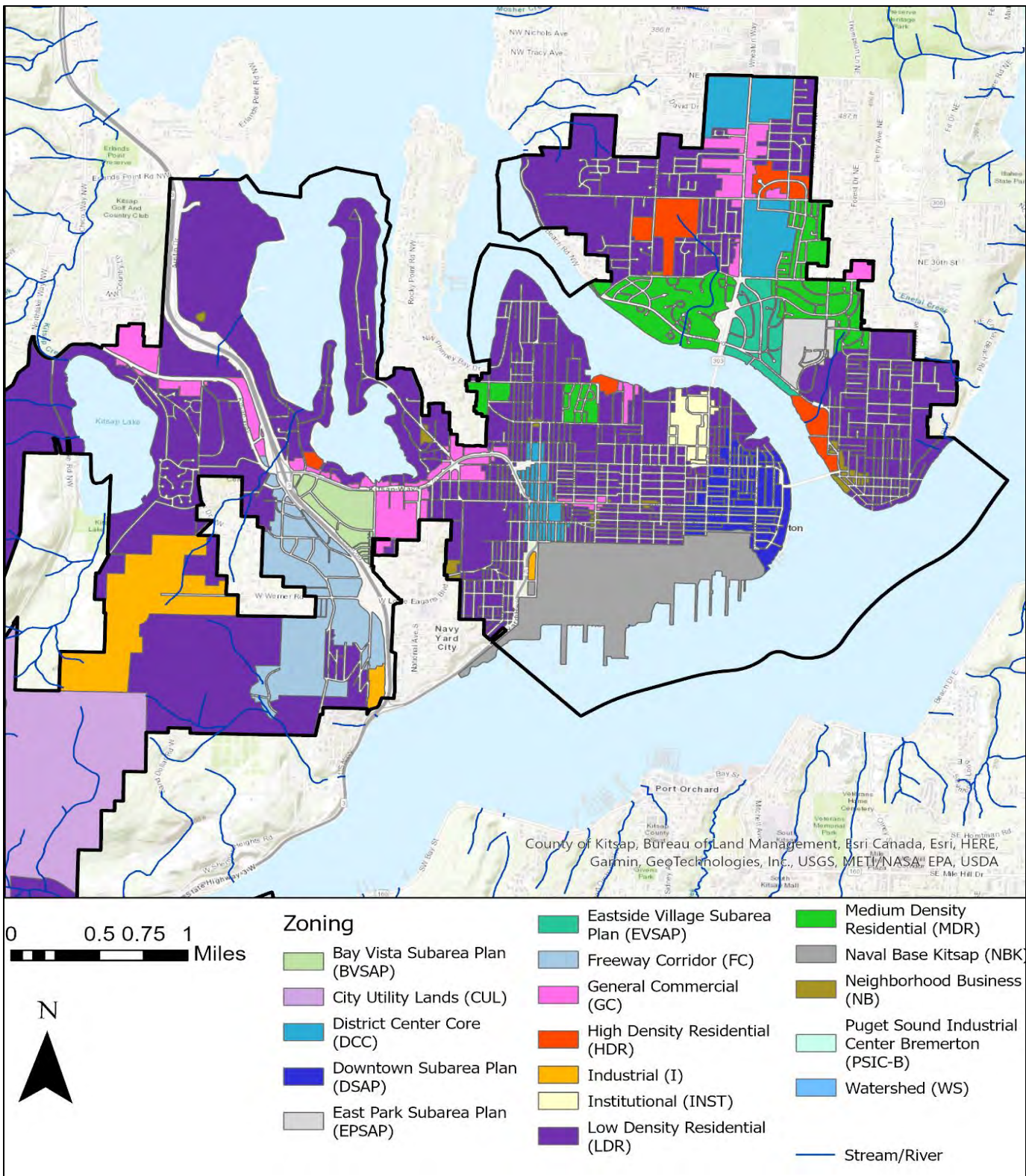
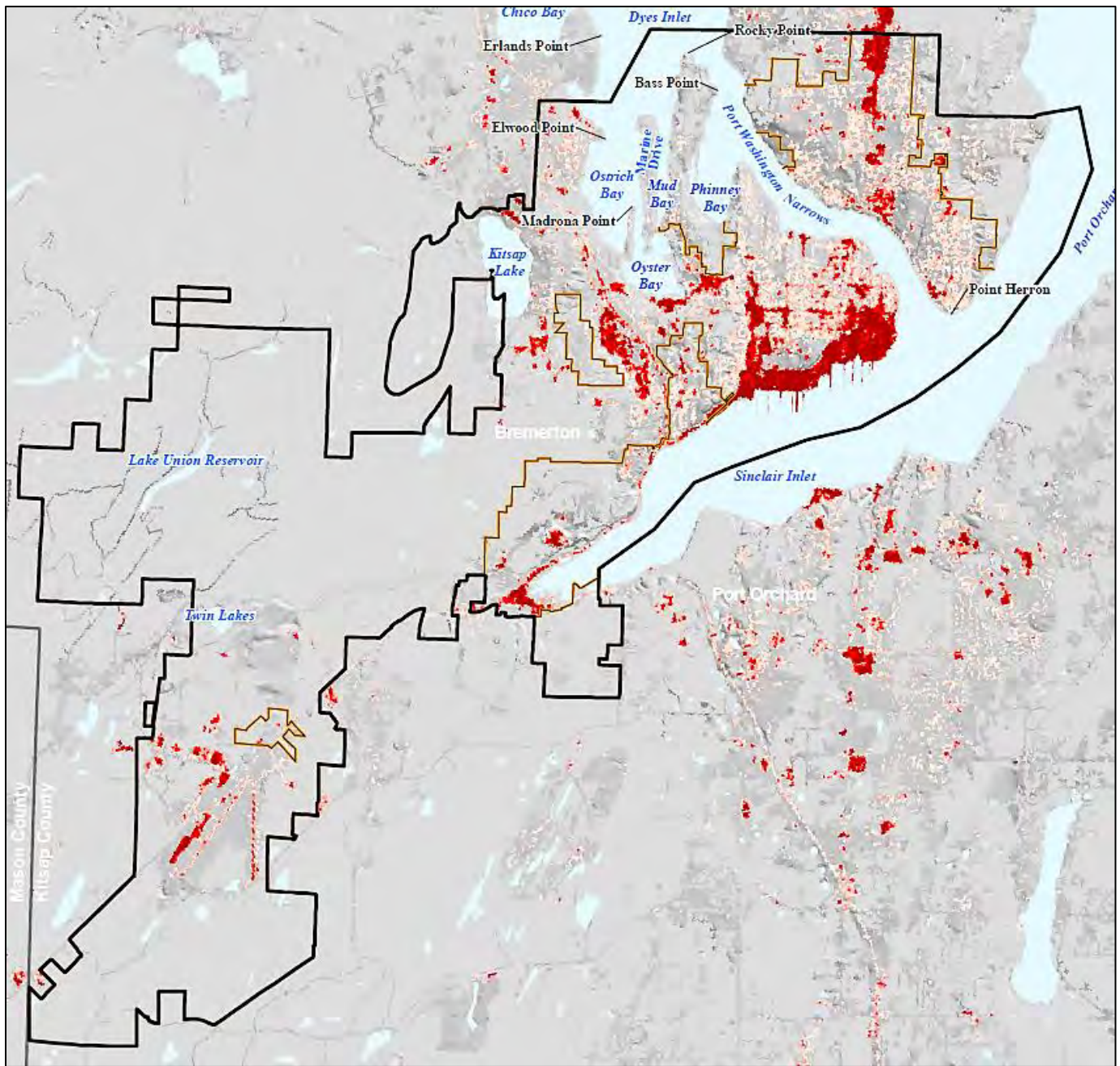


Figure 3-2. Land Use
 Stormwater Comprehensive Plan
 City of Bremerton



Legend

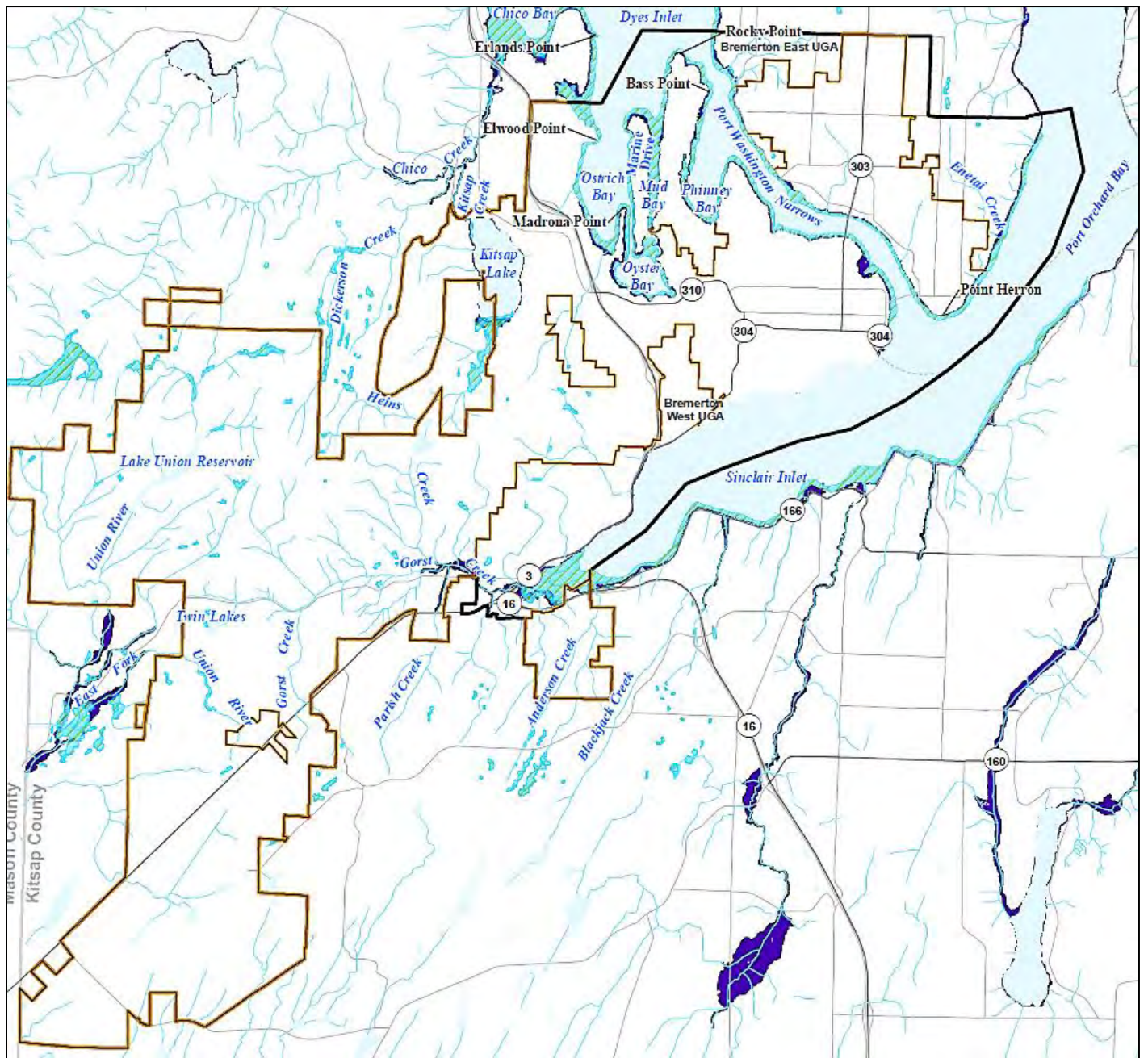
- Study Area
- City Boundary
- County Boundary
- Waterbody
- Percent Impervious
 - < 60%
 - 60-69%
 - 70-79%
 - 80-89%
 - 90-99%
 - 90-100%

SCALE IN FEET









 0 2,500 5,000



Figure 3-3. Impervious Surfaces
 Stormwater Comprehensive Plan
 City of Bremerton



Legend

-  City Boundary
-  Study Area
-  Rivers and Streams
-  Road
-  100 Year Flood Zone
-  Waterbody
-  County Boundary
-  Wetland (WDFW/NWI)

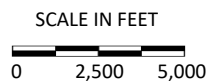


Figure 3-4. Surface Water Features
 Stormwater Comprehensive Plan
 City of Bremerton

3.4.1 Soil Conditions and Infiltration Potential

Glacial geology within the City created a complex mix of permeable deposits that infiltrate water in some areas, with impermeable deposits such as compacted till, silts and clays that limit or prevent the infiltration of water in others. Large areas of permeable deposits can be beneficial for infiltration, maintenance of stream base flow and aquifer recharge. Infiltration analysis of the City (Appendix C) shows infiltration opportunities in the central area of the City are generally limited by extensive deposits of glacial till and shallow bedrock (Figure 3-5). Moderate infiltration potential exists in selected areas of the City including the Pine Road corridor in east Bremerton, and the Warren Avenue and National Avenue corridors in west Bremerton. Refer to the Infiltration Assessment in Appendix C for additional detail.

3.4.2 Wetlands

Wetlands play an integral role in the ecology of the City's watersheds. The combination of shallow water, high levels of nutrients and primary productivity is ideal for the development of organisms that form the base of the food web and feed many species of fish, amphibians, shellfish and insects. Wetlands serve important stormwater quality, flood protection and groundwater recharge functions within the City's landscape and also provide essential habitat for fish and wildlife, including endangered species.

Wetlands, because of their unique position in the landscape, naturally receive stormwater. Past urbanization has altered the natural wetland hydrologic cycle in many locations due to increases in impervious area that increase the volume and rate of runoff, while decreasing groundwater recharge. Uncontrolled urban stormwater can cause erosion and channelization in wetlands, which ultimately adversely impacts the ability of wetlands to support aquatic habitat. Reductions in groundwater recharge within a watershed can also reduce dry weather flows in wetlands. Wetlands therefore have a limited capacity for handling increased flows or additional pollutant loadings that can be associated with stormwater. Degraded wetlands can lose their capacity to remove excess sediments, nutrients, and other pollutants, and provide habitat for fish and wildlife, if they are not adequately protected.

Within the City, wetlands are protected by a combination of land use regulations (BMC Chapter 20.14) and stormwater regulations (BMC 15.04). City stormwater code requirements for wetlands mirror those in Ecology's SWMMWW, which require that wetlands be protected from pollutant loading and hydrologic impacts. The City considers opportunities to restore and protect existing wetlands when evaluating stormwater capital projects. Wetlands are often highly effective at filtration, and construction of artificial wetlands to treat stormwater can provide treatment as well as habitat and open space benefits. The City considers treatment wetlands as a BMP option when evaluating specific stormwater projects. Current mapping of wetlands and hydric soils (which are typically associated with wetlands) in the City are shown in Figure 3.6.

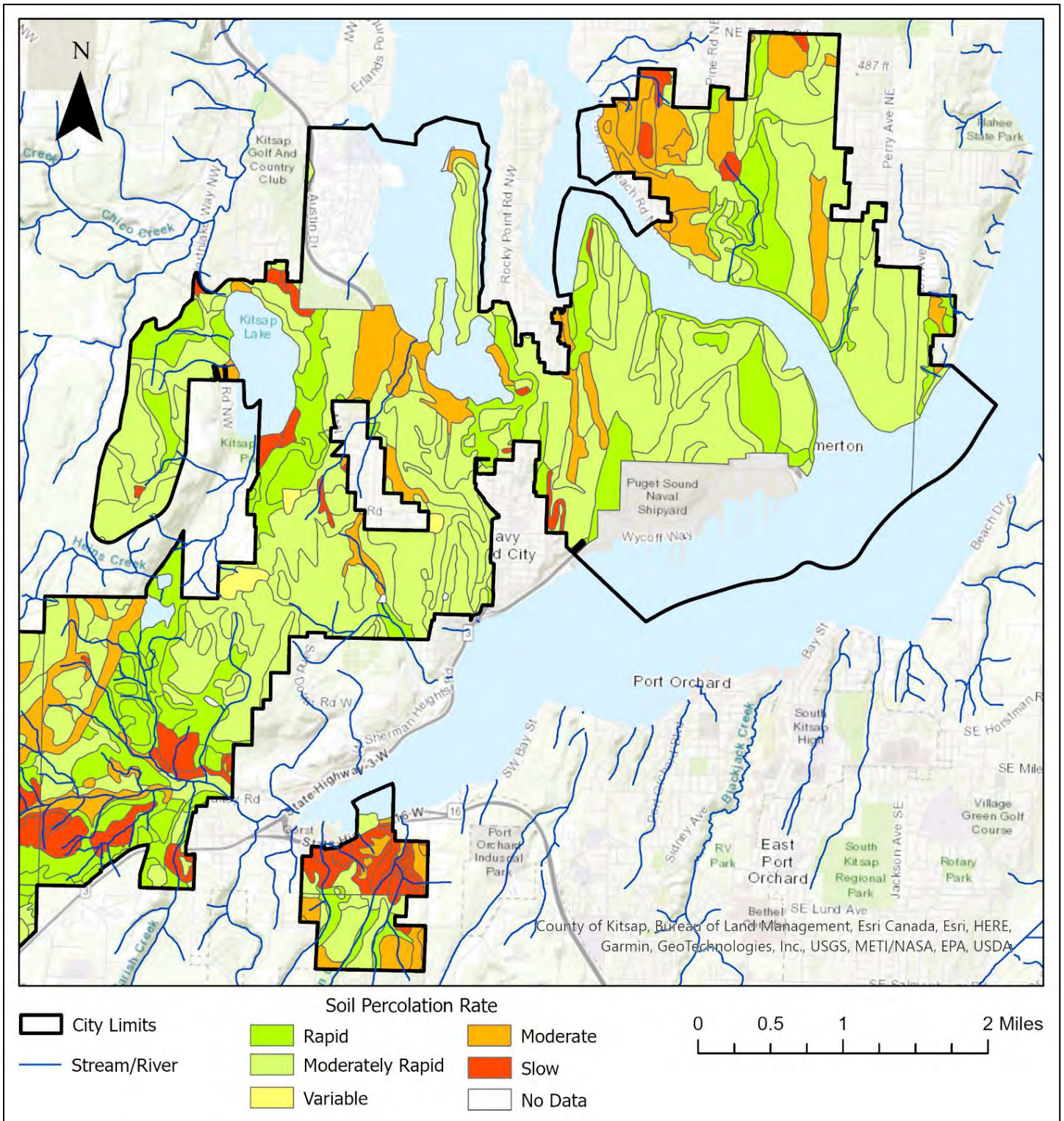
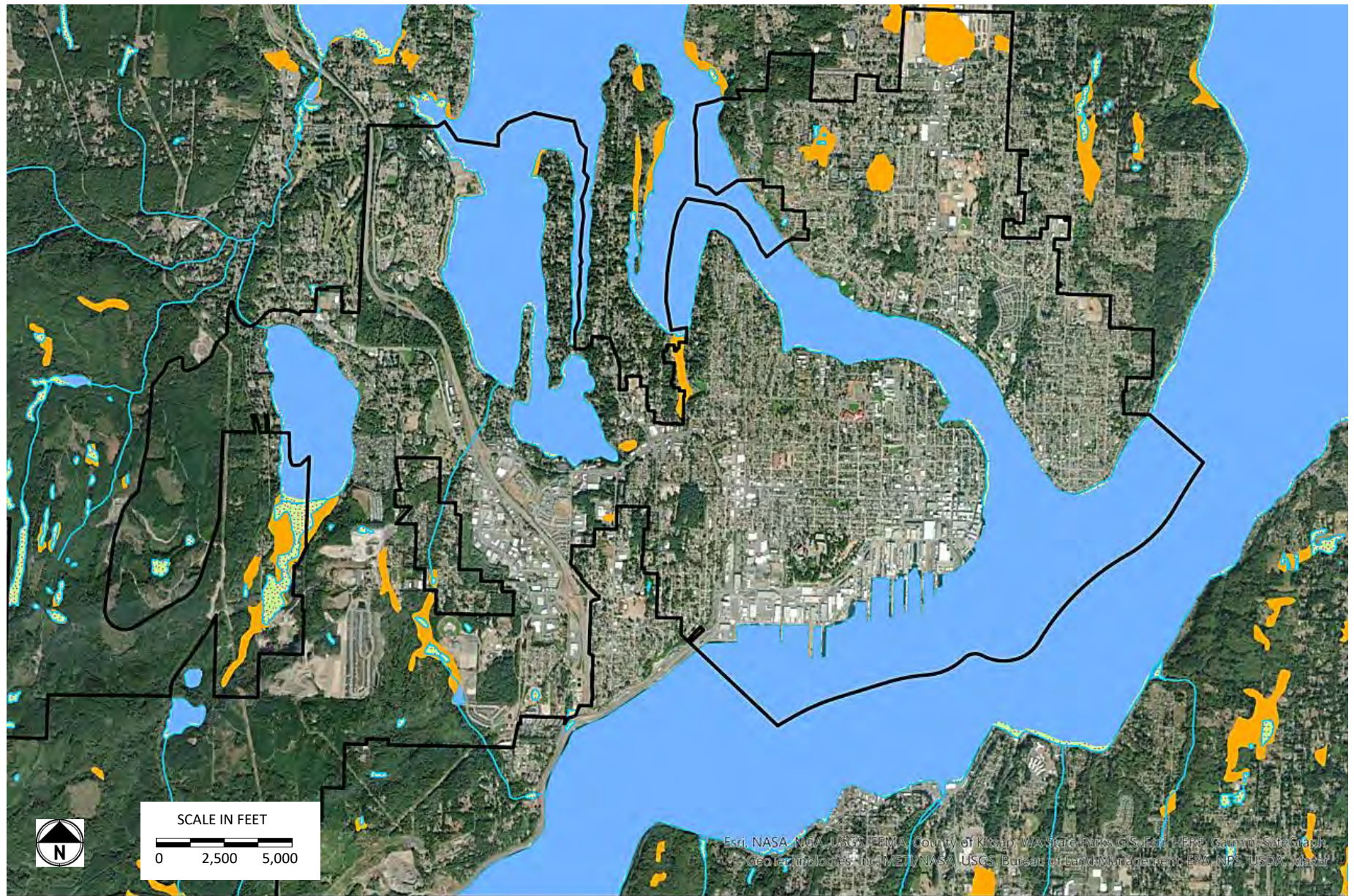


Figure 3-5. Infiltration Potential
 Stormwater Comprehensive Plan
 City of Bremerton



Legend

- Waterbodies
- Flowlines
- Wetland Areas
- Hydric Soils
- Bremerton City Limits



Figure 3-6. Wetlands and Hydric Soils
 Stormwater Comprehensive Plan
 City of Bremerton

3.4.3 Basin Areas

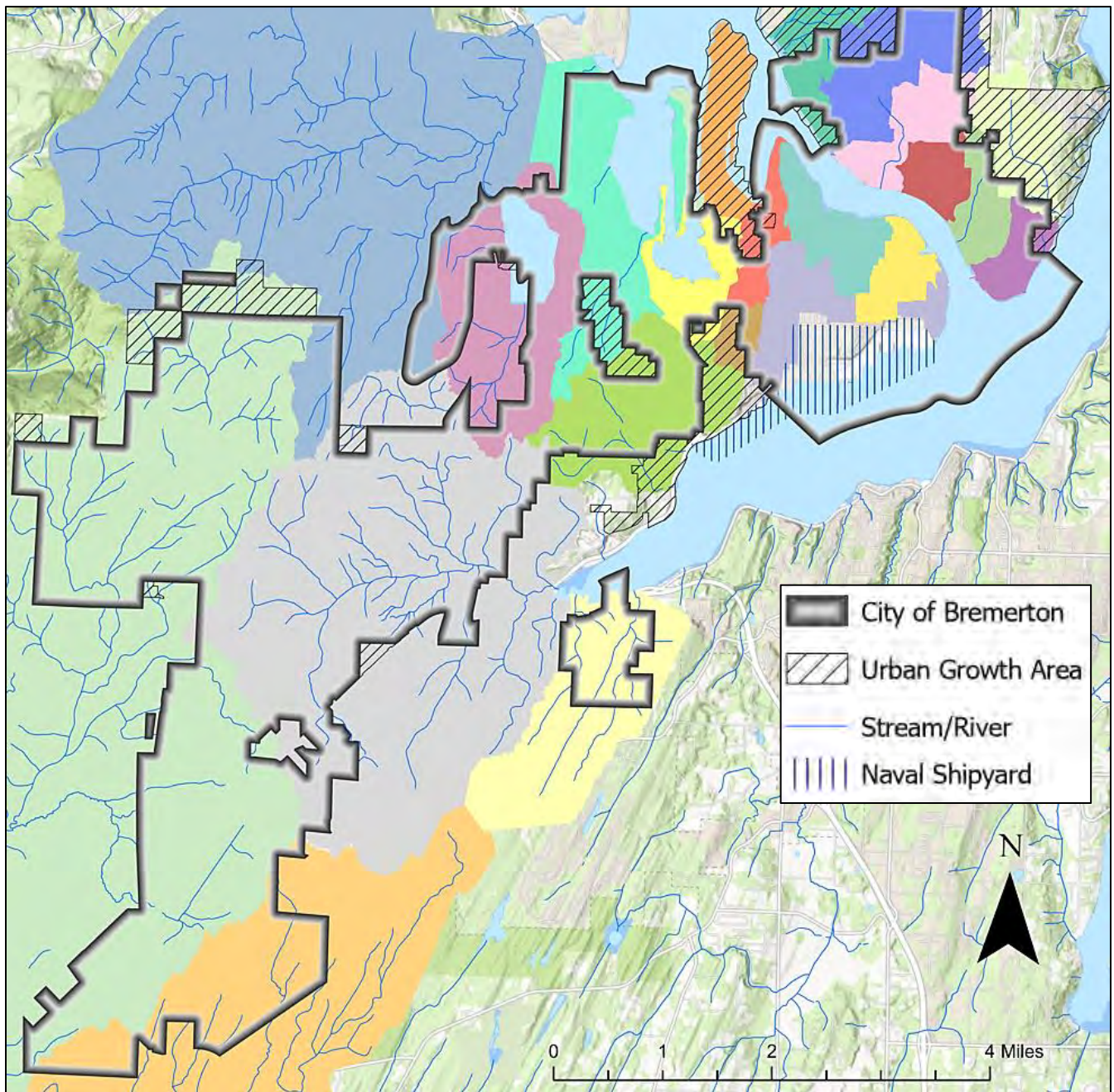
There are total of 24 primary basins in the City, which are summarized in Table 3-1 and shown in Figure 3-7. These basins typically include a combination of surface water streams and built stormwater system infrastructure.

Table 3-1. Drainage Basin Summary.

Basin Name	Size (Acres)	Acres in City Limits	% of Basin in City	Receiving Water	No. of Outfalls	Existing Development		Sub-Basins
						% Developed	Type	
Anderson Cove	410	410	100%	P. Washington Narrows	11	90	Residential, High School, parks	12
Anderson Creek	1,450	461	32%	Anderson Creek to Sinclair Inlet	3	35	Residential	4
Callow Avenue	411	403	98%	Sinclair Inlet	1	95	Residential, commercial, parks	1
Cherry Avenue	226	222	98%	Port Washington Narrows	3	95	Residential, commercial, parks	3
Coulter Creek	8,679	1,116	13%	Coulter Creek to Case Inlet	1	12	Port of Bremerton Airport, PSIC Bremerton	1
East Park	277	259	94%	P. Washington Narrows	4	90	Residential, commercial, parks	5
Enetai Creek	457	54	12%	Port Orchard Passage	3	70	Residential, commercial, parks	3
Gorst Creek	6,573	3739	57%	Gorst Creek to Sinclair Inlet	0	10	Golf Course, Twin Lakes, PSIC	1
Kitsap Lake	1340	851	64%	Kitsap Lake to Chico Creek to Sinclair Inlet	17	40	Residential, park, forest	19
Marine Drive	61	52	85%	Oyster & Ostrich Bay & Mud Bay	0	85	Residential, commercial	1
Marion Ave	129	70	54%	No Outlet/Infiltration	0	65	Residential, commercial, parks	2
Ostrich Bay	1170	904	77%	Ostrich Bay & Dyes Inlet	8	60	Residential, commercial	5

Table 3-1. Drainage Basin Summary (cont.).

Basin Name	Size (Acres)	Acres in City Limits	% of Basin in City	Receiving Water	No. of Outfalls	Existing Development		Sub-Basins
						% Developed	Type	
Oyster Bay	358	331	92%	Oyster Bay	5	80	Residential and commercial	7
Pacific Avenue	88	88	100%	Sinclair Inlet	4	100	Residential and downtown commercial	4
Phinney Bay	253	189	75%	Phinney Bay	6	80	Residential	7
Pine Road	963	564	59%	Port Washington Narrows	1	80	Residential, commercial, parks	1
Rocky Point	357	4	1%	Port Washington Narrows	0	80	Residential	1
Sinclair Park	1,294	856	66%	Sinclair Inlet	3	50	Residential, commercial, park, sensitive areas	4
Stephenson Creek	451	429	95%	Port Washington Narrows	8	90	Residential and commercial	4
Tracyton Beach	427	178	42%	Port Washington Narrows	7	50	Residential and park	9
Trenton Avenue	278	251	90%	Port Washington Narrows	7	80%	Residential and commercial	7
Union River	15,259	5514	36%	Union River to Hood Canal	0	<5%	PSIC Bremerton, watershed, reservoir	1
Warren Avenue	265	265	100%	Port Washington Narrows	6	98%	Residential, commercial, Olympic College	6
TOTALS	49,704	17,262	-	-	95		-	116



Stormwater Basins

- | | | | |
|----------------|-------------|--------------|------------------|
| Anderson Cove | Ostrich Bay | East Park | Sinclair Park |
| Anderson Creek | Oyster Bay | Enetai Creek | Stephenson Creek |
| Callow Ave | Pacific Ave | Gorst Creek | Tracyton |
| Cherry Ave | Phinney Bay | Kitsap Lake | Trenton Ave |
| Chico Creek | Pine Road | Marine Drive | Union River |
| Coulter Creek | Rocky Point | Marion Ave | Warren Ave |



Figure 3-7. Basin Map
 Stormwater Comprehensive Plan
 City of Bremerton

3.5 Water Quality

Sinclair and Dyes Inlet are the primary receiving waters for the City’s stormwater runoff. Water quality data for Sinclair Inlet, Dyes Inlet and tributary streams is relatively extensive; over 20 years of water quality monitoring at approximately 100 monitoring stations as well as numerous site-specific water quality and sediment studies associated with Naval Base Kitsap-Bremerton and other legacy industrial sites. Figure 3-8 summarizes water quality impairments in the study area as reported on Ecology’s 303(d) list of impaired waters.

The KPHD monitors bacterial water quality in several streams in the City (Figure 3-9). In general, stream water quality as measured by fecal coliform (FC) or E-Coli monitoring completed by the KPHD shows stream monitoring stations in Bremerton typically do not fully meet FC water quality standards (KPHD 2020). Historical marine water quality monitoring by the KPHD shows marine waters near Bremerton have a long term improving trend, with all monitoring stations meeting applicable standards in 2017, when the most recent marine water monitoring was performed by KPHD (KPHD 2017).

The most comprehensive study of Sinclair and Dyes Inlets water quality and potential stormwater impacts is Project ENVironmental InVESTment (ENVVEST), an assessment of FC sources and pathways conducted by Naval Base Kitsap-Bremerton. The study goal was used to identify microbial pollution problems within the Sinclair-Dyes Inlet watershed and to provide a comprehensive assessment of FC contamination from all identifiable sources in the watershed.



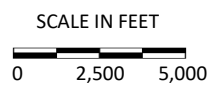
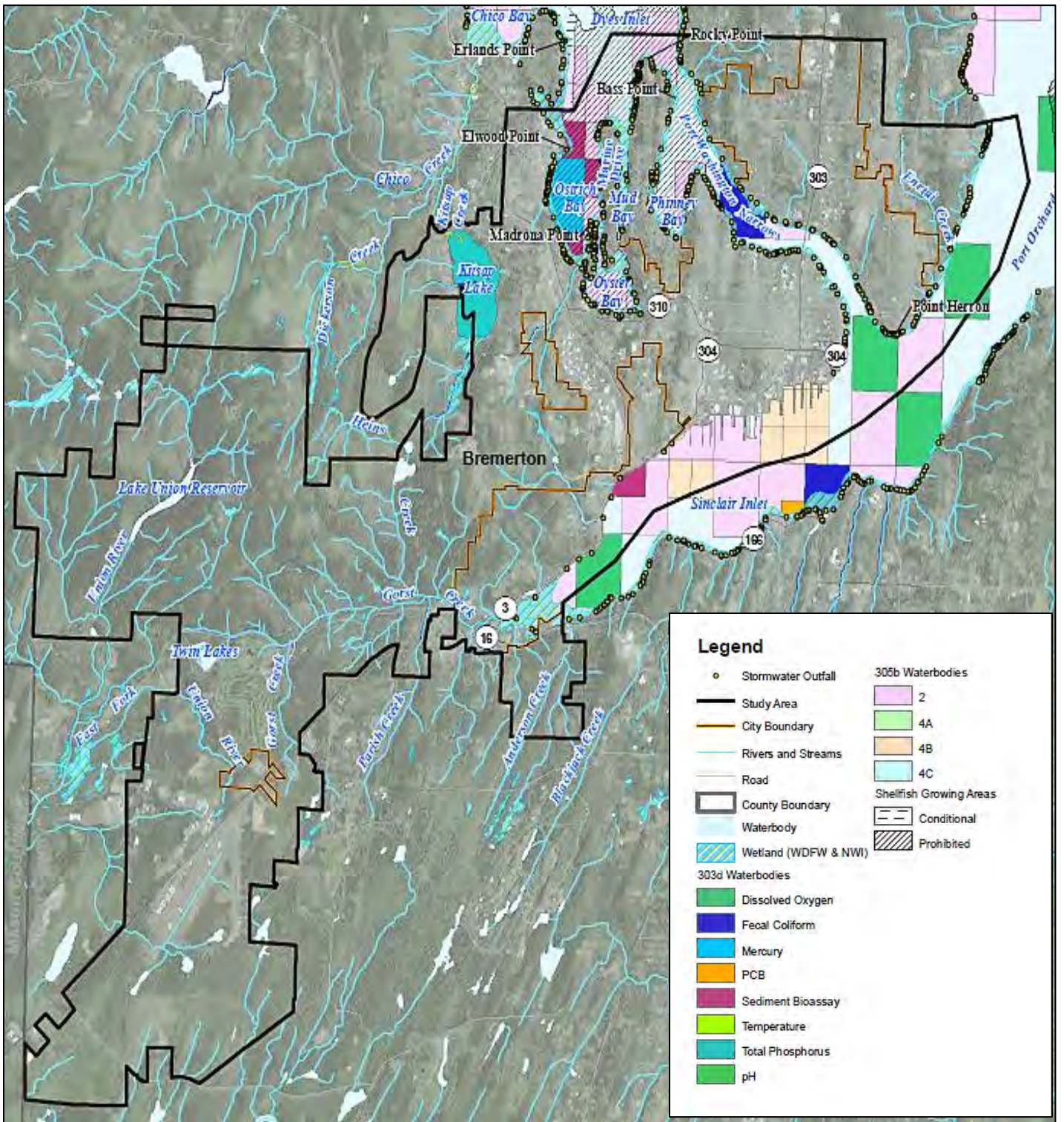


Figure 3-8. Water Quality Impairments
 Stormwater Comprehensive Plan
 City of Bremerton

Monitoring of stormwater outfalls, conducted as part of the study, showed bacterial loading to marine receiving waters from stormwater outfalls can be significant and is on the order of magnitude of streams that drain highly urbanized watersheds. In general, the main difference between urban streams and stormwater outfalls is the transient (storm-event driven) nature of stormwater outfalls. However, some outfalls are actually piped urban streams, which can flow year-round and can be high FC sources.

In general, prior studies have found the marine and nearshore waters of Sinclair-Dyes Inlet consistently meet water quality standards except in a few locations. Compliance with water quality standards is attributed to the combined efforts of the KPHD Pollution Identification and Control (PIC) Program, the City of Bremerton Combined Sewer Overflow (CSO) Reduction Program and Stormwater Utility source control program, and the Clean Water Kitsap partners stormwater Best Management Practices (BMPs) program.

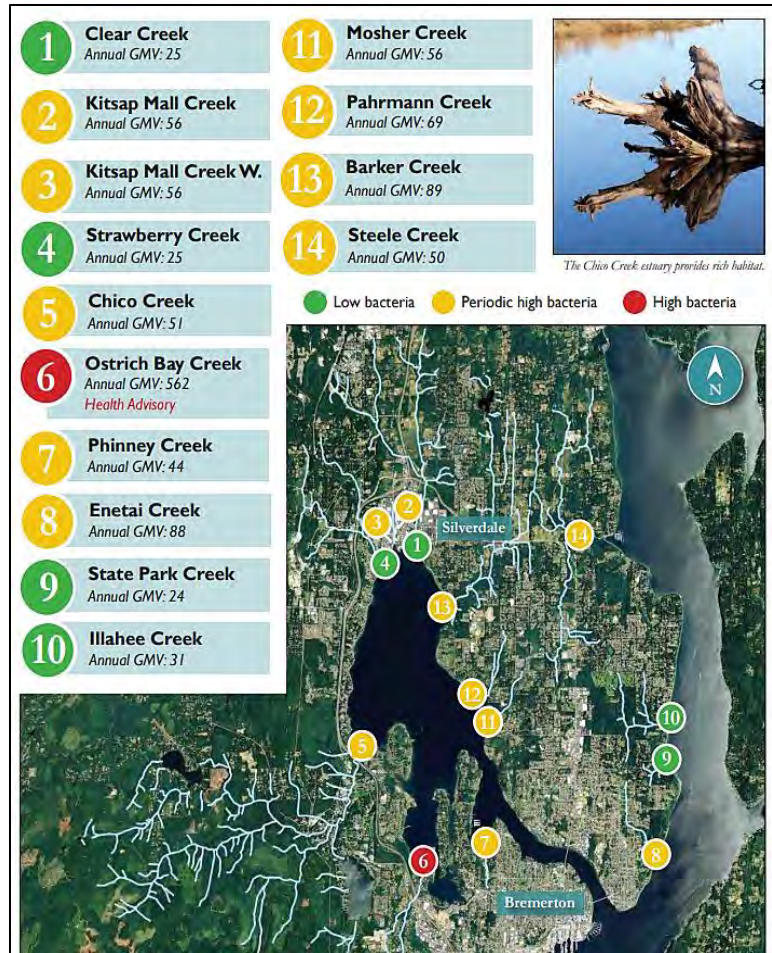


Figure 3-9. KPHD Water Quality Summary, 2020.

3.5.1 Sinclair and Dyes Inlets TMDL Water Quality Plan

The ENVVEST study was used as the basis for the Sinclair and Dyes Inlets total maximum daily load (TMDL) water quality cleanup plan. This plan was completed by Ecology in 2012 and describes pollutant loading conditions and reductions needed to attain state water quality standards. The plan used data from the 2003 to 2010 period to set load allocations.

Water quality corrective action programs in the Dyes and Sinclair Inlet watershed to implement the TMDL plan have included a variety of efforts by the City, Kitsap County and the KPHD. They include source control programs, stormwater treatment retrofits and on-site sewage system surveys. Two basins partially located in the City were identified as priorities in the 2012 TMDL Plan (see Figure 3-3 for watershed locations):

- Ostrich Creek basin in west Bremerton, and
- Phinney Creek basin in west Bremerton.

Since the TMDL Plan was completed in 2012, water quality conditions in Phinney Creek have improved significantly with FC levels in 2020 meeting Part 1 of the FC water quality standard (KPHD 2020). Ostrich Creek FC levels have remained elevated however, and the City and KPHD have implemented several water quality improvement projects in the basin to improve water quality, including:

- The City's Ostrich Creek Stormwater Treatment Retrofit project. This project was completed in 2022 and will help improve water quality of Ostrich Creek by installing 14 stormwater treatment vaults that treat runoff from high volume roads and commercial/industrial area.
- The KPHD's Ostrich Creek Pollution Identification and Control (PIC) project. This project, initiated in 2019, consists of a detailed water quality survey the Ostrich Creek watershed, identification of specific water quality contaminant sources, public education and enforcement of on-site sewage and waste disposal regulations where necessary (KPHD 2020b).

3.5.2 Other Water Quality Improvement Projects

The City has a variety of other water quality improvement projects completed, underway and planned. These include past capital projects on Lebo Boulevard, Marine Drive, Kitsap Way and Auto Center Way, as well as current projects at Quincy Square and Kitsap Lake, and future capital projects in the Pine Road and Warren Avenue corridors. Refer to the Capital Improvement Plan (Chapter 9) for additional detail on future planned water quality capital projects.

4 STORMWATER SYSTEM DESCRIPTION

The City's stormwater drainage system provides service for approximately 19 square miles of urban residential, commercial, and industrial lands within the City limits and receives upstream flow from approximately five square miles of unincorporated Kitsap County and three square miles of the City of Port Orchard. This existing drainage system consists of a network of natural surface water features and constructed stormwater facilities that collect, convey, treat, and discharge surface water runoff.

4.1 Stormwater Infrastructure

In general, the City has three types of stormwater infrastructure facilities:

- Conveyance network of pipes and ditches;
- Flow-control facilities such as detention ponds, vaults, and infiltration galleries; and
- Stormwater quality treatment systems such as bioretention cells and treatment vaults.

These City-owned components are summarized in Table 4-1 and consist of about 96 miles of piped conveyance, ranging from 4 to 96 inches in diameter; approximately 4,488 catch basins; and more than 50 water quality treatment systems. The City maintains its asset inventory using a Comprehensive Stormwater Map based on Geographical Information System (GIS) mapping of the constructed system. Maps of the City surface water and stormwater system are provided in Figures 4-1 through 4-5.

Table 4-1. Stormwater System Asset Inventory Summary.

Asset	No. Facilities Owned By City
CONVEYANCE	
Storm pipe, > 24" dia. (miles)	14
Storm pipe, < 24" dia. (miles)	82
Ditches (miles)	7
Catch Basin	4,488
Outfalls	83
STREET SWEEPING	
Arterial/Collectors (miles)	16.8
Collectors (miles)	31.8
Local Streets (miles)	88.5
Parking Lots (acres)	23.4
Permeable Pavements (miles)	1.5
FLOW CONTROL	
Detention Pond	9
Detention Vault	2
Infiltration Facility	3
WATER QUALITY TREATMENT	
Treatment Vault	37
Bioretention Cell/Swale/Rain Garden	13
Biofiltration Grass Swale (feet)	1,690

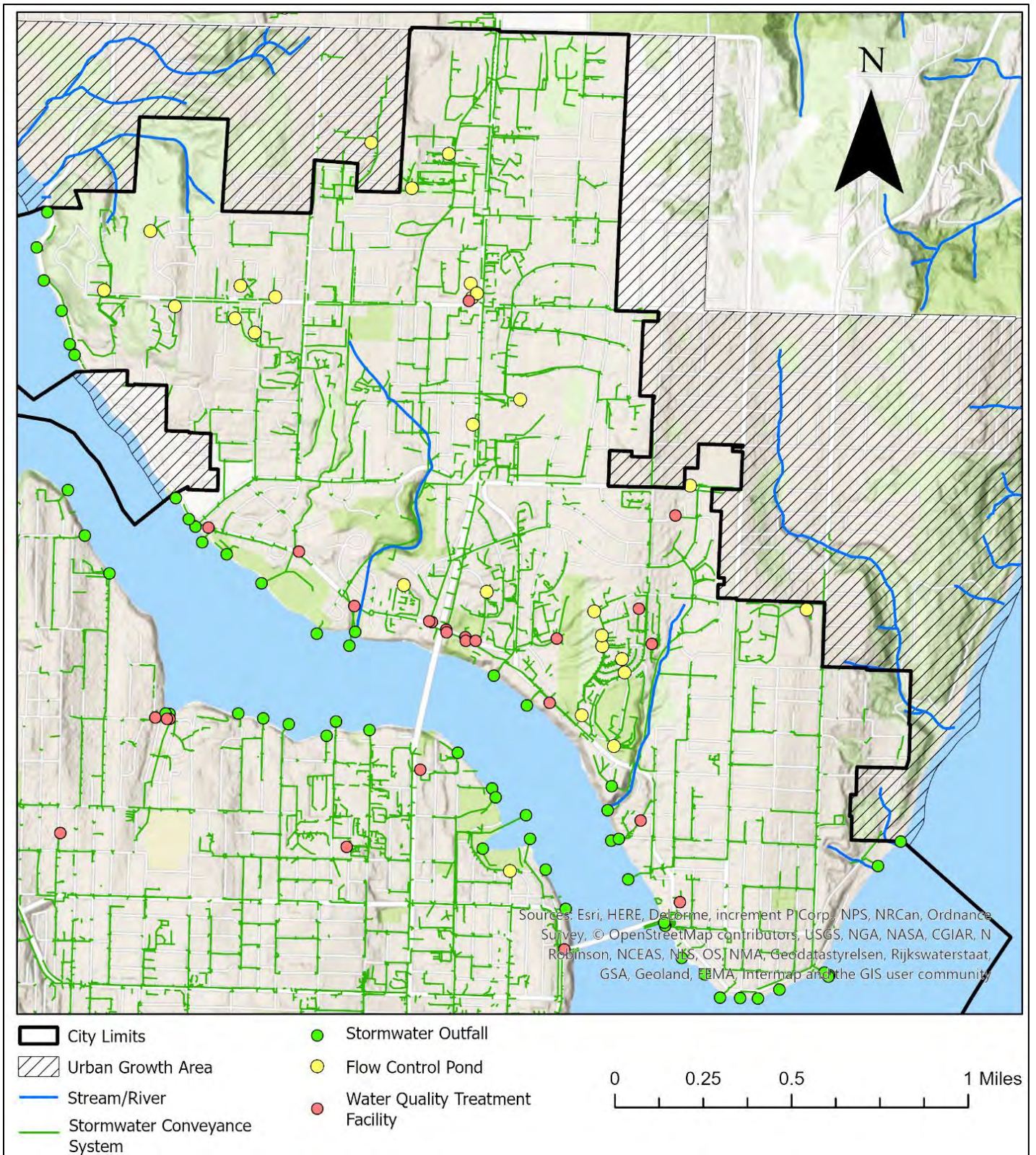


Figure 4-1. East Bremerton Stormwater System
 Surface and Stormwater Comprehensive Plan
 City of Bremerton

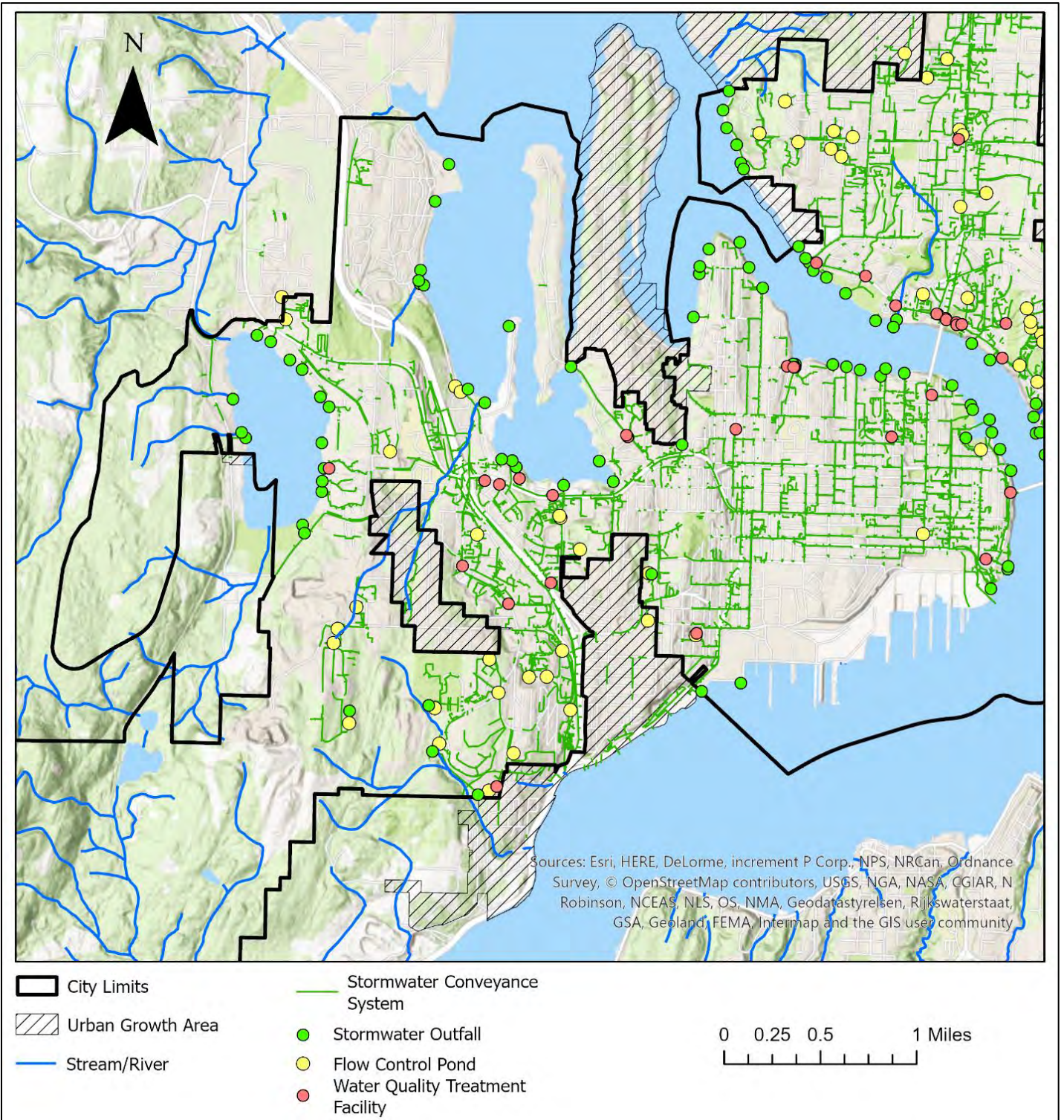


Figure 4-2. West Bremerton Stormwater System

Surface and Stormwater Comprehensive Plan

City of Bremerton

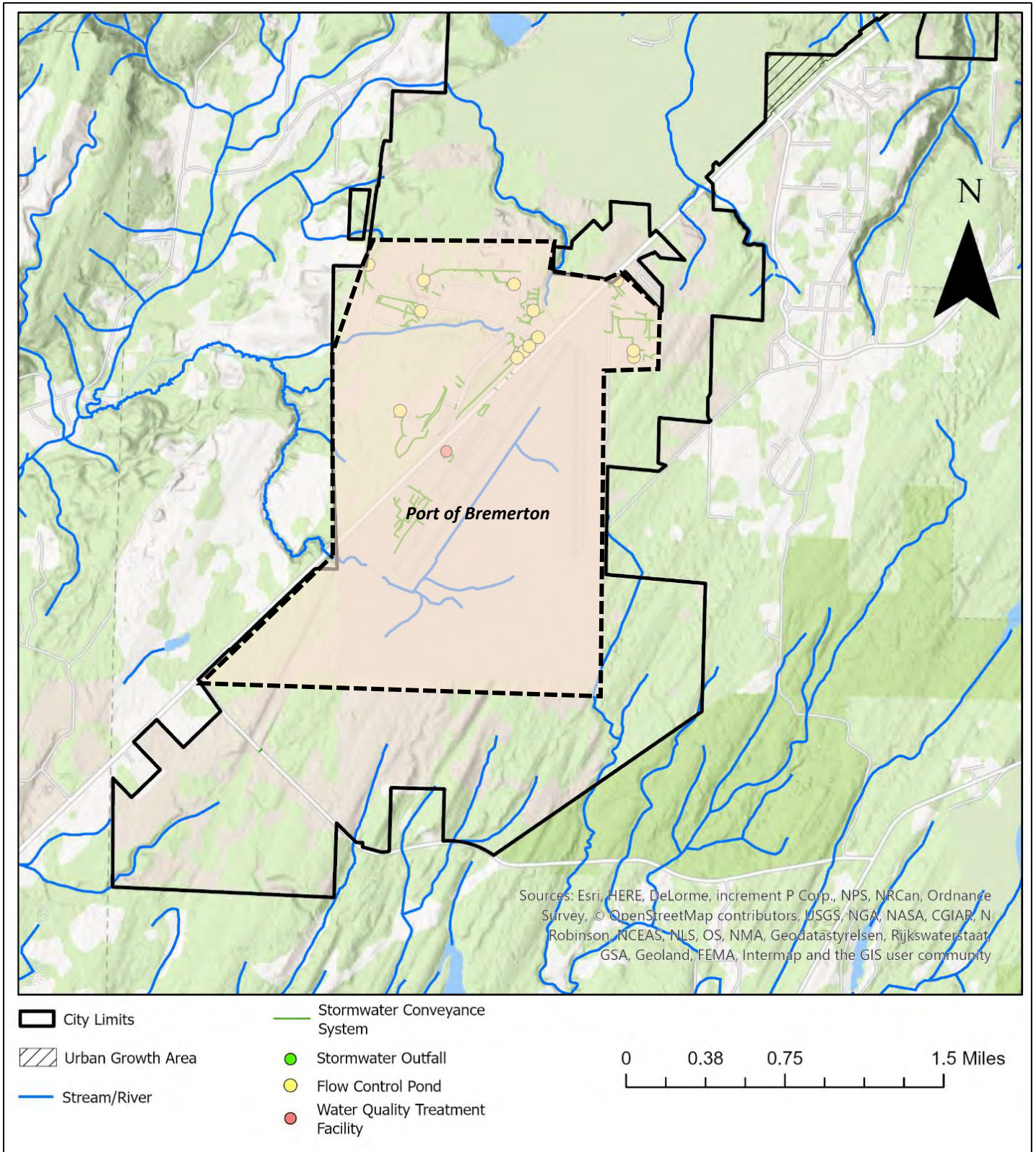


Figure 4-3. PSIC Stormwater System
 Surface and Stormwater Comprehensive Plan
 City of Bremerton

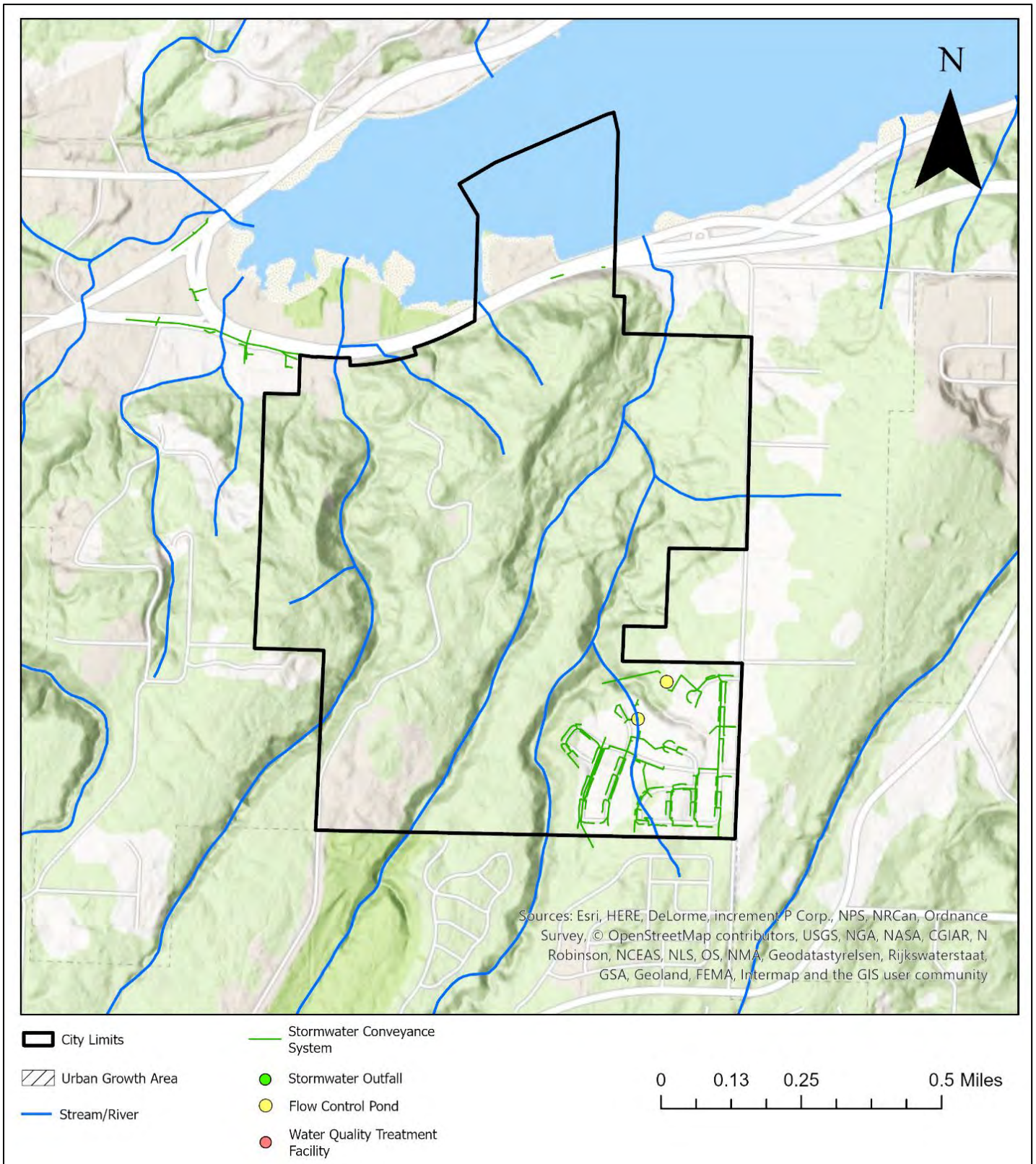


Figure 4-4. Anderson Creek Stormwater System
 Surface and Stormwater Comprehensive Plan
 City of Bremerton

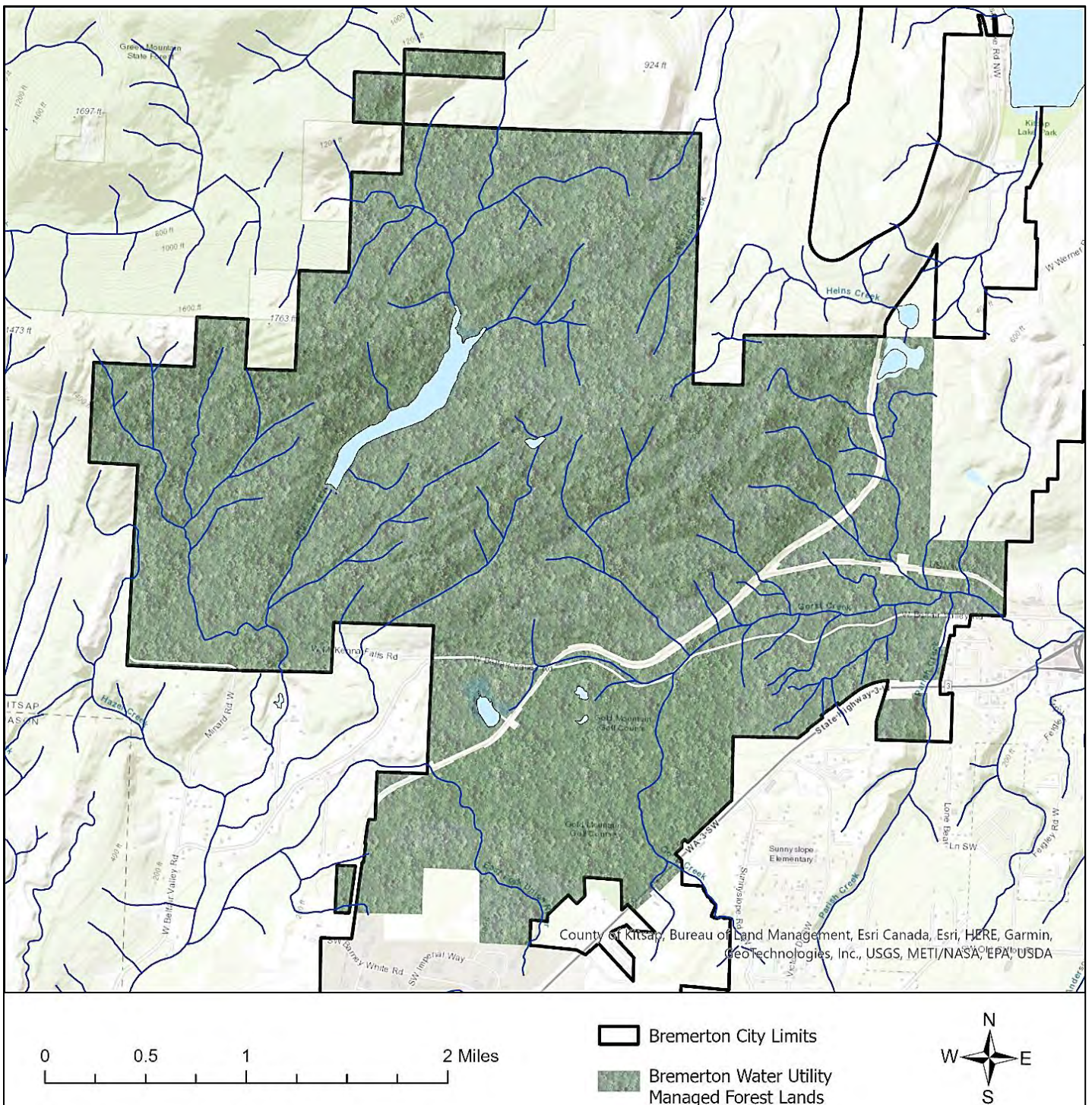


Figure 4-5. Bremerton Water Utility Forest Lands
 Surface and Stormwater Comprehensive Plan
 City of Bremerton

4.1.1 Conveyance System

The conveyance network includes all natural (streams and swales) and constructed open channels (swales and ditches), as well as piped drainage systems (including catch basins and conveyance structures) and culverts. These systems may be located on private property, City-owned property or within the City right-of-way.

4.1.2 Flow Control Facilities

The City owns and maintains 14 stormwater flow control facilities. Flow control facilities include retention and detention ponds, tanks, vaults, and infiltration facilities. The purpose of these facilities is to reduce the rate of stormwater flow from a specific site or area to reduce the potential for localized flooding, minimize flow damage to natural water courses, and prevent downstream erosion problems.



4.1.3 Water Quality Treatment Facilities

The City owns and maintains over 50 stormwater quality treatment facilities that include water-quality (wet) ponds, bioretention, swales, infiltration facilities, and bioretention systems (see Table 4-1). These treatment facilities remove pollutants from stormwater runoff before it is discharged into a water body, collection system or dispersed over the ground for infiltration. Stormwater treatment facilities in the City are shown in Figures 4-1 and 4-2.



4.2 Regional Coordination of Interconnected Systems

Stormwater management systems and contributing basins often span multiple jurisdictions. The City's stormwater facilities and service area overlaps with unincorporated Kitsap County, the City of Port Orchard, and Mason County. The City's stormwater collection, conveyance and treatment facilities also interconnect to WSDOT highway facilities and NBK facilities. Specific examples of these overlaps include:

- Kitsap County discharges stormwater into the City's system from the commercial corridor on Wheaton Way on State Route (SR) 303, from Navy Yard City, Rocky Point, West Hills, and numerous residential areas along the City limits .
- WSDOT discharges runoff into the City's system from SR 3, SR 303, SR 304, and SR 310.

- The City of Port Orchard discharges runoff into the Anderson Creek area from McCormick Woods residential development and forest lands.
- The City discharges runoff into Kitsap County at several points in East Bremerton, West Bremerton, and the PSIC area.
- The City discharges runoff into Mason County along the PSIC boundary and from Water Utility Forest lands.

4.2.1 Kitsap County

A Memorandum of Understanding (MOU), between Kitsap County and the City of Bremerton is in place and establishes procedures to coordinate stormwater management and SW Permit compliance efforts (Appendix D). Map data is shared and interagency notification of spills, or incidents is shared as needed through established communication platforms and identified staff positions.

4.2.2 Port Orchard

A Memorandum of Understanding (MOU) is in place between the City of Port Orchard and the City of Bremerton and establishes procedures to coordinate stormwater management and SW Permit compliance efforts (Appendix D). Map data is shared and interagency notification of spills, or incidents is shared as needed through established platforms and identified staff positions. Port Orchard has two stormwater facilities that are classified as dams which are upstream of Bremerton's residents. Bremerton's staff works with Port Orchard to ensure dam failure notification points of contact are kept up to date and attend Ecology inspections of the facility and review inspection reports.

4.2.3 Puget Sound Industrial Center and Port of Bremerton

The PSIC area (3,670 acres) abuts Mason County to the west, Bremerton's watershed lands to the north, and Kitsap County to the south and east (Figure 2-1). The majority of the PSIC is owned and operated by the Port and other portions are privately owned. The Port owns and manages the Bremerton International Airport, and an industrial area that leases to Waste Management, Kitsap County Public Works Annex, Cenex Gas, Safe Boats, and many other industrial tenants and office space. PSIC has 1,960 acres outside of the Port that includes SR-3, the Amazon Distribution Center, Defiance Boats, and a few smaller sites with the majority being undeveloped land. Future plans for the Port include a regional car racetrack, expanded airport services, and more light industrial tenants.

The PSIC discharges runoff to Gorst Creek and the Union River basin (downstream of the City-owned watershed) in Mason County and the Gorst and Coulter Creek basins in Kitsap County.

An interlocal agreement between the City and Port defines responsibility for the operation and maintenance of the stormwater system inside Port properties. Future development will utilize LID BMPs onsite retention, and treatment systems to protect downstream habitat while providing flood control.

4.2.4 Naval Base Kitsap

Bremerton has two stormwater systems that enter NBK which are permitted through a lease. NBK discharges runoff from non-industrial impervious surfaces, parking lots, roads, and roof tops into Bremerton's Callow Avenue stormwater system in Montgomery Avenue between 1st Street and Farragut Avenue. The system leaves NBK on Farragut Avenue and then re-enters NBK at the discharge point on Charleston Boulevard. Industrial drainage areas from NBK-Bremerton discharge directly into Puget Sound

under a federal NPDES stormwater permit, administered by the EPA. Stormwater from the NBK-Bremerton industrial area does not enter Bremerton's stormwater system.

4.2.5 Suquamish Tribe Coordination

The City of Bremerton routinely works closely with the Suquamish Tribe on water quality and habitat related issues. The City coordinates with the Suquamish Tribe to ensure that treaty rights are respected, and routinely seeks the expertise of tribal representatives on aquatic habitat and fishery issues. The Tribe leases a portion of the Gorst Creek site to use for fisheries and has two active hatchery areas that produce Chinook salmon. The tribe maintains a trap area to harvest spawning salmon to maintain their program.

4.2.6 Regional Habitat and Water Quality Coordination

Collaborating with regional stakeholders and partners is critical to effective regional efforts to restore and enhance water quality, aquatic habitat and adapt to climate change. The City participates in regional work groups like the WRIA 15 Salmon Recovery process, Salmon Recovery Council membership, West Sound Watershed Council (WSWC) and Technical Advisory Group, and Puget Sound Partnership's West Sound Local Integrating Organization (LIO). In 2020 the LIO and WSWC merged to form the West Sound Partners for Ecosystem Recovery (WSPER) to improve local program efficiency.

The City chairs the regional West Sound Stormwater Managers Group attended by the Kitsap County, the Cities of Poulsbo, Port Orchard, Port Angeles, Sequim, Gig Harbor, and Bainbridge Island. This group discusses and coordinates regional surface and stormwater-related issues including Permit regulations, water quality monitoring, education, and outreach collaboration.

4.3 Summary of System Deficiencies and Constraints

System deficiencies include gaps in system mapping and attributes, intermittent flooding, incomplete water quality treatment, incomplete collection system piping, aging conveyance infrastructure that must eventually be replaced, and fish passage barriers. These deficiencies are not unique to the City and are typical for medium sized cities with urban stormwater systems. In general, the current stormwater system adequately collects stormwater and has sufficient capacity to convey typical runoff volumes experienced in the area with minimal flooding.

Mapping of the public portion of the City's system is generally complete. Mapping of private collection and conveyance systems and connections to the City's system is underway as required by the SW Permit (see Chapter 5).

Fish passage barrier removal projects are described in greater detail in Chapter 7. Water quality and flood reduction improvements are targeted to priority basins including Ostrich Creek, Kitsap Lake, Stephenson Canyon, Oyster Bay, and Ostrich Bay. Improvements for these locations are included in the CIP (Chapter 9).

System capacity analysis, expansion, and planning for undeveloped areas of the City and PSIC are high priorities that will be addressed over the term of this plan. This will help prioritize capital projects to replace substandard or inadequate systems, define where installation of treatment systems will be most beneficial, and provide guidance for future development considerations.

5 WESTERN WASHINGTON PHASE II MUNICIPAL PERMIT COMPLIANCE

The City's Stormwater Program and MS4 is regulated by the Clean Water Act's National Pollutant Discharge Elimination System (NPDES) Municipal Phase II Stormwater General Permit. The term "General Permit" means a permit which covers multiple dischargers of a point source category within a designated geographical area, in lieu of individual permits being issued to each discharger. This permit, which is referred to in this plan as the "SW Permit" is reissued every 5 years and includes additional and/or refocused requirements with the goal of improving the quality of discharged stormwater. The SW Permit is issued and managed by Ecology under authority of the EPA's NPDES program.

The Western Washington Phase II Municipal NPDES Permit (SW Permit) covers the portion of western Washington that includes Bremerton and requires local governments to manage and control stormwater runoff so that it does not pollute downstream waters. All Phase II permittees have the same general SW Permit requirements.

The first general SW Permit was issued to the City in 2007, as was the case for the other Phase II regulated jurisdictions in western Washington. The current SW Permit was issued on August 1, 2019 and expires on July 31, 2024. Ecology is currently holding workshops, work groups, and receiving public and agency input and feedback for the next SW Permit term (2024-2029). In general, SW Permit requirements have become more stringent with each new permit issuance.

This chapter provides a summary of the SW Permit and the status of the City's compliance activities. The SW Permit is organized into Special Conditions, General Conditions, and appendices which provide clarification to sections of the SW Permit as well as additional requirements. Special Conditions describe SW Permit terms and conditions and provides prescriptive actions to meet requirements. The General Condition's section describes legal context for non-compliance, defines required actions, and provides guidance for Permittees and Ecology.

The City is required to develop and publish an annual Stormwater Management Program Plan (SWMP) that describes the City's program and documents how it will meet the broad conditions of the SW Permit. The SWMP outlines activities that will occur during the coming year. The permit requires the City's SWMP to meet requirements in 11 primary areas:

- Stormwater planning
- Public education and outreach
- Public involvement and participation
- Municipal separate storm sewer system (MS4) mapping and documentation
- Illicit discharge detection and elimination (IDDE)
- Controlling runoff from new development, redevelopment, and construction sites
- Operations and maintenance
- Source control program for existing development
- Compliance with TMDL requirements
- Monitoring and assessment
- Reporting

The current SW Permit requires the City to implement several new activities between 2019 and 2024 in addition to the many on-going requirements that carry over from the previous 2013-2019 Permit. The new activities listed in Table 5-1 below will require action. More details on the necessary changes to keep the City's SWMP in compliance with the evolving SW Permit requirements are listed below.

The SW Permit requires an ongoing program for gathering, tracking, maintaining, and using information to evaluate SWMP development, implementation, and permit compliance and to set priorities for program implementation. This includes tracking costs or estimated costs of program development and implementation for each component of the SWMP. It also requires tracking the number of inspections, follow-up actions (because of inspections), official enforcement actions, and types of public education used to help implement program components, for example, business source control requirements will be different than erosion and sediment control for construction.

A new requirement includes an extensive stormwater planning program to inform and assist in the development of policies and strategies to be used as water quality management tools to protect receiving waters. This Plan will meet a portion of the requirement by outlining the water quality and watershed protection policies, strategies, codes, and other measures needed to protect and improve local receiving water health. This Plan also identifies where gaps in compliance exist and provides guidance for recommended program development to eliminate these gaps in policies, municipal codes, staff capacity and equipment needs.

5.1 Stormwater Management Program Compliance and Gap Evaluation

The compliance and gap evaluation consisted of a review of each of the approximately 75 individual Phase II Permit requirements in Special Condition S5 and additional conditions in Special Conditions S7, S8, and S9. This review compared each permit requirement with status of existing City programs, actions, and facilities (as applicable) to identify potential gaps between existing operations and permit requirements. In some instances, compliance gaps were not identified; however, recommendations to strengthen compliance documentation are made where appropriate.

A Needs Assessment was originally completed in October 2016 and identified areas where improvements could benefit the Stormwater Program and strengthen SW Permit compliance. The majority of SW Permit compliance requirements associated with the 2016 Needs Assessment have been implemented, including updating City ordinances, coordination of public education activities and on-going system mapping. Significant implementation measures and permit required deliverables planned over the remaining permit term, as well as needs that must be addressed over the next several years are described in greater detail in the following sections. Table 5.1 on the following pages summarizes future SW Permit deliverables and the compliance gap analysis.

Table 5-1. NPDES Permit Deliverables and Gap Analysis Summary.

Permit Due Date	Permit Section	Category	Description	In Compliance with Permit?	Status			Action Needed
					Completed/ Initiated in 2021	Planned 2022	Planned 2023	
1/1/23	S5.C.1.b.i.a&b	Stormwater Planning	Prepare Stormwater Planning report describing water quality and watershed protection policies, strategies, codes, and other measures intended to protect and improve local receiving waters through planning or taking into account stormwater management needs/limits.	YES/FUTURE	●	●	●	Report prepared in 2022.
1/1/23	S5.C.1.b.ii.a	Mapping & Documentation	Identify location and capacity of stormwater facilities owned or operated by City.	YES/FUTURE		●	●	Prepared in 2022 as part of SMAP.
3/31/21	S5.C.1.d	Stormwater Planning	SMAP: Submit watershed inventory table.	YES	●			Completed 2021.
6/30/22	S5.C.1.d	Stormwater Planning	SMAP: document the prioritized and ranked list of receiving waters.	YES/FUTURE		●		Preliminary prioritization completed 2021, documentation to be completed 2022-23.
3/31/23	S5.C.1.d	SMAP	Develop a SMAP for at least one high priority catchment area.	YES/FUTURE		●	●	SMAP to be prepared in 2022-23.
8/1/23	S5.C.4.b	Mapping & Documentation	Complete mapping of private facilities and all connections between City system and others.	YES/FUTURE	●	●	●	Completed mapping of private facilities in 2022.
6/30/23	S5	Code gap analysis	Review existing codes for TESC enforcement support, bonding, escalating enforcement	YES/GAP		●		Current codes and policy will be updated to support TESC enforcement or ability to take control of an uncompliant site in 2023.
6/30/22	S5.C.6.c.	Controlling Runoff from Construction Sites	Implement an ordinance or other enforceable mechanism that addresses runoff from new development, redevelopment, and constructions site projects.	YES/FUTURE	●	●		Code and policy updates to provide private facility maintenance covenants and bonds in 2023.

Permit Due Date	Permit Section	Category	Description	In Compliance with Permit?	Status			Action Needed
					Completed/Initiated in 2021	Planned 2022	Planned 2023	
6/30/22	S5.C.6.c.vii	Controlling Runoff from Construction Sites	Implement a record keeping and reporting system for inspection, maintenance and enforcement actions on private development and associated stormwater systems.	YES/FUTURE	●	●		Record keeping system in place, reporting format was developed 2022.
6/30/22	S5.C.7.a	Operations & Maintenance	Update maintenance standards as necessary to meet the requirements of Section S5.C.7	YES/FUTURE		●		Code updates to support and clarify private facility maintenance covenants and bonds in 2023.
6/30/22	S5.C.7.b	Operations & Maintenance	Inspection and reporting of maintenance and enforcement of at least 80% of private facilities that discharge to City systems.	YES/FUTURE		●		Code updates to provide private facility maintenance covenants and bonds in 2023.
12/31/22	S5.C.7.d	Operations & Maintenance	Report compliance with inspection and maintenance criteria.	YES/FUTURE		●		Completed in 2022.
1/1/23	S5.C.7.d	Operations & Maintenance	Complete documentation of practices, policies, and procedures to reduce stormwater impacts from all lands owned or maintained by City.	YES/FUTURE		●		Completed in 2022.
12/31/22	S5.C.7.b	Operations & Maintenance	Implement an ordinance or other enforceable mechanism that establishes maintenance standards and enforcement mechanisms for private facilities.	POTENTIAL GAP		●		Code updates to provide private facility maintenance bonds in 2023.

Permit Due Date	Permit Section	Category	Description	In Compliance with Permit?	Status			Action Needed
					Completed/Initiated in 2021	Planned 2022	Planned 2023	
12/31/22	S5.C.7.b	Operations & Maintenance	Records of inspection and maintenance of private facilities showing compliance with Permit requirements. Achieve 80% of required inspections.	POTENTIAL GAP		●	●	Need code updates to provide private facility maintenance covenants and bonds in 2023. Additional staff are necessary to complete inspections and documentation as described in Chapter 6.
12/31/22	S5.C.7.d	Operations & Maintenance	Implement practices, policies, and procedures to reduce stormwater impacts associated with runoff from all lands owned or maintained by the Permittee, and road maintenance activities under the functional control of the Permittee.	POTENTIAL GAP		●	●	Pipe inspection and cleaning, culvert inspection, street and landscape maintenance must be documented, implemented and reported. Additional staff are necessary to complete inspections, maintenance, and documentation as described in Chapter 6.
1/2/23	S5.C.7.f	Operations & Maintenance	Update SWPPPs to include a detailed description of BMPs, inspections, inventory of materials and equipment stored on site, site map and a plan for spill prevention and response.	YES/FUTURE	●	●		Completed in 2022.
8/1/22	S5.C.8.b	Source Control	Establish inventory of sites with potential to generate pollutants to the MS4	YES/FUTURE		●		Completed in 2022.
8/2/22	S5.C.8.b	Source Control	Develop enforcement policy for required source control BMPs	YES/FUTURE		●		To be completed in 2023.
1/2/23	S5.C.8.b	Source Control	Inventory of sites with potential to generate pollutants. Annual inspection required of 20% of sites. Inspection required at 100% of sites with complaints.	YES/FUTURE		●	●	Source Control program is being developed and will be implemented in January of 2023.

Permit Due Date	Permit Section	Category	Description	In Compliance with Permit?	Status			Action Needed
1/2/23	S5.C.8.b	Source Control	Implement inspection program for sites with potential to generate pollutants. Annual inspection required of 20% of sites. Inspection required at 100% of sites with complaints.	YES/FUTURE		•	•	Inspection program will begin in January of 2023.
1/2/23	S5.C.8.b	Source Control	Implement enforcement policy for BMP implementation	YES/FUTURE		•	•	Policies and codes will be updated or developed in 2022 and 2023.

5.2 Permit Condition S5.A Stormwater Management Program

Under the SW Permit, the City is required to develop and implement a SWMP. The SWMP outlines the annual program to provide staff with guidance on actions they will complete over the coming year. It also functions as the written record of compliance with the SW Permit and includes all reporting requirements outlined in the Permit. The City publishes the annual SWMP on its website and to meet this Permit requirement: <https://www.bremertonwa.gov/458/Stormwater>.

5.3 Permit Condition S5.B Discharge Reduction

Bremerton Municipal Code (BMC) Title 15 has regulations requiring new and/or redeveloping properties to implement stormwater BMPs that reduce discharge of pollutants and mitigate increased flow rates and volumes. The regulations also require implementation of BMPs during construction that reduce impacts to receiving water from construction practices. BMC 15.04 – Stormwater, adopts the current Ecology SWMMWW for new and redevelopment, streets and utilities, and municipal maintenance activities and as such reduces the discharge of pollutants to the MEP and meets state AKART requirements. Stormwater systems that discharge directly to marine water are typically flow control exempt and not required to retain runoff onsite unless the downstream conveyance system lacks capacity to receive additional flow. Development that discharges to fresh water such as Kitsap Lake or an urban stream or limited capacity drainage is required to mitigate discharge from the site. This can be accomplished with onsite detention, retention, infiltration, or other approved BMPs.

5.4 Permit Condition S5.C.1 Stormwater Planning

Stormwater planning requirements are intended to inform and assist in the development of policies and strategies that provide water quality management tools to protect receiving waters. The City is currently in compliance with these SW Permit requirements, and in the future will need to complete the following to remain consistent with the SW Permit compliance schedule:

- Submit a report or add to the Annual Report (e.g., MS4 report card) to describe how water quality is being addressed during this SW Permit term in updates to the Comprehensive Plan (or equivalent) and in other locally initiated or state mandated, long-range land use plans that are used to accommodate growth or transportation.
- Annually assess and document any newly identified administrative or regulatory barriers to implementation of LID principles or LID BMPs, and the measures developed to address the barriers. If applicable, the report shall describe mechanisms adopted to encourage or require implementation of LID principles or LID BMPs.

Stormwater planning required under the SW Permit has both land use and infrastructure components. City staff from PW&U and DCD therefore coordinate through monthly stormwater program alignment meetings to help facilitate compliance with this permit requirement.

5.4.1 Low Impact Development Code Integration

Low Impact Development (LID) is a stormwater and land use management strategy that strives to mimic pre-disturbance hydrologic processes by emphasizing conservation, use of on-site natural features, site planning, and distributed stormwater best management practices (BMPs). LID BMPs emphasize pre-

disturbance hydrologic process of infiltration, filtration, storage, evaporation, and transpiration. Common LID BMPs include bioretention, rain gardens and permeable pavements.

The SW Permit requires that the City incorporate and require LID principles and LID BMPs in the City's development and land use codes. To meet this requirement, the City reviewed development code and regulations to identify and eliminate barriers and conflicts that would prevent LID use.



In June 2016 the Bremerton Comprehensive Plan, Critical Areas Ordinance and Zoning Code were updated to incorporate LID components and remove barriers to make LID the preferred stormwater management method for development. Subarea plans, BMC Title 11 – Streets and Rights-of-Way, Title 13 – Parks and Recreation, Title 15 - Municipal Utilities, and Title 20 – Land Use codes were reviewed and updated to support the use of LID. Additionally, in November of 2016, Bremerton adopted the Low Impact Development (LID) Technical Guidance Manual for Puget Sound along with the Stormwater Management Manual for Western Washington (SWMMWW). These documents define stormwater-related development standards for projects in Bremerton.

5.4.2 Stormwater Management Action Planning

The SW Permit requires the City to develop a basin prioritization process and criteria to select areas and projects to address water quality impacts caused by areas of existing development. This process includes the following elements:

- An inventory of local receiving waters and summary of available information about the contributing watershed areas.
- Prioritization of basins to identify the contributing watershed areas where implementation of stormwater retrofit projects will provide the greatest benefit to the receiving waters.
- Development of a Stormwater Management Action Plan (SMAP) for at least one high priority area that identifies tailored stormwater management actions, including: stormwater facility retrofits (new facilities or upgrades to existing facilities), a proposed implementation schedule, and budget sources. The SMAP must identify (1) short-term actions (i.e., actions to be accomplished within six years), (2) long-term actions (i.e., actions to be accomplished within seven to 20 years), and (3) a process to adaptively manage the plan.

The City initiated the SMAP process in 2022 and will complete the SMAP for the selected priority basins in 2023 as required by the SW Permit. Preliminary basin prioritization has been completed and is shown in Table 5.2. Analysis and planning for the remaining basins will be completed over approximately the next five years to develop a complete assessment of stormwater system needs and provide prioritized treatment retrofit and capacity projects for the 20-year CIP.

Table 5-2. Preliminary Basin Prioritization for Stormwater Management Action Planning.

Basin	Receiving Water	Area (ac)	% in City	% Developed	Beneficial Uses	Water Quality Standard
Kitsap Lake	Chico Creek	1,622	65	40	Primary contact recreation; shellfish; fish habitat	Freshwater Primary Contact
Ostrich Bay	Ostrich Bay	989	78	80	Shellfish, primary contact recreation	Marine Extraordinary Primary Contact
Oyster Bay	Oyster Bay	359	92	94	Shellfish, primary contact recreation	Marine Extraordinary Primary Contact
West Narrows	Port Washington Narrows	1,373	71	88	Shellfish, primary contact recreation	Marine Extraordinary Primary Contact
Pine Road	Port Washington Narrows	963	60	80	Shellfish, primary contact recreation	Marine Extraordinary Primary Contact

5.5 Permit Condition S5.C.2 Public Education and Outreach

Permit requirements related to public education and outreach include the following:

- Evaluation of ongoing efforts and how successful the program is at reaching target audiences;
- Documentation of lessons learned and recommendations for next steps with regional education and outreach program; and
- Design the next iteration of the program using community-based social marketing methods to develop a strategy and schedule.

The City's permit compliance responsibilities for these elements are addressed through existing regional public education efforts that are led by the *West Sound Stormwater Outreach Group* for Kitsap County. There are no compliance gaps in this SW Permit element and program assessment and updates are submitted with the annual reports to Ecology.

The Utility pays into this program which uses an Interlocal Agreement with Kitsap County and other local cities and partnership in group meetings to provide input to develop regional consensus on the program goals and direction. Providing regionally coordinated outreach materials and messages has many benefits and reduces staff time and resources that would be needed to implement an independent program.

5.6 S5.C.4 MS4 Mapping and Documentation

The City's stormwater infrastructure is managed through the GIS software system and meets requirements of the SW Permit. System data that fall under the SW Permit include:

- Known outfalls and discharge points,
- Receiving waters other than groundwater,
- Stormwater treatment and flow control BMPs/facilities owned or operated by the City,
- Privately owned stormwater treatment and flow control BMPs/facilities,
- Geographic areas served by the City that do not discharge stormwater to surface waters,
- Drainage basins and sub-basins,

- Tributary conveyances to all known outfalls and discharge points with a 24-inch nominal diameter or larger, or an equivalent cross-sectional area for non-pipe systems,
- Connections between the stormwater system owned or operated by the City and other municipalities or public entities, and
- All connections to the system authorized or allowed by the City after February 16, 2007.

Mapping of the City’s stormwater system is an ongoing effort. Transition to an all-digital recording and tracking system using iPads, GIS and database archiving and retrieval systems was implemented in 2019-2020 as part of asset management system upgrades. Mapping of all private stormwater system and interconnections with other stormwater jurisdictions is an ongoing priority project and will be completed as required by the SW Permit.

5.7 S5.C.5 Illicit Discharge Detection and Elimination

The Illicit Discharge Detection and Elimination (IDDE) program has been implemented to prevent, detect, characterize, trace, and eliminate illicit connections and illicit discharges into the stormwater system. The City’s IDDE program meets all requirements of the SW Permit including;

- Implementing procedures for reporting and correcting or removing illicit connections, spills, and other illicit discharges when they are suspected or identified per the standards of the BMC;
- Field screening, on average, over 12 percent of the system each year, tracked annually;
- Submitting data for all illicit discharges investigated during the previous calendar year.

The City’s IDDE program uses dry weather outfall screening and stormwater system sampling consistent with guidance in the *Illicit Connection and Illicit Discharge Field Screening and Source Tracing Guidance Manual* (Ecology 2013). City staff are trained to recognize and respond to illicit discharges, spills, and intentional dumping. BMC 15.04.190 provides regulatory and enforcement measures to prevent illicit discharges into the MS4. Illicit discharge prohibitions, inspections, enforcement, and penalties are regulated based on Bremerton Municipal Code BMC 15.04.190 Prohibited Acts, and 15.04.210 Violation Enforcement – Penalty.

5.8 S5.C.6 Controlling Runoff from New Development and Construction

The City’s permitting process requires plan review and site inspections for development and redevelopment projects. The City requires that stormwater site plans be designed in accordance with the most current edition of Ecology’s SWMMWW.

In accordance with SW Permit requirements, the City’s codes for controlling runoff from new development, redevelopment, and construction sites have been updated to adopt the most current version of the Ecology SWMMWW. These updates ensure LID is the preferred approach for new development and



redevelopment to reduce impervious surface area and minimize disturbance of native soils and vegetation. The BMC automatically adopts the most current version of Ecology’s SWMMWW so that when changes are made to Ecology’s manual they are immediately adopted by the City.

5.9 S5.C.7 Operations and Maintenance

The SW Permit requires the City to develop and implement an O&M program to prevent or reduce pollutant runoff from both municipal and private stormwater facilities. Permit conditions stipulate that City maintenance standards must be equal to those in the Ecology SWMMWW and it also requires that standards be developed for practices that are not covered by the Ecology SWMMWW. Specific inspection schedules and maintenance standards are required, and stormwater pollution prevention plans (SWPPPs) are required for certain categories/types of municipal sites.

Two separate departments within the City are responsible for operations and maintenance of the stormwater system: PW&U and the Parks Department. Within PW&U, the Stormwater Division is responsible for operation and maintenance of the stormwater system in the right-of-way and the street sweeping program; the Facilities Division of PW&U operates and maintains stormwater systems on city-owned properties for Public Works, Police, Fire, Courts, parking lots / garages and other facilities; the Utility Compliance Division works with private system owners, completes inspections, and enforces stormwater code requirements. Water Resources and the Wastewater Treatment Plant departments inspect and maintain several on-site stormwater systems and detention ponds at various locations throughout the city. The Forestry Division operates under the state Forest Practices Act rules with respect to forest roads, harvest, erosion and sediment control and water quality protection and coordinates with the Stormwater Division when forestry activities intersect with SW Permit requirements such as facility operations and run off control from material stockpiles (source control).

The SW Permit requires that all City Facility SWPPPs be updated at least once every permit cycle (5 years) to meet requirements of the SW Permit. Updates for the current permit cycle are required by December 31, 2022. These requirements include updated inventories of equipment, materials and BMPs, and verifying consistency of treatment and flow control BMPs with the current SWMM. Table 5.3 summarizes City facilities and departments subject to this requirement.

Table 5-3. City Facilities with SWPPPs.

Facility	Location	Responsible Department
Public Works Operation Center	100 Oyster Bay Avenue N	Public Works - Facilities
Wastewater Treatment Plant	1000 Oyster Bay Avenue S	Public Works – Wastewater
Gold Mountain Golf Course	7263 W Belfair Valley Rd	Parks – Contracted Services
Forestry Compound	4398 West Belfair Valley Road	Public Works - Forestry
UV Disinfection Facility	8301 W. Belfair Valley Road	Public Works – Water Resources
Municipal Courts Facility	550 Park Avenue	Public Works - Facilities
Fire Station #1	911 Park Avenue	Public Works - Facilities
Fire Station #2	5005 Kitsap Way	Public Works - Facilities
Fire Station #3/Olympus Campus	3031 Olympus Drive	Public Works - Facilities
Bremerton Police Department	1025 Burwell Street	Public Works - Facilities

The City’s O&M program includes employee training to reduce stormwater pollution from maintenance and other facility activities. To comply with this requirement Bremerton prepared and implemented the City’s *Stormwater Facility Maintenance Manual* and site-specific SWPPPs for applicable facilities. The City of Bremerton *Stormwater Facility Maintenance Manual* is updated as necessary to comply with the most current Ecology SWMMWW.

The Parks Department’s stormwater systems are operated and maintained by Parks maintenance staff. They inspect, clean, and document this activity in their SWPPPs, and in the City’s O&M documentation system for each park facility/location. Maintenance requests are submitted to the Public Works Stormwater Division when maintenance is beyond their capabilities. The Parks Department parking lots are swept monthly (or as requested) by the regenerative vacuum sweepers used by the Stormwater sweeping program.

5.9.1 Operation and Maintenance Compliance Gaps

The City has maintained compliance with Permit O&M requirements through previous permit cycles; however, potential compliance gaps have emerged as the SW Permit requirements have changed. Table 5.4 summarizes these potential O&M compliance gaps.

Table 5-4. Emerging Potential O&M Permit Compliance Gaps.

Permit Requirement	Staffing Impact	Gap
Compliance with the inspection requirements mandates record keeping of an established inspection program for both public and private facilities	New requirement in 2022. Increased staff time requirements for inspection, enforcement, and reporting.	Reduced O&M staff time available for actual maintenance activities.
Mandatory maintenance schedules for both public and private facilities	New requirement in 2022 requires inspection and reporting of private facilities.	Reduced O&M staff time available for actual maintenance activities.
Enforcement mechanism for private facilities including maintenance covenants and bonds	New requirement in 2022. Increased staff time for code development, enforcement, private facility maintenance and reporting.	Increased O&M staff time for private facility maintenance.
Mandatory City owned pipe inspection and cleaning (20%/year), street maintenance and landscape maintenance (annually)	New requirement in 2022. Pipe inspection and maintenance requires significant O&M staff.	Increased O&M staff time for pipe inspection and maintenance.
Update SWPPPs for all City facilities	New requirement in 2022. Must prepare updated SWPPPs for all City facilities.	Reduced O&M staff time available for other mandated maintenance activities.

Due to the labor intensive nature of these compliance gaps, additional O&M staff are anticipated to be necessary to meet Permit requirements. Refer to Chapter 6 for additional detail on staffing gaps and potential compliance strategies.

5.10 S5.C.8 Source Control Program for Existing and Future Development

The Source Control program for existing and future development is intended to be a proactive, preventative, inspection-based program that is focused on addressing pollution from existing development and activities that have the potential to release pollutants. The SW Permit requires that this program rely on the City to inspect businesses and properties, and if necessary, require operational and/or structural source control BMPs to prevent pollution from entering the City’s stormwater system.

The new source control program will be developed and implemented with progressive enforcement measures adopted and implemented by the end of 2023. Specific source control requirements of the SW Permit include the following:

- Develop an inventory of potential pollutant generating sites that identifies public and privately owned commercial and industrial properties.
- Conduct business specific education and outreach to inventoried properties.
- Conduct annual inspections equal to 20 percent of the businesses or properties on the inventory list.
- Develop and implement an ordinance, or other enforceable documents, requiring the application of source control BMPs for pollutant-generating sources associated with existing land uses and activities.
- Implement a progressive enforcement policy that requires sites to comply with stormwater requirements within a reasonable period.
- Train staff who are responsible for implementing the source control program.



A wide variety of businesses are subject to this requirement including food service, transportation, health care, building materials, and construction. Within the City of Bremerton, there are more than 800 commercial properties with 160 meeting the definition of “priority 1” businesses that will require inventory and inspection, and over 700 “priority 2” commercial properties that will need site visits, education, and outreach.

5.11 S7 Compliance with Total Maximum Daily Load Requirements

Under the federal Clean Water Act the Department of Ecology has established total maximum daily load (TMDL) allocations for many water bodies to define the maximum amount of a pollutant that may be allowed to enter a waterbody while still meeting water quality standards.

The *Sinclair and Dyes Inlets Fecal Coliform Bacteria Total Maximum Daily Load (TMDL)*, revised in 2012, established fecal coliform bacteria targets for 11 streams and 15 nearshore marine sites. The TMDL goal is to protect beneficial uses so that the tributaries and marine waters meet state water quality standards for bacteria and allow the maximum possible area of the two inlets to be opened for shellfish harvest. Table 5-5 summarizes TMDL requirements and compliance status most relevant to the City of Bremerton.

Table 5-5. TMDL Plan Implementation Summary.

TMDL Requirement	Implemented Compliance Actions	Water Quality Status
Designate Phinney and Ostrich Bay Creek watersheds as high priority for illicit discharge detection and elimination.	The City prioritizes outfall screening in these areas. Dry weather outfall sampling has been completed annually since 1995.	KPHD water quality monitoring shows improvement in Phinney Creek.
Reduce FC loading from Ostrich Creek and Phinney Creek	Constructed the Ostrich Creek basin water quality retrofit consisting of 14 treatment vaults in the Auto Center Way sub-basin area. Coordinated with KPHD on the Ostrich Creek basin PIC project including identify areas where sanitary sewers need to be extended (in Bremerton’s UGA) to provide service for failing septic systems.	KPHD water quality monitoring will continue through 2022 to track water quality status and improvements.
Reduce FC loading from other areas of the City	Installed 10 Modular Wetlands Treatment Systems on Lebo Blvd to improve the quality of stormwater discharged into Port Washington Narrows. Installed 4 Modular Wetlands Systems to treat runoff discharged to Oyster Bay. Four treatment vaults will be installed at Kitsap Lake in 2024.	KPHD marine water quality monitoring shows long-term improving trend in marine receiving water. Kitsap Lake monitoring shows improvement.
Planning/Project Development/Retrofit Prioritization	Watershed assessments of the Kitsap Lake and Ostrich and Oyster Bay basins are being developed to identify specific future actions to effectively address water quality and habitat problems.	KPHD marine water quality monitoring shows long-term improving trend in marine receiving water. Kitsap Lake monitoring shows improvement.
Operation and Maintenance	Maintain cleanout of catch basins to levels below 60 percent full with focus on areas that drain to Phinney and Ostrich Bay Creeks and shorelines along Port Washington Narrows.	Requirement met by continuing regular annual maintenance.
Public Education	Install and maintain pet waste education and collection stations at municipal parks and other City lands adjacent to stream and marine shorelines. Over 50 pet waste bag dispensers and education signs are installed throughout the City.	Requirement met by continuing regular service and maintenance.

5.12 S8 Monitoring and Assessment

The SW Permit requires the City to either develop and implement its own stormwater monitoring program or provide funding support for the Ecology program under section S8.A, Regional Status and Trends

Monitoring and Stormwater Action Monitoring. The City opted to join Ecology's program in 2013 and contributes annually to the fund. This meets the SW Permit requirement.

5.13 S9 Reporting Requirements

The SW Permit has significant documentation and reporting requirements. The City is fully meeting these requirements. An annual report is required to be submitted to Ecology by March 31 of each year for the previous calendar year. The annual report includes a copy of the current SWMP Plan, as required by S5.A.2., and the annual report form as provided by Ecology pursuant to S9.A, describing the status of implementation of the requirements of the Permit during the reporting period. All records and documents related to SW Permit actions and requirements are to be retained for at least five years.

5.14 Proposed 2024-2029 SW permit

The SW Permit is updated and re-issued on a 5-year cycle. Prior SW Permits were issued in 2007, 2012 and 2019 and the current permit covers the 2019 – 2024 period. Ecology issued a preliminary informal draft of the 2024-2029 SW Permit in November 2022 with subsequent preliminary sections issued over the following months. The objective of these informal drafts were to identify key issues and potential new requirements for the updated SW Permit, and to initiate outreach and feedback with permittees. Ecology intends to issue a formal draft SW Permit in fall of 2023, with adoption in summer 2024.

Based on Ecology's informal draft SW Permit, potential SW Permit updates will likely address a range of O&M, treatment, source control and retrofit elements, including:

- Increased O&M requirements for street sweeping and private residential facility inspections.
- Enhanced source control requirements for management of building materials that contain PCBs.
- Guidance for identifying treatment locations and BMPs for chemicals from tire wear that have been shown to be highly toxic to coho salmon.
- Climate change guidance including considerations for predicting future rainfall.
- Management of tree canopy including retention and restoration components.
- Criteria for requiring treatment based on population.

The current SWMMWW will also be updated as part of the SW Permit process and will include specific guidance on implementation of updated SW Permit requirements.

5.14.1 Operation and Maintenance Updates

At this time, O&M SW Permit updates focus on street sweeping programs to improve source control for pollutants from tire wear, and inspection frequency for private facilities.

Street Sweeping: Street sweeping has been shown to be an effective tool for reducing pollutant discharges in stormwater and is an element of the existing SW Permit. Under the proposed 2024-2029 SW Permit, the primary pollutant of concern related to enhanced street sweeping is 6PPD quinone, which has been shown to be highly toxic to coho salmon. Recent research has shown that this chemical causes more than half of the coho salmon that return to Puget Sound's urban streams to die before they can spawn (Washington Stormwater Center 2023).

Street sweeping is currently required under the existing SW Permit, but frequency of sweeping is not specified. Under the updated SW Permit, the City's street sweeping program would be modified as follows:

- Streets would be prioritized for sweeping based on their traffic volumes and discharge locations.
- In high priority areas, sweeping would occur at least once prior to October 1 each year, and two additional times a year unless the City can document an alternative sweeping schedule that provides equivalent water quality benefit.
- A minimum of 90 percent of the City would be swept a minimum of once per year.

The City currently sweeps arterial streets on a quarterly basis, and other streets no less than annually. Staffing impacts associated with this update SW Permit requirement are therefore not expected to be significant. Non-staffing related impacts to the City's stormwater program from this new requirement may include:

- Revised sweeping schedules and locations based on prioritization of areas that discharge to streams utilized by coho salmon, such as Ostrich Creek and Kitsap Creek.
- Street sweeping equipment upgrades that provide removal effectiveness at levels that may be required under the new SW Permit.

Research is currently underway on effectiveness of various street sweeping equipment and methods. Enhanced street sweeping equipment may therefore be necessary to meet tire particle removal requirements. As currently proposed, these new street sweeping requirements would go into effect in 2027.

Private Facility Inspection Frequency: The updated SW Permit proposes increasing the frequency of residential facility inspections to twice per year, compared to once per year as required under the existing SW Permit. The City currently inspects residential treatment and flow control facilities on an annual basis so the new requirement will have a significant impact on staffing and reporting.

Source Control Program for PCBs in Stormwater: The SW Permit update is considering adding requirements related to stormwater management for polychlorinated biphenyls (PCBs) in building materials. PCBs are a group of man-made compounds that are very persistent, and accumulate in people and animals, becoming more concentrated in organisms at the top of the food chain, like orcas. PCBs were produced for commercial uses from about 1929 until 1979. PCBs were used mostly in heat transfer fluids in electrical transformers and capacitors, but also as plasticizers, wax and pesticide extenders, and lubricants (Ecology 2023a).

PCBs were added to building caulk at high levels - up to about 30% by volume - to enhance the flexibility and longevity of seals. Buildings and structures built or renovated between 1929 and 1979 (and particularly between 1950 to 1979) may contain PCBs, mainly in door and window caulking, exterior paint, roofing and siding (Ecology 2023a).

Potential new SW Permit requirements for PCBs may include the following:

- Targeted public education regarding BMPs for washing of external buildings and handling of building materials during renovations and demolition.
- New City policies and procedures to ensure proper building exterior cleaning, maintenance and wash water handling.
- New City policies and procedures for handling of building materials during building renovation and demolition.

These requirements are expected to be implemented on or before 2027. Impacts to the City could include code updates, as well as modifications to building permit issuance and inspection processes to ensure building demolition and renovation best management practices are followed.

5.14.2 Tree Retention

Ecology is proposing updating the SW Permit to better address the ecosystem and stormwater management services provided by the tree canopy. Lack of tree cover has been shown to be an important water quality stressor at a regional scale (Ecology 2023a). Although tree retention is addressed at the individual site scale as part of existing LID design procedures, the updated SW Permit is proposing tree canopy retention requirements at a landscape scale to better protect receiving waters and beneficial uses. Specific tree canopy related requirements being considered in the updated SW Permit include:

- Documenting existing tree canopy coverage and changes in canopy coverage over time.
- Develop and adopt tree canopy retention/restoration objectives to improve stormwater management and support water quality improvements.

Specific permit required timelines for these actions have not yet been proposed. Impacts to the City related to this requirement could include inventory and assessment costs, as well as development of new plans and code requirements for tree retention and restoration. Coordination with other City departments on tree canopy planning and land development regulation would likely be an important component of compliance with this permit requirement since land clearing and landscaping is regulated as part of new development. Updates to BMC 20.50, Landscaping, could be necessary under this proposed permit condition to address tree protection, tree cover and tree re-planting provisions of the updated SW Permit. The City will evaluate specific needs and regulatory gaps after the final updated 2024-29 SW Permit is issued in 2024.

5.14.3 SWMMWW Updates

The SWMMWW will be updated concurrent with the SW Permit and will provide specific technical guidance for implementing many of the updated SW Permit requirements. The primary updates being considered that have potential to affect the City's stormwater program consists of lowering the project Minimum Requirement 6 (MR6) treatment threshold from 5,000 square feet to 2,000 square feet, new treatment guidance for 6PPD quinone, and new hydrologic modeling requirements that reflect predicted climate change impacts.

New Development Thresholds for Treatment: Under the proposed SW Permit update, new development that adds 2,000 sq-ft or more of new pollutant generating surface would be required to meet MR 6, Stormwater Treatment. This is a reduction of the 5,000 sq-ft threshold in the current SW Permit. A

primary impact to the City from this new requirement would be additional staff time to review, approve and inspect smaller sites and development that would now be subject to MR 6 treatment requirements.

6PPD Quinone Treatment: Treatment requirements for 6PPD quinone have potential to effect City transportation projects as high traffic volume public roads are the primary source of this contaminant. New requirements are likely to require that the City assess existing impairments from 6PPD quinone, identify specific outfalls and contributing basins that discharge to coho streams, and prioritize 6PPD treatment locations.

Modeling Requirements Related to Climate Change: Hydrologic modeling required under the existing SWMMM uses historical rainfall records to predict treatment and detention requirements. Ecology is evaluating whether these historical records are providing realistic predictions of future rainfall patterns due to climate change. Accordingly, the new SWMMM may require new modeling requirements that are likely to reflect higher peak flow events, which in turn could result in larger treatment and flow control facilities.

Under BMC 15.04.020, the City automatically adopts the most recent version of the SWMMWW including future amendments. When the updated SWMMWW is adopted by Ecology in 2024, the new requirements will therefore become immediately effective in the City.

Stormwater Control for Priority Developed Areas: Ecology is proposing to add a new section to the SW Permit called “Stormwater Control for Priority Developed Areas” (very generally referred to as a “retrofit program”). This requirement would build on the SMAP requirements in the existing SW Permit. The proposed program will contain two main provisions:

1. **Strategic investments for stormwater management actions.** This requirement would be aimed at leveraging the SMAP and implementing the projects identified through that process. This is intended to drive strategic investments in stormwater management actions and infrastructure. Strategic investments would prioritize structural BMPs such as stormwater facility retrofits.

Opportunistic Stormwater Controls: This requirement would be aimed at encouraging eligible project types that improve stormwater management infrastructure. The proposed approach would use elements from the Phase I Structural Stormwater Control (SSC) Program, specifically the project types that are eligible for providing credit to the “level of effort” (see definition below), as well as the method for calculating the area being treated by the stormwater BMP – i.e. the method to determine “equivalent area” that is meeting new and redevelopment standards from the SW Permit’s Appendix 1. Opportunistic stormwater controls could consist of a wide range of BMPs including bioretention, treatment wetlands, vegetated filter strips and other similar BMPs that use plants and soils to treat stormwater and enhance habitat and aesthetics. Specific requirements and options for Opportunistic Stormwater Controls have not yet been developed. The City will evaluate specific needs and regulatory gaps after the final updated 2024-29 SW Permit is issued in 2024.

Permittees will be required to meet an overall “level of effort” (i.e. performance measure) and be able to use one or both of the above provisions to meet the requirement. The specific definition and criteria for this “level of effort” has not yet been determined (Ecology 2023a).

5.14.4 2024-2029 SW Permit Update - Summary and Conclusions

The informal draft 2024-2029 SW Permit contains a variety of proposed new requirements for program management, O&M, facilities and proposed rules for water quality treatment retrofits. The proposed rules for treatment retrofits are expected to have minimal impact to the City’s stormwater program since the City already has a well-established retrofit program. Individually, the new SW Permit requirements may not have significant impacts to City staffing or program costs. However, they collectively represent a potentially significant increase in program management staff time. Since existing SW Permit requirements will carry forward into the new SW Permit, the additional requirements represent an increment of new work, and staffing levels may therefore need to be adjusted to ensure compliance. Stormwater program staff will continue to monitor and evaluate proposed SW Permit updates to ensure that program resources are adequate to meet regulatory requirements.

6 PROGRAM MANAGEMENT AND ADMINISTRATION

This chapter describes program organization and management including functional responsibilities and staffing. PW&U staff are responsible for stewardship of the Utility’s surface and stormwater systems, which includes minimizing the frequency and severity of flooding; improving water quality; and protecting, enhancing, and restoring aquatic habitat. Because of the broad nature of these responsibilities, City staff work from a variety of departments.

6.1 Organization and Existing Staffing

Management of the Stormwater Utility is within PW&U (Figure 6-1). Compliance with the SW Permit and implementation of the stormwater program requires coordination and staff from other City departments including Community Development and Parks. Figure 6-2 depicts this coordination structure, and the Stormwater Coordination Executive Policy in Appendix E describes the coordination process in more detail.

On a day-to-day basis, staff are assigned to one or more of the following core services as described in Table 6.1. As of February 2023, there are a total of 16.14 stormwater full time equivalent (FTE) staff in the Utility. Due to increasing NPDES permit requirements, staffing needs are expected to increase over the 2022-2027 planning term. Roles and responsibilities for existing staff are summarized in sections 6.1.1 through 6.1.5. Section 6.2 describes and summarizes these needs for future staffing analysis and projections.

Table 6-1. Stormwater program staffing as of February 2023.

Service & Activity	Department	Division	Staff	No. FTE
Program Management	Public Works and Utilities	Management	Director	0.1
			City Engineer	0.1
			Operations Manager	0.1
			Internal Services Mgr.	0.1
Program Management and Capital Improvements	Public Works and Utilities	Engineering	NPDES Permit Coord.	1.0
			Env. Technician	1.0
			SW Project Manager	0.85
			Project Inspector	0.5
			Stormwater Eng. Tech.	0.5
Development Review and Inspection	Public Works and Utilities	Engineering	Project Assistant	0.5
			Development Engineer	0.11
			Development Inspector	0.39
Operation and Maintenance	Public Works and Utilities	SW Maintenance and Facilities	Admin. Tech.	0.56
			O&M Service Specialist and Laborer	5.6
			Compliance Division	0.3
Administration and Financial Services	Public Works and Utilities	Administration and Finance	Facilities O&M	1.16
			Billing & Customer Svc.	2.22
			Locates & Customer Response	0.75
			Financial Tracking	0.3
TOTAL				16.14

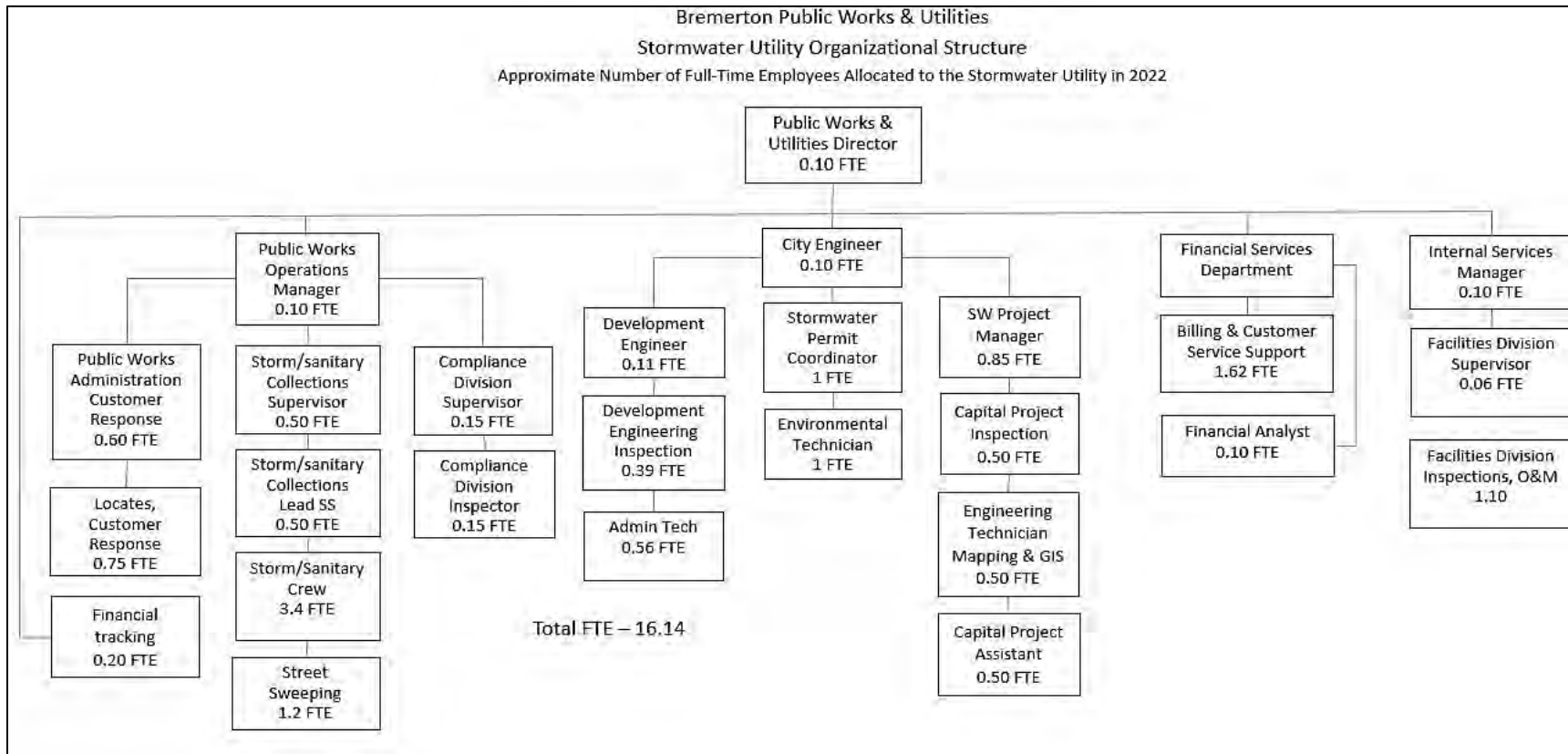


Figure 6-1. Stormwater Utility Organization.

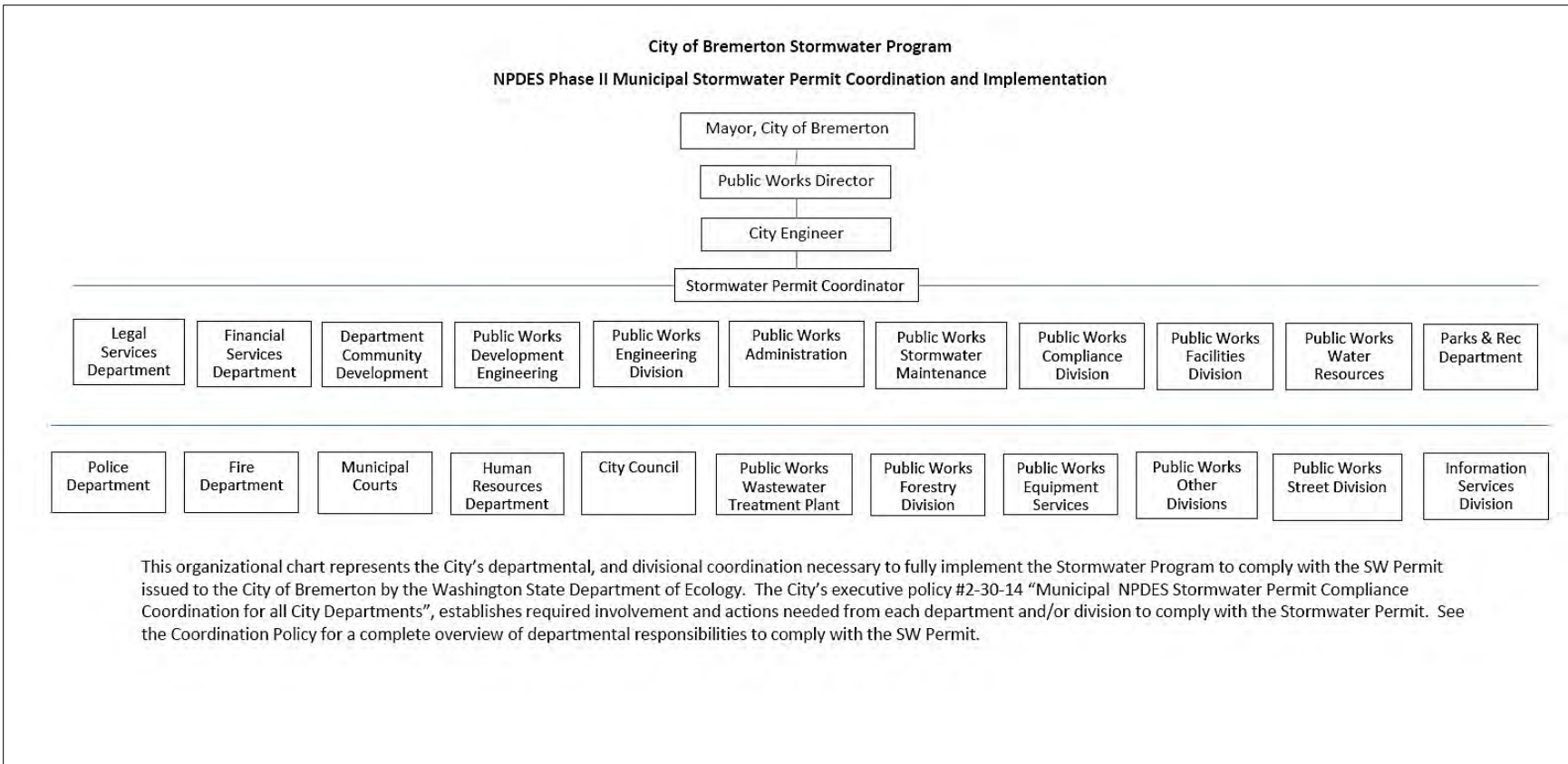


Figure 6-2. Interdepartmental Coordination for Implementing SW Permit.

6.1.1 Program Management

Program management includes developing plans and policies to meet SW Permit requirements; annually updating the City’s Stormwater Management Program (SWMP); coordinating ongoing training and needs; ensuring that procedures and protocols for specific programs (i.e., Illicit Discharge Detection and Elimination, Education and Outreach, Operations and Maintenance, and Construction) are developed and implemented.

Program management activities are currently implemented by two FTEs; the City’s Stormwater Permit Coordinator (SWPC), and an Environmental Technician. The SWPC is responsible for coordinating the City’s compliance with SW Permit requirements. The position manages program compliance, provides program oversight and direction, reviews and develops programs and policies to implement SW Permit requirements. The position is the point of contact for SW Permit compliance with Ecology and adjacent jurisdictions and prepares and submits annual reports to Ecology. The Environmental Technician position supports the SWPC and provides basin planning, education and outreach, reporting, code development, GIS support, outfall water quality monitoring, sampling and testing as needed, and source control program support.

6.1.2 Operation and Maintenance

The Utility operates and maintains stormwater facilities located on City property including streets, parking lots and garages, and City facilities that are “owned” by other departments such as police, fire, library, courts, and the convention center. Privately owned commercial properties, used for business or multi-family housing, have various types of stormwater systems that require inspection, maintenance, and documentation. The SW Permit requires that both City and private facilities be operated and maintained in accordance with an approved Operation and Maintenance Manual. The City’s Stormwater O&M Manual identifies specific timelines and procedures for facility maintenance.

All city-owned parks are operated and maintained by the Parks Department. Stormwater systems on these properties are generally maintained and operated by Parks Department maintenance staff. However, when catch basins or stormwater pipes need hydro-jetting or vacuum cleaning, the Parks Department submits a work order to the Stormwater Division requesting specific work to be completed.

Stormwater O&M staff report to the Storm/Sanitary Supervisor, under the Utility Operations Manager. The City recently upgraded an O&M position to Stormwater Maintenance Lead to establish separate crews for Sanitary Sewer and Stormwater. Currently, the Sanitary Sewer and Stormwater crews perform most day-to-day activities separately; however, the Supervisor will combine the two crews when necessary to perform large or complex work, for emergencies, or other day-to-day workload variability. As of February 2023, a total of 7.06 FTE are assigned to support stormwater program O&M.

6.1.3 Facility Inspections

The SW Permit requires that the City inspect both public and private stormwater facilities, document maintenance needs, and report compliance with maintenance provisions of the SW Permit. There are approximately 5,000 separate stormwater facilities that must be routinely inspected under the SW Permit. Many treatment and flow control facilities require inspection on a semi-annual basis, with others such as

catch basins needing inspection on no less than a biennial basis. Overall, the SW Permit requires approximately 3,300 facility inspections per year.

Utility maintenance staff inspect stormwater facilities located on City streets, as well as other facilities that are owned by other City departments. Privately owned commercial properties, used for business or multi-family housing, have various types of stormwater systems that require inspection, maintenance, and documentation. Bremerton has over 1,000 commercial properties with distinct stormwater systems that need to be inspected and maintained.

Private property systems are inspected using criteria from the City's Stormwater O&M Manual, and owners are notified that maintenance is required when conditions warrant. The owners are required to complete the maintenance and notify the City when it is completed so a follow up inspection can be completed. Inspection and compliance staff as of February 2023 consists of one inspector that works part time with commercial property owners to ensure their systems are operational and maintained.

6.1.4 Development Review and Code Compliance

The PW&U Engineering Division's Development Group and the Department of Community Development (DCD) review new and redevelopment permitting requests in support of the stormwater program. Developers and property owners submit a site plan with their development permit application to the City's Permit Center which is then processed through the DCD. The City's Development Review Engineer works with DCD staff and the applicant to make sure that all development proposals comply with the City's stormwater codes. Once permitted and under construction, development projects are regularly inspected by City staff for temporary erosion and sediment control (TESC) BMP installation and good housekeeping practices in accordance with the BMC. As of February 2023, development review staff consists of a Development Review Engineer (0.11 FTE), Development Inspector (0.39 FTE), and an Administrative Technician (0.56 FTE).

6.1.5 Capital Improvement Plan Development and Implementation

Stormwater capital facilities are the public infrastructure that collects, conveys, stores, and treats stormwater as it flows through the City. Capital facilities are one of the most visible of the Utility's services. The Utility's capital facilities are publicly funded construction projects designed to minimize flooding, maintain or improve water quality, and protect or enhance aquatic habitat. In recent years, capital facilities projects have also included land acquisition, habitat restoration, and revegetation to mitigate human impacts to surface water resources. Capital Improvement Plan (CIP) development is a joint effort by several Public Works Divisions with input from other departments and citizens. The Stormwater CIP utilizes 2.35 FTE; a Project Manager, Engineering Technician, Construction Inspector and Administrative Technician. Refer to Chapter 9 for additional information on the Capital Improvement Program.

6.2 Administration

As of February 2023, the Utility allocates 3.27 FTEs to Administration and Support Services. Administrative activities include budgeting, accounting, billing, record keeping and the customer response program.

Administrative labor costs have increased over recent years in response to regulatory record keeping requirements, and increased stormwater system operation and maintenance data needs associated with SW Permit compliance.

6.3 Program Needs and New Staffing Plan

The Stormwater Program future staffing needs are driven by the compliance requirements of the SW Permit. As shown in the gap analysis in Chapter 5, the City will need additional staff to meet several specific permit requirements including source control regulation and system O&M. Staffing for each of these requirements is described below.

6.3.1 New Source Control Staff

As described in Chapter 5, the source control program requires a business inventory, inspection and enforcement program beginning in 2023. The new program requires inspection of approximately 800 commercial properties in the City once per 5-year permit cycle, or 20 percent of the properties each year. The program includes outreach to each of these properties, coordination, inspection, follow-up on corrections, enforcement as necessary, and reporting. This is a new requirement of the SW Permit and new work for staff which will require 1.0 new FTE staff (Senior Service Specialist) in 2023 to implement.

6.3.2 New Operation and Maintenance Staff

Stormwater O&M requirements are increasing due to a combination of new SW Permit requirements and expansion of the system via new development. New SW Permit requirements, beginning no later than December 31, 2022, include private facility inspection and maintenance enforcement, as well mandatory City facility maintenance schedules and pipeline inspections. Beginning no later than December 31, 2022, the City must perform the following maintenance and inspections:

Catch Basins: Every catch basin (4,488 total) is required to be inspected every-other year, and cleaning must typically be performed if sediment/debris exceeds approximately 60 percent of the sump depth or has accumulated to less than 6 inches from the lowest pipe invert. This work is generally being performed currently; however, increased workload on sanitary sewer laterals and other demands on the maintenance crew have reduced stormwater maintenance actions.

Storm Sewer Mains, Laterals and Culverts: All mains, laterals and culverts are required to be inspected and/or cleaned once each permit cycle, or 20% annually. This work is currently performed on an as needed basis and so this requirement constitutes new work.

Treatment and Flow Control Systems: The City currently has 37 treatment vaults, 9 detention ponds, 1,690-feet of bioswales, numerous rain gardens and a stormwater park. The SW Permit requires inspection and maintenance as required for all of the above treatment systems. Treatment vaults require annual media replacement and 6-month inspections to ensure they are functioning. Treatment systems are growing in the City, and so maintenance of the systems constitutes new work.

Operation and maintenance requirements necessary to meet current SW Permit conditions were evaluated by calculating labor hours to complete the inspection, maintenance, and reporting provisions of the SW Permit. Labor requirements were identified for each type of existing facility and maintenance

activity in coordination with City O&M staff. In performing this evaluation, a gap of approximately 2,500 in-field maintenance hours was identified. This translates to two additional full time equivalent O&M staff. One new Service Specialist staff FTE was added to the budget in 2023, and one additional Service Specialist FTE staff will be considered in the 2024 – 2027 period. Table 6.2 provides annual staffing detail relative to O&M needs assuming full compliance with SW Permit requirements in 2023.

6.4 Summary of Proposed New Staff and Program Staffing

In summary, SW Permit compliance is expected to require 3 new staff over the 2022 -2027 period. These additional staff will ensure the City can meet required SW Permit O&M activities and schedules. Specific staff additions are as follows:

- One new Service Specialist Senior position was added with the 2023 budget, and this person is dedicated to developing and implementing the new Source Control Program, helping education and outreach, and public involvement activities to meet permit requirements. Duties also include support for asset management system development and helping with long range planning for system needs.
- Two new operation and maintenance positions to address increasing O&M requirements resulting from prescriptive levels of inspection and maintenance which exceed past practice, expansion of the stormwater collection system, and added treatment systems. One new position was added with the 2023 budget, and the remaining position would be considered during the 2024-2027 period. The specific timing for this additional O&M staff will be determined as part of the annual program review and budgeting process.

Table 6-3 summarizes potential program staffing needs over the next six years based on the requirements of the SW Permit. Program needs and associated staffing levels will be evaluated annually to determine whether additional staff above the new positions described above are necessary/warranted.

The staffing levels shown in Table 6-3 reflect requirements of the existing SW Permit, which expires in July 2024. The next SW Permit (2024-2029) will likely include new compliance requirements that may influence staffing requirements during the 6-year period covered by this plan, and beyond. Ecology expects to issue a draft of the 2024-2029 SW Permit in 2023, and a final SW Permit by July 2024. Stormwater Program staff closely monitors proposed new SW Permit conditions and will evaluate potential staffing and financial requirements as compliance requirements are proposed by Ecology.

6.5 Asset Management Program

The City uses GIS as an asset management system that documents system components, age, condition, inspection results, operation, maintenance, and replacement needs. Mapping and managing the maintenance of the stormwater system is fundamental to the Utility's asset management program. Mapping is used to make decisions about infrastructure repairs and upgrades, and planning operations and maintenance activities and schedules.

Table 6-2. Operation and Maintenance Staff Requirements based on SW Permit compliance requirements.

ASSET	QUANTITY	UNIT	INSPECTION							MAINTENANCE							TOTAL FTEs
			INSPECTION FREQUENCY ¹	NO. PER MONTH ²	UNIT PER HR. ³	HOURS MONTH	NO. STAFF ⁴	HOURS YEAR	FTE ⁵	MAINTENANCE FREQUENCY ¹	NO. PER MONTH ²	UNIT PER HR. ³	HOURS MONTH	NO. STAFF ⁴	HOURS YEAR	FTE ⁵	
CONVEYANCE																	
Storm pipe, > 24" dia.	73,920	Ft	Min. 20%/year	1,232.00	200.00	6.16	5	370	0.23	Min. 20%/year	1,232.00	100.00	12.32	5	739	0.46	0.69
Storm pipe, < 24" dia.	432,960	Ft	Min. 20%/year	7,216.00	300.00	24.05	3	866	0.54	Min. 20%/year	7,216.00	150.00	48.11	3	1,732	1.08	1.62
Catch Basin Maintenance	4,488	Each	All every 2 yrs.	Inspection and Maintenance conducted at same time.				0.00	All every 2 yrs.	187.00	2.00	93.50	3	3,366	2.10	2.10	
Ditches	35,376	Ft	Annually	2,948.00	1,000.00	2.95	1	35	0.02	Annually	2,948.00	100.00	29.48	3	1,061	0.66	0.69
Stormwater Outfalls <24" dia.	25	Each	Annually	2.00	0.50	4.00	1	48	0.03	Annually	2.00	2.00	4.00	3	144	0.09	0.12
Stormwater Outfalls >24" dia.	58	Each	Annually	4.00	0.50	8.00	1	96	0.06	Annually	4.00	4.00	16.00	3	576	0.36	0.42
STREET SWEEPING																	
Arterial/Collectors	16.8	Miles	Weekly	72.80	15.00	4.85	1	58	0.04	Quarterly	5.60	0.20	28.00	1.4	470	0.29	0.33
Collectors	31.8	Miles	Weekly	137.80	15.00	9.19	1	110	0.07	Quarterly	10.60	0.20	53.00	1.4	890	0.56	0.63
Local Streets	88.5	Miles	Weekly	383.50	20.00	19.18	1	230	0.14	Annually	7.38	0.40	18.44	1.4	310	0.19	0.34
Parking Lots	23.4	Acres	Quarterly	7.80	5.00	1.56	1	19	0.01	Annually	1.95	0.40	4.88	1.4	82	0.05	0.06
Permeable Pavements	1.5	Miles	Annually	0.13	1.00	0.13	1	2	0.00	Annually	0.13	0.04	3.13	1.4	53	0.03	0.03
FLOW CONTROL																	
Detention Pond	9	Each	Annually	0.75	0.25	3.00	1	36	0.02	Annually	0.75	10.00	7.50	3	270	0.17	0.19
Detention Vault	2	Each	Annually	0.17	0.50	0.33	1	4	0.00	Annually	0.17	8.00	1.33	5	80	0.05	0.05
Flow Splitter	4	Each	Annually	0.33	0.50	0.67	1	8	0.01	Annually	0.33	4.00	1.33	3	48	0.03	0.04
Infiltration Pond	1	Each	Annually	0.08	0.25	0.33	1	4	0.00	Annually	0.08	16.00	1.33	3	48	0.03	0.03
Infiltration Facility	2	Each	Annually	0.17	0.25	0.67	1	8	0.01	Annually	0.17	16.00	2.67	3	96	0.06	0.07
WATER QUALITY TREATMENT																	
MWS Treatment Vault	14	Each	Semi-annually	1.17	2.00	2.33	1	28	0.02	Annually	1.17	0.25	4.67	3	168	0.11	0.12
Filtterra Treatment Vault	2	Each	Semi-annually	0.17	2.00	0.33	1	4	0.00	Annually	0.17	0.25	0.67	3	24	0.02	0.02
BioPod Treatment Vault	17	Each	Semi-annually	1.42	2.00	2.83	1	34	0.02	Annually	1.42	0.25	5.67	3	204	0.13	0.15
Bioretention Cell/Swale	5	Each	Annually	0.42	2.00	0.83	1	10	0.01	Annually	0.42	0.10	4.17	3	150	0.09	0.10
Biofiltration Grass Swale	1,690	Ft	Annually	140.80	100.00	1.41	1	17	0.01	Annually	140.80	20.00	7.04	3	253	0.16	0.17
Rain Garden	8	Each	Annually	0.67	2.00	1.33	1	16	0.01	Annually	0.67	0.25	2.67	3	96	0.06	0.07
Oil/Water Separator	2	Each	Annually	0.17	2.00	0.33	1	4	0.00	Annually	0.17	0.25	0.67	3	24	0.02	0.02
Pretreatment Vaults	2	Each	Annually	0.17	2.00	0.33	1	4	0.00	Annually	0.17	0.25	0.67	3	24	0.02	0.02
PRIVATE FACILITY INSPECTION																	
Facilities	640	Each	80% Annually	42.67	1.00	42.67	1	512	0.32	-	-	-	-	-	-	-	0.32
TOTALS									1.58							6.82	8.39

¹ Based on NPDES permit requirements.

² Assumes equivalent number each month.

³ Production rate based on combined time for travel, traffic control, on-site operations, clean up and documentation.

⁴ Includes equipment operators, labor and traffic control as applicable.

⁵ Based on 1,600 hours in the field per year per FTE staff after vacations, holidays, sick leave, training and admin. time allocations.

Table 6-3. Existing and Estimated Staffing Based on SW Permit Requirements.

Position	Existing Staff as of Feb. 2023	No. of Full Time Equivalent (FTE) Staff Potentially Needed Based on SW Permit Requirements				
		2023	2024	2025	2026	2027
Operation and Maintenance						
Street Sweeping	1.2	1.4	1.4	1.4	1.4	1.5
Catch Basin Insp. & Maintenance	2.0	2.1	2.1	2.2	2.3	2.3
WQ Treatment and Flow Control O&M	1.3	1.3	1.4	1.4	1.4	1.4
Outfalls and Ditches O&M	1.2	1.2	1.2	1.3	1.3	1.3
Private System Insp. & Enforcement.	0.3	0.3	0.3	0.3	0.3	0.4
Pipe Insp. & Maintenance.	1.0	2.4	2.4	2.4	2.5	2.5
Source Control & IDDE	0	1.0	1.0	1.0	1.0	1.0
Subtotal	7	9.7	9.8	10	10.2	10.4
Program Management						
Director of Public Works	0.1	0.1	0.1	0.1	0.1	0.1
Operations Manager	0.1	0.1	0.1	0.1	0.1	0.1
City Engineer	0.1	0.1	0.1	0.1	0.1	0.1
Internal Services Manager	0.1	0.1	0.1	0.1	0.1	0.1
NPDES Permit Manager	1.0	1.0	1.0	1.0	1.0	1.0
Env. Technician	1.0	1.0	1.0	1.0	1.0	1.0
Subtotal	2.4	2.4	2.4	2.4	2.4	2.4
Capital Improvements						
Project Manager	0.85	0.85	0.85	0.85	0.85	0.85
Capital Project Inspector	0.5	0.5	0.5	0.5	0.5	0.5
Engineering Technician	0.5	0.5	0.5	0.5	0.5	0.5
Capital Project Admin. Tech.	0.5	0.5	0.5	0.5	0.5	0.5
Subtotal	2.35	2.35	2.35	2.35	2.35	2.35
Development Review						
Development Engineer	0.11	0.11	0.11	0.11	0.11	0.11
Development Inspection	0.39	0.4	0.4	0.4	0.4	0.4
Development Eng. Admin.	0.56	0.59	0.59	0.59	0.59	0.61
Subtotal	1.06	1.1	1.1	1.1	1.1	1.12
Administration and Finance						
Customer Response	0.6	0.6	0.6	0.6	0.7	0.7
Locates and Customer Service	0.75	0.8	0.8	0.8	0.8	0.8

Table 6-3. (continued)

Billing and Customer Service	1.62	1.7	1.7	1.7	1.8	1.8
Financial Supervisor	0.06	0.06	0.06	0.06	0.06	0.06
Financial Tracking	0.2	0.2	0.2	0.2	0.2	0.2
Financial Analyst	0.1	0.1	0.1	0.1	0.1	0.1
Subtotal	3.33	3.5	3.5	3.5	3.6	3.6
TOTAL FULL TIME EQUIVALENT STAFF	16.14	19.0	19.1	19.3	19.6	19.8

Mapping includes developing an accurate asset inventory that documents the size, age, material type, and other characteristics of each asset. This mapping also maintains a record of impervious surfaces throughout the Utility’s service area which is used to calculate stormwater utility fees. The City’s GIS platform is used to geolocate the asset inventory and provide a framework for obtaining and storing detailed asset records. It allows the Utility to record several types of data in one place, and to visualize the data geographically for more accurate and complex analyses. Connectivity between stormwater assets (e.g., manholes, catch basins, pipes, outfalls, treatment facilities) will provide the foundation for building a hydraulic model.

Current asset management practices for the Utility include mapping, inspection with condition rating and assessment, water quality and habitat monitoring and evaluation, and data management. The current asset management system is a combination of system attributes tracked in the GIS system, condition assessments from inspections where they have been completed and system financial value tracking by the Finance Department. This system has the following elements that address SW Permit requirements:

- Inventory of existing City-owned stormwater facilities;
- GIS information with asset details such as size, age, material, and condition;
- Operations and maintenance with description of procedures for inspection, maintenance and reporting that are consistent with current regulatory guidance;
- Tracking and reporting of data that includes maintenance records, inspection, and enforcement data required by the permit; and
- Financial asset inventory based on capital project and deeded facilities with estimated value.

The Utility is in the process of implementing an asset management system for the stormwater utility. Refer to section 6.5.2 for a description of recommended asset management system improvements.

6.5.1 Condition Assessment

Condition assessment is performed as part of on-going system inspection, operation and maintenance. System condition reports are maintained through the City’s management system, which tracks inspection results, maintenance needs and work orders. System conditions are typically evaluated relative to the following criteria:

- Routine O&M actions that are performed as part of typical operations and are largely preventative in nature, and

- Major system repairs that require design, permits and public bidding. These projects are typically reflected in the stormwater CIP.

Additionally, some condition assessment is performed in response to customer inquiries and complaints.

6.5.2 Asset Management Recommendations

To date, all of the city and private storm systems have been inspected, however, capacity and condition evaluations have not been fully completed, particularly for the City’s pipe conveyance system. The following actions are recommended to address asset management gaps:

- Complete mapping of the City system with assistance from O&M staff, and private systems connected to the City’s system with assistance from the Compliance Inspector.
- Inventory the City’s pipeline system consistent with requirements of the existing SW Permit. The inventory goal per the SW Permit is to evaluate 20 percent of the system per year.
- Utilize software tools to provide access to comprehensive information about stormwater infrastructure in the field, capture detailed information, note map corrections as they are found, and share information in real time between the field and the office.
- Train staff to conduct system mapping and hydraulic modeling.

6.6 Public Education and Outreach

An educated and informed public is one of the Utility’s best means of preventing pollution from entering surface and stormwater systems. To make efficient use of public outreach and education dollars, the Utility partners with other West Sound jurisdictions to develop and implement a regional environmental education program.

The West Sound Stormwater Outreach Group (WSSOG) is a partnership between all Kitsap cities, Gig Harbor, Port Angeles, US Navy, and Kitsap County. Under this program, partner jurisdictions implement behavior change campaigns focused on proper pet wastewater disposal and natural yard care. The group also promotes the regional spills reporting hotline, the Puget Sound Starts Here campaign, fixing vehicle leaks, and other messages to reduce stormwater pollution. The Utility supports this partnership by providing staff and sharing financial costs with the other jurisdictions.



6.7 Monitoring

The SW Permit requires the City to select an option of developing and implementing an approved water quality monitoring program or joining a coalition of agencies that develop and implement Ecology approved programs. Bremerton has opted to join a coalition of Puget Sound agencies to implement the Regional Stormwater Monitoring Program (RSMP) now called “Stormwater Action Monitoring” (SAM).

Annual fees are paid to Ecology from each of the member agencies to fund the program. Information on the RSMP/SAM, including results and findings, are available at the Department of Ecology web site: <https://ecology.wa.gov/Regulations-Permits/Reporting-requirements/Stormwater-monitoring/Stormwater-Action-Monitoring>

Bremerton completes site specific water quality sampling at selected treatment retrofit locations prior to construction to provide baseline data used to track treatment system performance. Outfall and stormwater system samples are periodically collected to look for illicit or accidental connections to the stormwater system. This effort has been successful in identifying and correcting connections that negatively impact water quality.

6.8 Fish and Wildlife Habitat Coordination

Collaborating with internal and external partners is critical to effective regional efforts to restore and enhance aquatic habitat and adapt to climate change. The Utility participates in regional work groups like the WRIA 15 Salmon Recovery process, Salmon Recovery Council membership, West Sound Watershed Council and Technical Advisory Group, and Puget Sound Partnership Local Integrating Organization (LIO). Key habitat-related tasks done by the Utility are:

- Identify and prioritize habitat restoration and enhancement projects,
- Evaluate potential property acquisitions,
- Plan, design and implement restoration projects,
- Pursue and acquire external grant funding for habitat projects, and
- Implement and monitor acquisition and habitat projects.

Other activities include assisting with other City habitat-related plans and studies and implementing and tracking habitat related code updates.

6.9 Government-to-Government Relations

The Utility coordinates with the Suquamish Tribe to ensure that treaty rights are respected, and the Utility routinely seeks the expertise of tribal representatives on aquatic habitat and fishery issues. The Utility also participates in a regional Stormwater Managers Group attended by Kitsap County and the cities of Poulsbo, Port Orchard, Port Angeles, Sequim, and Bainbridge Island. This group discusses surface and stormwater-related issues including SW Permit regulations, water quality monitoring, education, and outreach collaboration.

A Memorandum of Understanding (MOU) agreement between Kitsap County and City of Bremerton provides the framework for inter-agency cooperation that includes spill notification, establishes open records sharing for stormwater system GIS maps, and general notification and response for illicit discharges and actions. A similar agreement is in place with the City of Port Orchard to support where McCormick Woods development discharges into Anderson Creek in the southernmost area of Bremerton. These MOUs are provided in the Appendices.

6.10 Equity and Inclusion

The terms “equity and inclusion” within the stormwater context generally refers providing just and fair resiliency in the face of floods, drought, and other climate risks and provide access to safe and clean water to the entire population regardless of economic status, race, location, or other orientation. Public sector entities like the City’s Stormwater Utility have significant responsibility for policy development, regulatory accountability, planning and capital project implementation. The Utility therefore has substantial influence on flood control and water quality priorities and timelines, as well as potential for significant equity impacts.

Equity and inclusion goals and actions within the Utility will make good faith efforts to reflect and implement the policies, plans and procedures developed by the City’s Race Equity Advisory Committee. The purpose of this committee is to advise the City Council, by applying a race equity analysis to all aspects of governance; and to maintain engagement with other work being done throughout the Bremerton Community.

7 FISH PASSAGE BARRIERS

This chapter describes fish passage barriers in the City and potential projects to restore fish habitat. The ability of salmon and steelhead to swim upstream to their traditional spawning grounds is vital to sustaining their populations. When fish cannot spawn upstream or reach traditional rearing areas, their populations decrease. Barriers to fish passage, in the form of road culverts, dikes, and other obstructions, reduce the distribution and habitat available to fish, including salmon and steelhead. The City is working to address these barriers throughout the City’s jurisdiction.

7.1 Anadromous and Resident Fish Presence

Streams in the City support several species of salmonids and resident fish, the most common species being coho, fall chum, resident trout and winter steelhead. Fish presence within the City is primarily within the Chico Creek/Kitsap Lake, Gorst Creek, Anderson Creek, and Union River basins. Table 7-1 lists fish presence in streams within the City.

There are no native runs of chinook salmon in streams draining to Puget Sound from the City and the east side of the Kitsap Peninsula, including Sinclair and Dyes Inlets and tributaries. Fall-run Chinook salmon in Sinclair Inlet are supported entirely by Gorst Creek hatchery production, operated by the Suquamish Tribe in cooperation with the Poggie Club through a lease with the City of Bremerton.

Puget Sound winter steelhead are present in several City streams. Both chinook salmon and winter steelhead are listed as “threatened” under the federal Endangered Species Act (ESA), and the marine shoreline of the City is designated critical habitat for both species under the ESA. Coho and fall chum also occur in the City, with many of the streams in the City supporting populations of fall chum.

Table 7-1. Fish Presence in City of Bremerton streams.

WATERSHED	BASIN	CITY STREAM	FISH SPP. PRESENT ¹
Dyes Inlet	Chico Creek	Kitsap Creek	coho, chum, steelhead, resident trout
	Ostrich Bay	Ostrich Creek	coho, chum, resident trout
Sinclair Inlet	Gorst Creek	Gorst Creek	chinook, coho, chum, steelhead, resident trout
		Parish Creek	chinook, coho, chum, steelhead, resident trout
		Bailey Creek	coho, chum, resident trout
	Anderson Creek	Anderson Creek	coho, chum, steelhead, resident trout
	Wright Creek	Wright Creek	chum, resident trout
	Enetai Creek	Enetai Creek	coho, chum, resident trout
Hood Canal	Union River	Upper Union River	coho, chum, steelhead, resident trout
		E. Fork Union River	resident trout
		N. E. Fork Union River	resident trout

¹ Source: WDFW Salmonscape 2023.

7.2 Fish Habitat Stream Mapping

The City has a number of streams that are mapped as both “fish habitat” (Type F), and Non-Fish Habitat (Type N). Figures 4-2 through 4-6 shows stream locations in the City. Stream water type mapping is done

by the Washington Department of Natural Resources (DNR) as part of the state-wide water typing classification system. In general, this system classifies stream according to whether the stream currently supports fish and/or has the potential to support fish based on physical characteristics.

As shown in Table 7-1, the Union River, Chico Creek, Gorst Creek, and Anderson Creek are the largest Type F fish bearing streams within the City of Bremerton. These creeks support chum salmon, coho salmon, steelhead, and resident trout. However, several of the smaller urban streams within the City that are mapped as “fish habitat” Type F by DNR have been altered over time and do not currently support sustainable salmon and trout populations. Stephenson Creek, an unnamed drainage near Pine Road, and two unnamed streams near N.A.D. marine park are locations where legacy development has diverted the stream into stormwater systems as roadways and residential/commercial developments were built. These streams are still identified as fish bearing and/or fish habitat on federal, state, and local regulatory maps due to mapped physical features, even though no fish are present and potential for fish habitat restoration is extremely low.

The CIP (see chapter 9) therefore includes a number of basin planning projects that would include evaluations of these streams to determine feasibility of fish habitat restoration and fish population recovery. If restoration and recovery are determined to not be feasible, then a water type modification proposal could be submitted to DNR to change the stream classification to non-fish bearing. This would help ensure greater consistency between City and regulatory agency mapping and improve implementation of the City’s critical area ordinance with respect to stream buffers.

7.3 Barrier Inventory

The WDFW has inventoried and assessed a total of 63 fish passage barriers located within City of Bremerton boundaries (Figures 7-1 and 7-2). This includes three barrier removal projects on Ostrich Creek that were completed in early 2023. Table 7.2 summarizes barrier types and locations. The majority of these barriers are located on City and state roads. The highest number of barriers on a single stream is 17 on Ostrich Creek, with at least seven barriers shown as being located on stream segments that are mapped as non-fish bearing.



7.4 Prioritization of Fish Passage Improvement Projects

Prioritization of fish passage improvement projects is important because limited funding restricts the number of projects that can be undertaken at any given time. The WDFW prioritization of fish passage barriers is based on combination of habitat gain, infrastructure condition, cost and funding availability. A priority index based on species use and habitat gain has been assigned to many of the barriers by WDFW (see Table 7-2). City barrier removal priorities reflect a combination of WDFW habitat criteria, facility structural needs and funding availability. Section 7.5 summarizes City fish passage barrier replacement priorities during the 2022-2028 plan period.

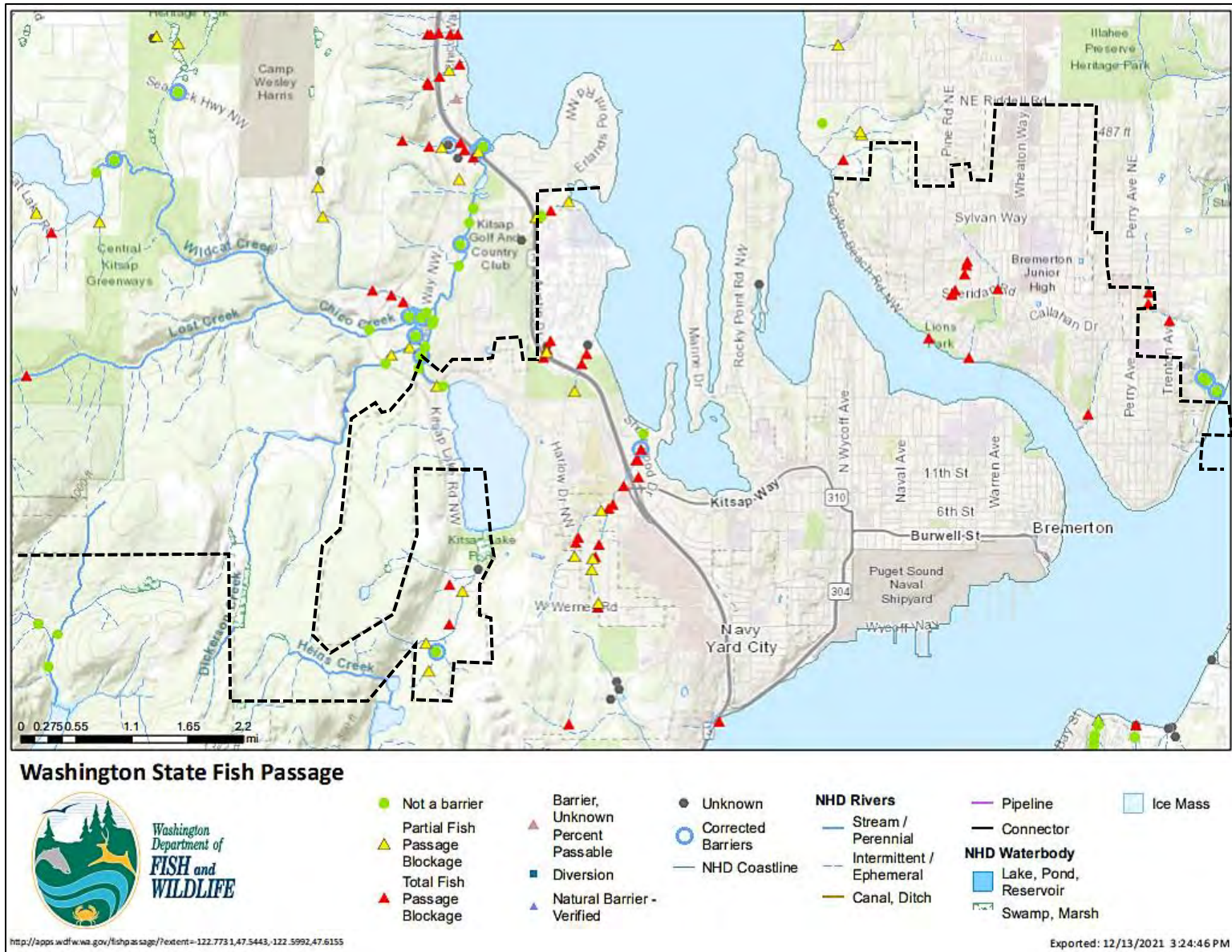


Figure 7-1. Fish Passage Barriers, Central Bremerton Area
 Surface and Stormwater Comprehensive Plan
 City of Bremerton

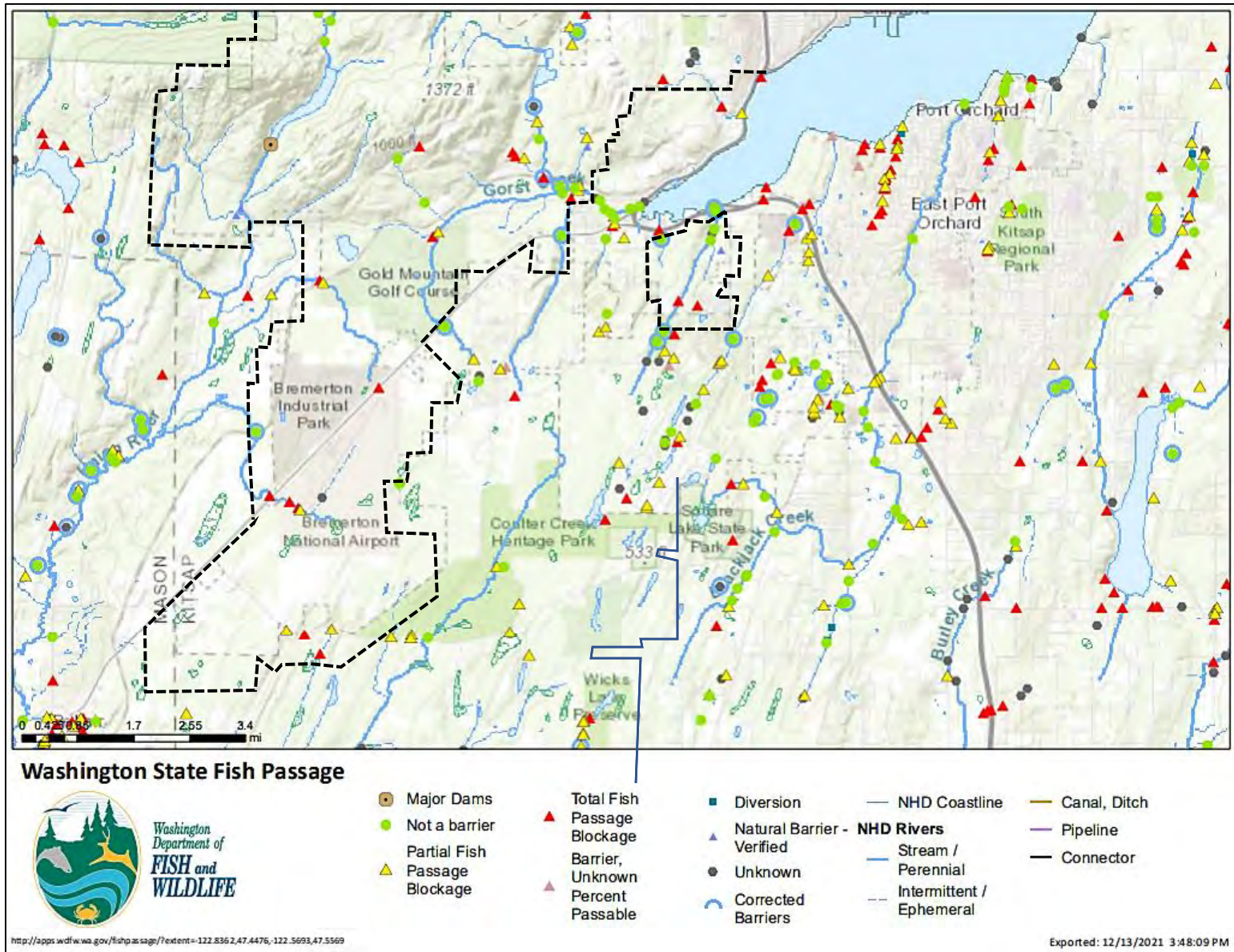


Figure 7-2. Fish Passage Barriers, West Bremerton Area
 Surface and Stormwater Comprehensive Plan
 City of Bremerton



Table 7-2. Fish Passage Barrier Summary.

Stream name	Tributary To	WDFW Site ID	Barrier type	% Passable	Lineal Habitat Gain (m)	WDFW Priority Index	Estimated Cost for Barrier Removal	Road Type	Location	Description	Status
City Culverts											
McDougal Creek	Port Washington Narrows	920424	culvert	0	N/A	unk	\$350,000	HMA/Urban Minor Arterial	City	Schley Canyon @ Wheaton Way	No action planned - mitigation
Ostrich Creek	Ostrich Bay (Brentwood)	996510	culvert	0	3,240	unk	\$1,600,000	HMA/Residential	City	New bridge	CIP/PWTF/completed in 2022
Ostrich Creek	Ostrich Bay (Kitsap Way)	996509	culvert	0	2,688	20.00	\$2,000,000	PC/HMA/Urban Minor Arterial	City	New Kitsap Way Culvert	CIP/PWTF/completed 2022
Ostrich Creek	Ostrich Bay (Price Rd)	996512	culvert	0	2,407	22.94	\$1,200,000	HMA/Residential	City	New bridge	CIP/PWTF/completed in 2022
Kitsap Creek	Chico Creek	15.0230 1.70	culvert	33	5,221	45.61	\$9,500,000	Urban Minor Arterial/HMA	City	Northlake Way project	Feasibility/preliminary design
Parish Creek	Gorst Creek	15.0220 0.10	culvert, fishway	0	unk	unk	\$1,250,000	Urban Minor Arterial	City	W Belfair Valley Rd	CIP
unnamed	Ostrich Cr	921121	Culvert/WS Drop	0	unk	unk	\$3,500,000	HMA/Residential	City	Runs beside Brentwood from SR3	Conceptual w/SR3
unnamed	Ostrich Cr (SR3/Brentwood)	921119	Culvert/WS Drop	0	unk	unk	\$350,000	HMA/Residential	City	From SR-3 to Ost Creek	Evaluation
unnamed (Sheridan Rd)	unnamed	920417	culvert	0	603	7.76	\$1,000,000	HMA/Urban Minor Arterial	City	Yew Creek Land locked	No action planned
unnamed (Sheridan Rd)	Port Washington Narrows	920423	culvert	0	unk	unk	\$1,500,000	HMA/Urban Minor Arterial	City	Stephenson Crk @ Sheridan Rd	No action planned
unnamed (Yew Crk)	Port Washington Narrows	920488	culvert	0	861	7.28	\$2,000,000	PC/HMA/Residential	City	Yew Creek Land locked	No action planned
unnamed (Lebo Blvd)	Port Washington Narrows	920416	culvert	0	unk	unk	\$12,000,000	PC/HMA/Residential	City	Stephenson Crk Land locked	No action planned
							Subtotal	\$26,900,000			
Dams											
Gorst Creek	Sinclair Inlet Bremerton WS	15.0216 0.60	fishway, dams	67	5,311	unk	\$2,000,000	None	City	Hatchery area	Addition to HWS in 2019
unnamed 15.0212 (AC Dam)	Anderson Creek	998905	dam (1)	0	2,385	37.04	\$500,000	None	City	Anderson Creek dam 1	Removal planning
Anderson Creek (AC Dam)	Anderson Creek	998901	dam (2)	0	2,837	33.49	\$500,000	None	City	Anderson Creek dam 2	Removal planning
Wright Creek	Sinclair Inlet	932910	dam	0	2,285	21.17	\$100,000	Stormwater Pond	City	Wright Creek Bus Park	No action planned
Wright Creek	Sinclair Inlet	932575	dam	33	2,400	21.31	\$100,000	Stormwater Pond	City	Wright Creek Bus Park	No Action planned
Jarstad Creek	Gorst Creek Bremerton WS	15.0218 0.10	culvert	67	unk	unk	\$2,000,000	Gravel forest road	City	Upstream of park	No Action planned
							Subtotal	\$5,200,000			
Corrected - Barriers removed in Forest lands (watershed)											
Heins Creek	Gorst Creek Brem WS	15.0221 0.10	culvert	33	622	22.93	\$200,000	Gravel FS	City	Corrected	
							Subtotal	\$200,000			
Private Property inside City of Bremerton											
unnamed 15.0215	Sinclair Inlet Private	996761	culvert	0	2,022	15.47	\$125,000	Private	City	Private drive	No Action planned
unnamed (Bay View Ct)	Port Washington Narrows	920489	culvert	0	536	7.54	\$40,000	HMA/Private	City	Private drive	No Action planned
unnamed	Port Washington Narrows	920502	culvert	0	220	7.17	\$45,000	HMA/Private	City	Private drive	No Action planned
unnamed	Port Washington Narrows	920503	culvert	0	170	7.04	\$45,000	HMA/Private	City	Private drive	No Action planned

Table 7.1 Fish Passage Barriers (cont).

Stream name	Tributary to:	WDFW Site ID	Barrier type	% Passable	Lineal Habitat Gain (m)	WDFW Priority Index	Estimated Cost	Road Type	Location	Description	Status	
unnamed	Port Washington Narrows	920504	culvert	0	151	6.97	\$45,000	HMA/Private	City	Private drive	No Action planned	
Ostrich Creek	Ostrich Bay (Cemetery)	996511	culvert	0	2,470	23.32	\$2,500,000	graves/HMA/channel	City	Forest Lawn Cemetery	No Action planned	
Ostrich Creek	Ostrich Bay	930560	culvert	67	715	13.58	\$100,000	HMA/Residential	City	Residential driveway	No Action planned	
unnamed	Wright Creek	932505	culvert	0	unk	unk	\$45,000	Private culvert	City	Private drive	No Action planned	
Wright Creek	Sinclair Inlet	932506	culvert	0	unk	unk	\$45,000	Private culvert	City	Private drive	No Action planned	
Wright Creek side channel	Sinclair Inlet	932507	culvert	0	unk	unk	\$45,000	Private culvert	City	Private	No Action planned	
Ostrich Creek	Ostrich Bay	930563	dam	33	76	7.48	\$100,000	Private Dam/Residential	City	Private dam	No Action planned	
Subtotal							\$3,135,000					
Private Property in Kitsap County (Bremerton UGA)												
unnamed	Ostrich Creek	930564	culvert	0	1,208	13.85	\$500,000	HMA/Residential	County	Harlow Dr	No Action planned	
unnamed	Ostrich Creek	930565	culvert	0	1,603	14.89	\$100,000	Private Rd/Residential	County	Residential driveway	No Action planned	
unnamed	Ostrich Creek	930566	culvert	33	1,031	13.45	\$50,000	Private Rd/Residential	County	Residential driveway	No Action planned	
unnamed	Ostrich Creek	930567	culvert	33	884	13.20	\$50,000	Private Rd/Residential	County	Residential driveway	No Action planned	
unnamed	Ostrich Creek	930568	culvert	33	410	12.23	\$50,000	Private Rd/Residential	County	Residential driveway	No Action planned	
unnamed	Ostrich Creek	930569	culvert	0	249	12.16	\$300,000	Urban Major Collector	County	Werner Rd @ Skylark	No Action planned	
Ostrich Creek	Ostrich Bay	930561	culvert	0	281	10.73	\$500,000	HMA/Residential	County	Harlow Dr	No Action planned	
Ostrich Creek	Ostrich Bay	930562	dam	0	230	11.31	\$100,000	Private Dam/Residential	County	Private dam	No Action planned	
Subtotal							\$7,920,000					
WSDOT Barriers												
unnamed 15.0215	Sinclair Inlet WDOT	991670	culvert	0	2,192	13.91	\$21,000,000	SR-16 WSDOT	WSDOT	Unnamed creek by Anderson Cr.		
Ostrich Creek	Ostrich Bay (SR-3 WSDOT)	996508	culvert	0	2,745	20.00	\$30,000,000	HMA/Urban Freeway	WSDOT	Kitsap Way on west side of SR 3 to Brentwood Drive		
Subtotal							\$51,000,000					

7.5 Barrier Removal and Habitat Improvement Projects

The following fish passage barrier removal and fish habitat enhancement projects are included in the City's CIP (Chapter 9), which is updated annually. Fish passage projects that are currently on the current 6-year CIP are also noted in Table 7-2.

7.5.1 Ostrich Creek Fish Passage Improvements

The Ostrich Creek fish passage project was completed in 2022 and consisted of barrier removals at three City road locations; Brentwood Drive, Kitsap Way and Price Road. The total cost of this project was approximately \$7 million.

7.5.2 Kitsap Creek at Northlake Way

The Kitsap Creek project will replace an existing barrier culvert with a new three-sided concrete culvert at the intersection of Northlake Way and Kitsap Lake Road. Preliminary design of this project is currently underway. The estimated cost of this project is \$9.6 million with implementation currently planned in 2026-2027. Implementation of this project is subject to receipt of grant funding.



Ostrich Creek at Kitsap Way, pre-construction.



Ostrich Creek at Kitsap Way, after construction.

8 KITSAP LAKE MANAGEMENT PLAN

Kitsap Lake is the primary freshwater resource in the City of Bremerton and is a popular destination for boaters, fishers, and swimmers. It is the City’s primary freshwater recreation resource and supports a variety of beneficial uses including direct contact recreation, boating, and fishing.

8.1 Purpose and Scope

Kitsap Lake water quality is impaired by bacteria, phosphorous and toxic blue-green algae. The lake is also affected by excessive aquatic weed growth. These impairments result from existing and past land use, soil conditions, and natural lake processes which have limited the use of the lake for recreation and create periodic public health hazards.

Historically, these impairments have been addressed through corrective action projects designed to identify and mitigate specific sources of pollution. Although these corrective actions have been beneficial, they have not been sufficient to eliminate health risks and swimming closures. A more intensive, on-going management program has therefore been developed to address recurring water quality challenges in Kitsap Lake.



8.2 Kitsap Lake Basin Description

Kitsap Lake is a 238-acre lake with a maximum depth of about 29-ft. The lake’s watershed is about 1,622 acres, of which 69 percent (1,123 acres) is located within the City of Bremerton (Figure 8-2).

Surrounding urban development and numerous recreational opportunities make Kitsap Lake a popular destination among Kitsap County residents. Kitsap Lake has two public parks with swimming area beaches and two public boat ramps. Kitsap Lake is a popular water skiing and jet skiing lake and has a year-round trout and bass fishery. Trout are stocked annually by WDFW to support the fishery. The outflow from the lake

The lake supports resident cutthroat, coho and steelhead (WDFW 2023). The lake outlet is a 72” concrete pipe that runs under Northlake Way and is a fish barrier that prevents spawning fish from reaching the lake. This is planned for removal and replacement in the CIP. An extensive wetland at the south end of the lake supports forested, scrub-shrub, and emergent wetland vegetation. Land cover around the lake is predominantly urban grasses, high intensity residential, and low intensity residential on the north and eastern sides of the lake. The western and southern shores are less developed dominated by low intensity residential and mixed forest and grasslands.

The lake has a water level control structure located on private property at the lake outlet. This structure is registered with Ecology’s Dam Safety program under private ownership and is not a barrier to migrating fish species. The system is not in use and the weirs have been removed but the concrete base and walkway remains in place.



NOT TO SCALE

Figure 8-1. Kitsap Lake.

Impervious surfaces are relatively low around the west and south sides of the lake but greater than 50 percent, with areas above 80 percent, on the eastern and northern shores. About 90 percent of the lake shoreline is affected by shoreline armoring, overwater structures, removal of riparian vegetation, and impervious surfaces within 200 feet of the lake shore (Parametrix 2012).

The lake shoreline is mostly in private ownership. Kitsap Lake Park is on the south shore within the City, and an open space corridor designated to the south connects the lake with the City's watershed lands. The discharge from the lake flows into Kitsap Creek which drains to Chico Creek just north of the City. The

US Navy owns Camp McKean, a private park for military personnel and dependents, on the west bank of the lake.

8.3 Water Quality Conditions and Impairments

Kitsap Lake water quality is listed as impaired by Ecology for bacteria and phosphorous. It is classified as “Extraordinary Primary Contact” waters by state water quality standards.

Kitsap Lake has a history of problems associated with high levels of bacteria and swimming closures. The original impaired water listings for bacteria was based upon a study conducted in 1983 (Parametrix 1984). The Kitsap Public Health District (KPHD) has implemented swimming beach closures due to elevated levels of bacteria dating back to 1953 (KPHD 2005). Due to toxic algae blooms the KPHD closed the lake for recreation 40 percent of the time (105 weeks) between 2014 and 2018. Unsafe levels of *E. coli* bacteria were reported at Kitsap Lake swimming beach three times during the summer of 2018.

Direct contact recreation at the lake has been limited from time to time by *E. coli*, toxic cyanobacteria (commonly known as toxic blue-green algae) and “swimmers itch”, which is caused by an allergic reaction to a parasite. The source of these pollutants is typically dispersed and difficult to identify and control. Common sources include wildlife, pets, on-site sewage systems and stormwater (KPHD 2005).

Kitsap Lake is impaired due to elevated levels of phosphorous, which is contributing to algae and aquatic weed growth. In 2002, Kitsap Lake was classified as eutrophic due to elevated phosphorus levels (KPHD 2011). Elevated phosphorous has led to annual potentially toxic blue-green algae blooms in Kitsap Lake in recent years (Figure 8-3). These blooms require swimming beach closures and public health advisories for the entire lake.



Figure 8-2. Blue-green algae in Kitsap Lake.

Potential sources of pollution in Kitsap Lake include failing onsite sewage systems (OSS), stormwater runoff, animal waste and waterfowl (KPHD 2005).

8.4 Aquatic Weeds

Kitsap Lake is naturally shallow and is undergoing a natural aging process whereby sediments slowly fill in the bottom over time. The eutrophication process is accelerated by development on and near the lake that contribute excess nutrients that speed up the aging process. Kitsap Lake contains high levels of phosphorus in lake sediments. This phosphorus “feeds” algae and weeds in the summer when sunlight and warm temperatures increase. The algae can produce toxins, which make the water unsafe for swimming, eating fish, and for pets to drink. The weeds become a hazard for boaters and swimmers. During these algae blooms, KPHD posts signs to discourage lake activities. As the weeds die off in the fall and winter, the biomass decomposes and releases nutrients into the lake to feed weed growth over the

next season. The decomposing vegetation also adds to the lake sediment which over time will fill in the lake.

Figure 8-4 shows historical fall phosphorous concentrations for Kitsap Lake in the 1990 – 2005 period, with results exceeding the Ecology action level of 20 ug/ml phosphorus.

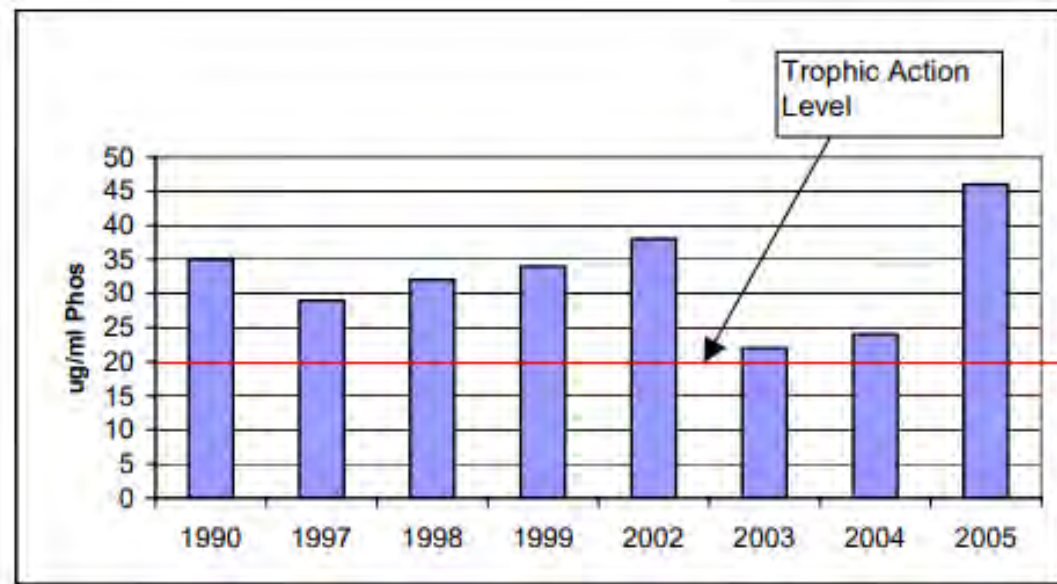


Figure 8-3. Historical levels of Phosphorous in Kitsap Lake.

8.5 Management Strategies

Management goals for Kitsap Lake focus on the following objectives:

- Reduce phosphorus and nutrient levels,
- Reduce potentially toxic blue-green algae growth,
- Provide a healthy setting for recreational use (swimming, fishing, and boating),
- Reduce the level of noxious lake weeds and maintain boating lanes,
- Help improve the lake's aquatic habitat and support local wildlife, and
- Install stormwater treatment systems at outfalls into the lake.

Implementing effective management strategies requires a thorough understanding of the source of water quality problems, evaluation of corrective action alternatives and securing sufficient funding for implementation and on-going operation and maintenance. Due to the wide range of issues and shared watershed jurisdiction with Kitsap County, a watershed management plan has been prepared to identify actions to improve lake water quality.

8.6 Kitsap Lake Watershed Plan

Kitsap Lake water quality issues have been addressed in the past through limited one-time local and state-funded management activities. These management activities have included planning, assessment and

pollution identification and correction measures that focused on septic systems. Although these efforts have helped improve conditions in Kitsap Lake, they have not been sufficient to protect direct contact recreational uses or the overall health of the lake.

In response to continued water quality issues at Kitsap Lake, the City's Stormwater program has developed a Kitsap Lake Watershed Plan. The purpose of this plan is to integrate stormwater infrastructure improvements, harvest excess aquatic vegetation (to remove biomass and improve water quality), eliminate invasive vegetation species, reduce phosphorus to control algae and address beneficial use impairments. Additional efforts that include outreach and education of lakeside residents and lake users will help restore and protect water quality, habitat, and lake use for the benefit of people, wildlife, and fish.

8.6.1 Stormwater Retrofits

A 2005 study by the KPHD showed that stormwater runoff was a significant source of pollutant loading to the lake (KPHD 2005). Kitsap Lake receives stormwater from the surrounding areas through 14 outfalls that vary from natural drainage, to ditches, to conventional collection system pipes. Stormwater discharged into the lake is typically untreated except for oil/water separators installed in the Dockside development and a stormwater pond at the Puget Sound Energy site at the north end of the lake.

The City will be installing a stormwater treatment retrofit at the Kitsap Lake Park as part of a park redevelopment project. An Ecology grant is also partially funding treatment retrofit designs at four high priority sites around the lake within the City. A future construction grant is anticipated to fund construction. Water quality testing is an ongoing effort to identify pollution sources that will be addressed with later projects and to monitor current improvements.

8.6.2 Nutrient and Aquatic Weed Control

Phosphorous is over abundant in Kitsap Lake and is a food source for algae and aquatic weeds. Effective nutrient control requires an understanding of external and internal sources of phosphorus pollution. By understanding the source of pollution, management plans can be developed to meet phosphorus compliance standards for the lake.

Lake trophic data collected and analyzed by the KPHD provided definitive data that shows the cause of the cyanobacteria problem is internal recycling of phosphorous from the sediments during low oxygen events occurring over a six-week period each summer. The KPHD subsequently recommended that the most effective avenue of remediation would be an alum treatment over the course of multiple years (KPHD 2012).

Based on years of planning studies and recent sampling efforts completed by the City, a series of management strategies have been implemented to address elevated phosphorus levels, invasive vegetation, and excessive amounts of aquatic vegetation. These elements all contribute to algal blooms that at times release toxins that are a human health hazard.

In 2020, the City received an NPDES Permit to implement activities that improved lake water quality, with a goal of eliminating blue-green algae blooms, invasive plants, and excess aquatic vegetation. Available phosphorus in the lake was reduced by applying a product named Phoslock™ to remove the food algae

uses to grow. Harvesting excess aquatic vegetation removed future phosphorus load that would be released during decomposition in the fall and winter. Invasive vegetation was eliminated with herbicide under controlled conditions.

The City updated the Kitsap Lake Integrated Aquatic Vegetation Management Plan in 2020. The project resulted in a 90% reduction of free reactive phosphorus and there were no lake closures due to toxic cyanobacteria blooms in 2020 and 2021.



8.6.3 Public Education and Outreach

Public education and outreach is an important element of nonpoint source pollution management in the Kitsap Lake watershed. The City implements a variety of outreach measures city-wide as part of the West Sound Stormwater Outreach Group. The WSSOG develops and implements stormwater education to targeted audiences. The Kitsap Lake Watershed Plan builds on these citywide outreach measures to provide targeted outreach to the Kitsap Lake area. Outreach measures include:

- Mailed brochure about status of the plan and implementation measures,
- Public meetings to provide information and opportunity for feedback on proposed plans and implementation measures,
- Staff providing on-site help as requested by property owners,
- Placement of educational signs at parks and water access points regarding the importance of not bringing invasive weeds into the lake on boats and trailers,
- Education for lakefront property owners on safely and effectively controlling aquatic weeds on their property,
- Signage and educational material designed to inform lake users and property owners on ways to improve water quality,
- Information on sources of nutrient loading and the role of excess nutrients in algae formation and water quality, and
- Educational materials for teachers at Kitsap Lake Elementary School to provide to students that live in the watershed.

8.6.4 On-site Sewage Systems and Sanitary Sewer Extensions

Approximately half of Kitsap Lake is served by sanitary sewer within the Bremerton City limits. The remainder of the lake is in unincorporated Kitsap County with no sanitary sewer service available. These properties use on-site septic systems to treat household wastewater, many of these systems are more than 40 years old with some likely in need of replacement.

The City will continue to work with the KPHD to assess opportunities and needs for extending municipal sewer infrastructure. This assessment will occur as part of on-going water quality monitoring and watershed plan development.

A portion of the wastewater collection system is located on the lake shoreline, and the City assesses the condition of the gravity collection system on a regular basis using charcoal dye packs. Dye packs are placed in the lake along the shoreline and then yellow fluorescent dye is poured into the wastewater collection system and pumped through the system. Dye packs will absorb trace amounts of dye if there is a leak. Tests are completed with KPHD as the lead agency who use third party testing to provide indisputable data. Charcoal dye packs are analyzed with a photo spectrometer that provides results showing the slightest trace of dye which would indicate a leak in the system. Testing was last completed in 2020 and to-date there have been no leaks detected.

8.6.5 Lake Management District

To-date the City has committed to stabilizing lake water quality, managing submerged aquatic vegetation and noxious weeds on the shoreline. It may be necessary to create a Lake Management District (LMD) to continue funding water quality and aquatic weed management activities. The community, the City, and Kitsap County may consider the formation of a lake management district to fund future work. The district may include properties surrounding Kitsap Lake as well as possibly within the Kitsap Lake watershed. The LMD would provide funding through annual assessments via property taxes from properties within the proposed district boundary area. The LMD could be established to fund specific lake management activities that were identified in the Kitsap Lake Management Plan. The LMD development process would be completed through a public forum.

The use of in-lake management activities has demonstrated that with implementation of a planned integrated program, water quality, habitat, and recreational uses of the lake can be enhanced and maintained. These programs do however require on-going application, monitoring, and adaptive management with stable funding being required for long-term success.

8.7 Kitsap Lake Phosphorous Limited Waterbody Designation

Prior studies have determined that total phosphorous (Tp) sources in Kitsap Lake include both internal recycling, as well as input from development within the watershed (KHD 2011). Accordingly, the City implemented an ongoing annual lake treatment program in 2020 to reduce existing Tp recycling. The City is also in the process of implementing multiple stormwater retrofits to reduce Tp loading from existing development.

Both the lake treatment program and stormwater treatment retrofits will help to control Tp levels in Kitsap Lake. However, due to the sensitivity of Kitsap Lake to phosphorous loading, and the extensive

amount of undeveloped, urban zoned land in the Kitsap Lake watershed, additional protective measures are needed to ensure that new development does not contribute Tp levels that negate or decrease the water quality gains from prior/on-going lake treatment and City-sponsored stormwater retrofits.

Total phosphorous sources include runoff from bare soil and developed areas. Phosphorus occurs naturally, in human and animal waste and is added to some detergents and fertilizers. Roofs, driveways, and other impermeable surfaces interrupt the absorption and filtration provided by forests and soils, and instead send phosphorus-laden stormwater directly to the receiving water (Ecology 2016).

To protect Kitsap Lake water quality in the long term, the City is designating Kitsap Lake as a phosphorous limited water body. This designation will require all new development to meet the phosphorous treatment requirements of the most current SWMMWW. The technical and regulatory basis for this requirement and associated implementation measures are described below.

8.7.1 Basis for Designation

Pursuant to the 2019 SWMMWW, phosphorous treatment BMPs are required for new development in watersheds that local governments, Ecology or the USEPA have determined to be sensitive to phosphorus and are being managed to control phosphorus. Under the SWMMWW, local government can use the following criteria for determining whether a water body is sensitive to phosphorus:

- Those waterbodies reported under section 305(b) of the Clean Water Act and designated as not supporting beneficial uses due to phosphorous or other water quality criteria related to excessive phosphorus.

Kitsap Lake is listed under Ecology's 305(b) report as limited for total phosphorous (Ecology 2023b) and therefore meets the requirement for a local agency water body designation as "phosphorous limited".

8.7.2 Treatment Requirements for New Development

Pursuant to the designation of Kitsap Lake as a phosphorous sensitive water body, all future development in the contributing basin to Kitsap Lake that triggers water quality treatment under MR 6, as currently defined in the SWMMWW or amended, will be required to implement phosphorous treatment as defined under the SWMMWW. Phosphorous treatment will be in addition to Enhanced treatment.

9 CAPITAL IMPROVEMENT PLAN

The purpose of the Capital Improvement Plan (CIP) is to identify the projects that are intended to improve stormwater management, infrastructure, flood control and water quality conditions in the City to meet regulatory requirements and maintain the required level of service. In general, a capital project is a structure, improvement, restoration, piece of equipment, land, or other major asset that has a useful life of at least one year and a project cost that exceeds \$10,000. The Utility uses the CIP to strategically plan and program capital investments.

This chapter describes both a short term (6-year) and long term (20-year) CIP. In general, the 6-year plan describes projects that are underway, have funding secured or are anticipated to be funded in the near term. The 20-year plan consists of projects that are currently unscheduled and are not funded. Both the 6-year CIP and 20-year plan are updated as basin assessments and system evaluations are completed and the need for system upgrades are better understood. The 6-year stormwater capital plan is typically updated on an annual basis to reflect new information and system needs.

The CIP identifies the specific facilities, costs and schedule of capital projects that address and implement the City's stormwater management needs and goals. The CIP groups projects into categories that reflect the purpose and potential funding sources for each type of project. Projects are grouped to reflect differences in how projects are evaluated, funded, and managed, as follows:

- *Storm Drains, Culverts, Bridges and Ditches* are improvements to the man-made and natural stormwater systems, such as conveyance capacity improvements, pipe replacement, replacement of facilities that have reached the end of their useful life or have insufficient capacity for existing conditions. These projects include flood control/reductions, as well as other stormwater collection, conveyance, or treatment elements.
- *Fish Barrier* projects remove or mitigate a barrier to anadromous fish migration. These projects typically involve removal of an undersized or deteriorated culvert that is located under a City street with a new larger culvert or bridge.
- *Transportation* projects consist of the stormwater element of roadway improvements. This can include new collection and conveyance systems, as well as water quality treatment retrofits.
- *Buildings, Roads, Bridges and Land* consist of the Utility's contribution to capital development of City operations and maintenance facilities.
- *Miscellaneous* projects are those not categorized under the above project types. This includes planning and management capital investments, and site-specific water quality retrofits.

9.1 Identification, Selection and Programming of Projects

The City annually updates the 6-year CIP. Potential projects are identified and evaluated by Utility staff as part of the continuous process to address stormwater drainage, water quality and aquatic habitat needs or deficiencies. Capital projects are prioritized each year based on professional judgement by staff, prioritization scoring (see section 9.3.1) and plans/studies performed by the City or other regional partners. These plans and studies will include the basin assessment and action plan developed as part of the SMAP required under the SW Permit.

The highest priority projects are scheduled for implementation within the six-year planning horizon and are included in the City's 6-year CIP. Many water quality and aquatic habitat projects are identified as contingent upon obtaining funding from outside sources, such as state and federal grants or loans. Projects that are not a high priority and/or have funding challenges are typically placed into the 20-year CIP. As projects are completed in the 6-year CIP, projects are re-evaluated yearly and projects are pulled forward.

Much of the City's stormwater system was constructed in the early 1900's. Stormwater piping from this era was typically constructed of corrugated steel, which has a useful life of between 50 and 100 years depending on thickness and coating. The CIP recognizes that much of this existing piping has likely reached the end of the useful life, and the plan prioritizes substandard main replacement or rehabilitation projects to upgrade and replace the aging system.

To accelerate the improvement of water quality around Bremerton, stormwater treatment retrofits are being considered in all new road projects to take advantage of redevelopment opportunity. Grant funding is actively sought to offset the cost of these retrofits and to provide adequate funds for system replacement.

Regulatory compliance with the City's SW Permit includes guidelines and minimum standards for water quality and maintenance of stormwater infrastructure. Many capital projects focus on improvements to existing systems to comply with the SW permit. Other projects comply with goals and actions described in the Sinclair and Dyes Inlets Fecal Coliform Bacteria TMDL Plan, which is considered by Ecology an extension of the City's SW Permit.

Based on this project planning process and criteria, a total of 40 CIP projects are identified for the 6 year CIP (Table 9.1). A total of 41 projects, that are not on the 6 year CIP, are currently included in the 20 year CIP (Table 9.2). The location of projects in the 6 year CIP are shown in Figure 9.1.

9.2 Cost Estimating Process

Cost estimates for capital projects are based on engineering or planning studies where available and are used to develop project budgets. When preliminary engineering information is not available, costs are developed based on a combination of engineering judgement, desktop and field assessment, and preliminary hydrologic modeling. Cost estimates for projects are developed and escalated to the anticipated year of implementation.

9.3 Planning Projects

Planning projects typically consist of identifying stormwater related deficiencies, alternatives and proposed capital improvements for a specific watershed, basin or sub-basin catchment area. These planning studies are essential for identifying stormwater infrastructure needs, options and costs to address both historical and emerging stormwater needs in the City. Planning projects typically include assessment of natural features such as streams, wetlands and shorelines and include strategies and projects for both protection and restoration of these natural resources.

Table 9-1. Six Year (2022-2027) Stormwater CIP.

MAP ID	PROJECT NAME	SUMMARY DESCRIPTION	SCORE	RANK	Rq'd By NPDES	Total Project Budget	PY(s) Actual	YEAR AND BUDGET						TOTAL 6-YEAR CIP
								2022	2023	2024	2025	2026	2027	
STORMDRAINS, CULVERTS, BRIDGES AND DITCHES														
1	Pine Road Basin Stormwater Improvements	New storm drains and outfalls for basin	55	4	no	\$3,881,330	\$120,000	\$2,500,000	\$759,459	\$0	\$0	\$0	\$0	\$3,259,459
2	Schley Canyon Culvert Repair (CIPP)	Pipe lining (CIPP) and slope stabilization repairs	45	5	no	\$600,000	\$100,000	\$521,747	\$0	\$0	\$0	\$0	\$0	\$521,747
3	E. 9th Street Stormwater Improvements	Replace system to accommodate Perry Ave. flows	67	2	no	\$4,100,000	\$0	\$300,000	\$300,000	\$3,500,000	\$0	\$0	\$0	\$4,100,000
-	CIPP Rehabilitation of Storm lines	CIPP repair of deteriorated storm drains	-	-	YES	\$350,000	\$150,000	\$150,000	\$150,000	\$150,000	\$150,000	\$150,000	\$150,000	\$900,000
-	Storm Drainage Replacement Program	Replace deteriorated/undersized storm pipe	-	-	YES	\$150,000	\$85,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$600,000
-	Storm Main Replacement with Paving	Replace storm drains and reconstruct pavement	-	-	YES	\$300,000	\$0	\$300,000	\$300,000	\$300,000	\$50,000	\$0	\$195,000	\$1,145,000
4	Kitsap Lake Algae Control Treatment	Algae and aquatic weed treatment	-	-	no	\$175,000	\$150,000	\$175,000	\$175,000	\$175,000	\$175,000	\$175,000	\$175,000	\$1,050,000
4	Kitsap Lake Stormwater Treatment	New water quality treatment vaults at 4 locations	32	11	no	\$1,700,000	\$50,000	\$195,551	\$0	\$0	\$1,500,000	\$0	\$0	\$1,695,000
4	Francis St. Outfall Replacement	Replace existing outfall	26	12	no	\$500,000	\$0	\$100,000	\$399,139	\$0	\$0	\$0	\$0	\$499,139
5	Chester Stormwater Outfall Reconstruction	Reconstruct outfall and add diffuser	-	-	no	\$510,000	\$0	\$80,000	\$0	\$0	\$0	\$0	\$430,000	\$510,000
6	Eastpark Stormwater Outfall	Replace beach nourishment around outfall	21	15	YES	\$100,000	\$0	\$50,000	\$0	\$0	\$0	\$0	\$0	\$50,000
7	Oyster Bay Outfall Replacement at OB-1	Replace existing outfall and retaining wall	23	13	no	\$1,800,000	\$0	\$0	\$0	\$300,000	\$1,500,000	\$0	\$0	\$1,800,000
8	Jacobson Blvd. Stormwater Outfall	Replace erosion protection at existing outfall	15	18	no	\$200,000	\$0	\$0	\$40,000	\$160,000	\$0	\$0	\$0	\$200,000
9	Riddell Road Conveyance	New 1,300-ft of new storm conveyance pipe	33	10	no	\$150,000	\$0	\$0	\$20,000	\$300,000	\$0	\$0	\$0	\$320,000
-	Second Street Stormwater Treatment	Stormwater treatment for Second St.	-	-	no	\$3,563	\$3,563	\$0	\$0	\$0	\$0	\$0	\$0	\$3,563
10	Evaluate Separation of Marion Basin (Callow 5)	Evaluate directional drill connection to Callow basin	40	8	no	\$175,000	\$0	\$0	\$0	\$0	\$25,000	\$150,000	\$0	\$175,000
-	Stormwater Outfall Dive Inspection/Assessment	Dive inspection of marine outfalls	-	-	no	\$300,000	\$0	\$0	\$0	\$0	\$0	\$250,000	\$0	\$250,000
<i>Storm Drains, Culverts, Bridges and Ditches Subtotal</i>			-	-	-	\$14,994,893	\$655,000	\$4,675,861	\$2,443,598	\$5,185,000	\$3,70,000	\$1,025,000	\$1,250,000	\$18,279,459
FISH BARRIERS														
11	Ostrich Creek Culvert Improvements	Replace barrier culverts with box culverts/bridges at Kitsap Way, Brentwood Drive and Price Rd.	60	3	no	\$4,687,968	\$1,955,556	\$2,900,000	\$0	\$0	\$0	\$0	\$0	\$2,900,000
12	Northlake Way Culvert Replacement	Replace barrier culvert with New box culvert for fish passage	38	8	no	\$9,654,000	\$10,591	\$0	\$0	\$0	\$0	\$500,000	\$500,000	\$1,000,000
13	Parish Creek Flood Reduction and Fish Passage	New box culvert parallel to existing culvert and reestablish stream channel	79	1	no	\$1,450,000	\$0	\$0	\$0	\$0	\$0	\$100,000	\$1,350,000	\$1450,000
<i>Fish Barriers Subtotal</i>			-	-	-	\$15,791,968	\$1,966,147	\$2,900,000	\$0	\$0	\$0	\$600,000	\$1,850,000	\$5,350,000
TRANSPORTATION														
3	E. 11th St. and Perry Avenue Reconstruction	Perry Avenue and 11th St. stormwater facilities	-	-	no	\$1,614,151	\$115,000	\$1,335,958	\$81,1200	\$0	\$0	\$0	\$0	\$1,417,078
14	Washington Avenue Roundabout	Stormwater facilities for roundabout	18	17	no	\$910,000	\$0	\$200,000	\$710,000	\$0	\$0	\$0	\$0	\$910,000
15	Quincy Square on 4th St.	Innovative water quality treatment for new street	41	8	no	\$450,000	\$0	\$450,000	\$450,000	\$0	\$0	\$0	\$0	\$450,000
16	6th Street Phase III	Stormwater for reconstruction of 6th Street	21	15	no	\$50,000	\$0	\$50,000	\$0	\$0	\$0	\$0	\$0	\$50,000

Table 9-1. Six Year (2022-2027) Stormwater CIP (cont.)

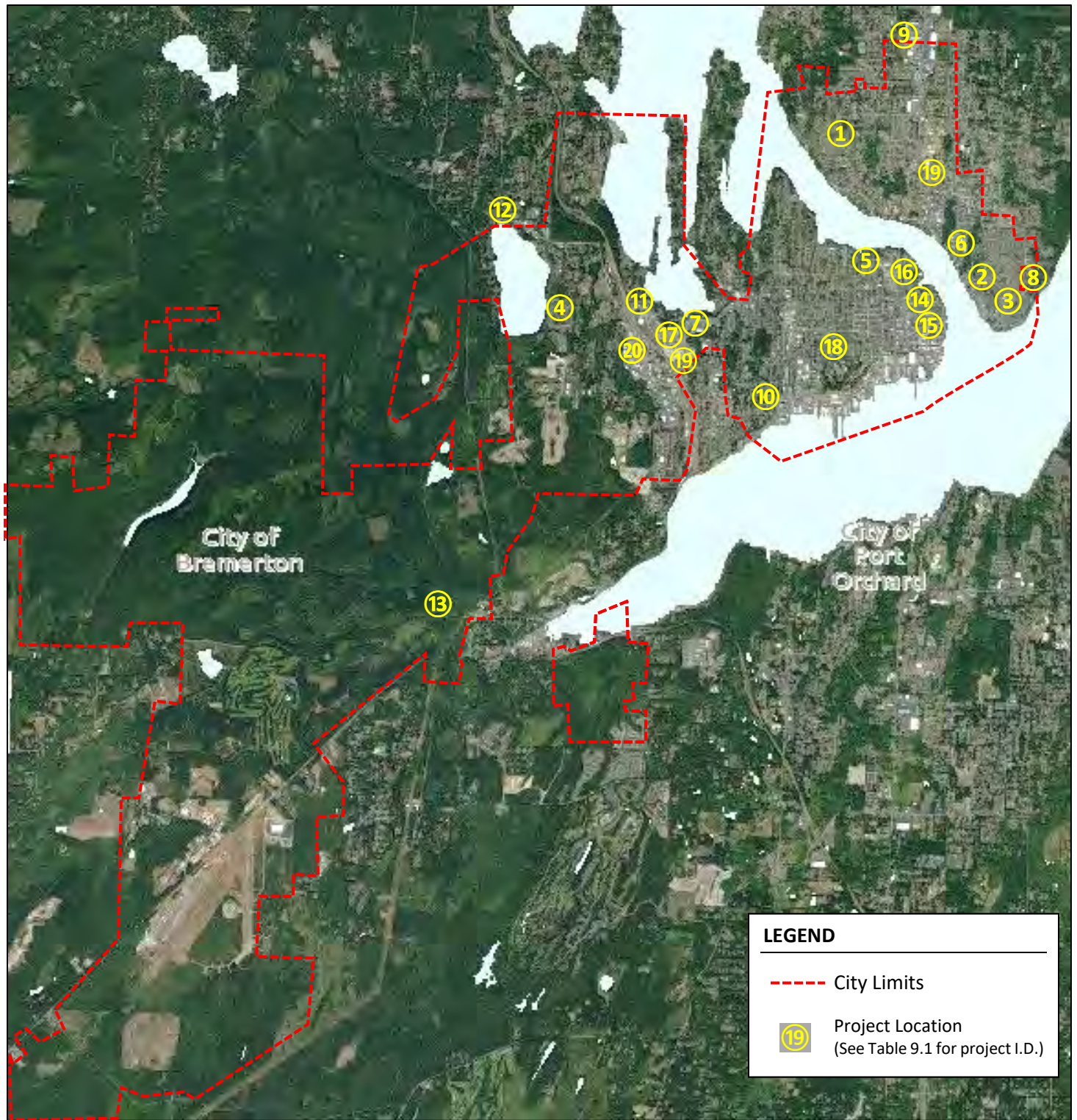
MAP ID	PROJECT NAME	SUMMARY DESCRIPTION	SCORE	RANK	Rq'd By NPDES	Total Project Budget	PY(s) Actual	YEAR AND BUDGET						TOTAL 6-YEAR CIP
								2022	2023	2024	2025	2026	2027	
17	Oyster Bay Avenue Improvements	Stormwater facilities for roadway reconstruction	44	6	no	\$855,000	\$0	\$0	\$0	\$0	\$0	\$105,000	\$105,000	
18	Naval Avenue Road Diet	Rechannelize Naval Avenue to provide bike lanes	21	15	no	\$50,000	\$0	\$0	\$0	\$0	\$50,000	\$0	\$50,000	
19	View Ridge Elementary Safe Route to School (Almira Dr.)	Sidewalks, striping, storm system	-	-	no	-	\$0	\$0	\$0	\$200,000	\$550,000	\$0	\$750,000	
<i>Transportation Subtotal</i>			-	-	-	<i>\$3,929,151</i>	<i>\$115,000</i>	<i>\$1,585,958</i>	<i>\$1,241,120</i>	<i>\$0</i>	<i>\$200,000</i>	<i>\$600,000</i>	<i>\$105,000</i>	<i>\$3,732,078</i>
SEWER MAINS														
-	Oyster Bay Beach Sewer	Contribution to sewer improvements	-	-	no	-	-	\$200,000	\$0	\$0	\$0	\$0	\$0	\$200,000
<i>Sewer Mains Subtotal</i>			-	-	-	-	<i>\$0</i>	<i>\$200,000</i>	<i>\$0</i>	<i>\$0</i>	<i>\$0</i>	<i>\$0</i>	<i>\$0</i>	<i>\$200,000</i>
MISCELLANEOUS														
4	Kitsap Lake Park Modular Wetland	New water quality treatment vault at City park	19	16	no	\$70,000	\$0	\$85,000	\$0	\$0	\$0	\$0	\$0	\$85,000
20	Ostrich Bay Creek Treatment Retrofit	13 water quality treatment vaults at various locations	22	14	YES	\$1,725,000	\$100,000	\$1,107,658	\$0	\$0	\$0	\$0	\$0	\$1,107,658
-	Asset Management Implementation	Implement new/upgraded software system	-	-	no	\$50,000	\$0	\$50,000	\$0	\$0	\$0	\$0	\$0	\$50,000
<i>Miscellaneous Subtotal</i>			-	-	-	<i>\$1,845,000</i>	<i>\$100,000</i>	<i>\$1,242,658</i>	<i>\$0</i>	<i>\$0</i>	<i>\$0</i>	<i>\$0</i>	<i>\$0</i>	<i>\$1,242,658</i>
TOTAL CAPITAL COSTS						\$36,993,670	\$2,836,147	\$10,604,477	\$3,684,718	\$5,185,000	\$3,900,000	\$2,225,000	\$3,205,000	\$28,804,195
TOTAL CAPITAL COSTS WITH INFLATION						-	-	\$10,604,477	\$3,905,801	\$5,825,866	\$4,557,322	\$2,704,011	\$4,050,790	\$31,648,267
REVENUE SOURCES														
Beginning Balance								\$4,714,809	\$4,249,969	\$3,013,216	\$1,678,460	\$2,814,596	\$963,447	-
Grants, ARPA and other potential funding (secured and not secured)								\$2,382,946	\$1,085,000	\$4,007,600	\$1,389,612	\$530,732	\$548,961	\$9,944,852
General Facility Charges								\$500,000	\$595,204	\$471,458	\$297,131	\$310,871	\$325,245	\$2,499,909
Revenue Bond Proceeds											\$4,000,000		\$8,000,000	\$12,000,000
Other Loan Proceeds								\$7,196,691	\$938,844	\$0	\$0	\$0	\$0	\$8,135,535
Interest Earnings								\$60,000	\$50,000	\$12,053	\$6,714	\$11,258	\$3,854	\$143,879
TOTAL REVENUE SOURCES								\$14,854,446	\$6,919,017	\$7,504,326	\$7,371,918	\$3,667,457	\$9,841,507	\$32,724,175
ENDING CAPITAL FUND BALANCE								\$4,249,969	\$3,013,216	\$1,678,460	\$2,814,596	\$963,447	\$5,790,717	-

Table 9-2. Twenty-year capital project improvement plan.

PROJECT NAME	SUMMARY DESCRIPTION	SCORE	EST. COST
Almira Stormwater Improvements, Ph. 2	Stormwater upgrades to support pedestrian and bicycle improvements.	53	\$3,400,000
Elizabeth Avenue and 13th Street Stormwater Improvements	Construct new storm line from intersection west to alley and tie in two basins, then new pipe north through the alley to a new basin	50	\$600,000
Lent Landing culvert replacement	Purchase approx. 18 residences and demolition, remove existing culvert, creek restoration and a bridge on Lebo Boulevard with closure of 3 streets; Plum, Will, and Reid.	48	\$12,000,000
Werner Road	Widen Werner Road and provide intersection improvements.	44	\$1,900,000
The Cedars Storm System Improvements	Construct storm system with quality treatment and outfalls, includes purchasing easements.	44	\$500,000
Forest Lawn Cemetery culvert replacement and stream restoration	Replace an existing fish passage barrier culvert and stream restoration.	43	\$1,000,000
Rainier Avenue Stormwater Improvements	Construct new storm main to connect with the storm system in 19th and 20th Streets, add curb and gutter.	41	\$350,000
West Kitsap Lake Road Drainage System Improvements	Assessment, capacity analysis, and construction of improvements to the mix of open channel and culvert flows along the roadway and to Kitsap Lake.	40	\$600,000
Northlake Way Drainage System Improvements	Assessment, capacity analysis, and construction of improvements to the mix of open channel and culvert flows along the roadway and to Kitsap Lake.	40	\$600,000
Lake Flora Road Culvert Replacement	Replace existing 36-inch HDPE pipe with appropriately sized 3-sided box culvert.	40	\$600,000
Crawford/Beach Drive	Construct improvements to the storm system on Beach Drive.	40	\$1,500,000
Poindexter Stormwater Improvements	Construct a new storm main to connect with the storm system in Werner Road.	39	\$3,000,000
Kitsap Way Ditch Reconstruction	Replace the existing open channel and rolled gutter with catch basins, hard piping and water quality treatment.	39	\$1,200,000
Airport Way	Design and construct segment of Cross SKIA connector.	36	\$500,000
Werner Road/Nollwood Lane Stormwater Improvements	Analysis of drainage flows and construction of an overflow line to W. O Street.	36	\$600,000
Jenner Avenue Storm Improvements	Replace and upsize storm main, run line to bottom of canyon.	31	\$120,000
Naval Ave Improvements - 12th St to 11th St	Construct new storm system from 12th Street to 11th Street on Naval Ave.	24	\$150,000
Shorewood Drive Stormwater Improvements	Basin and downstream analysis, construct storm system and add quality treatment.	24	\$550,000
Werner Road/Loxie Egans Storm line replacement	Replace existing 42-inch CMP running underneath Werner Road/Loxie Egans which connects to 54-inch CMP running parallel to SR 3 in front of the auto dealership. Coordination with WSDOT.	24	\$1,000,000
Sinclair/Union Improvements	Stormwater facilities for intersection improvements.	23	\$500,000

Table 9-2. Twenty year capital project improvement plan (cont.).

PROJECT NAME	SUMMARY DESCRIPTION	SCORE	EST. COST
Westpark Oyster Bay Outfall at OB1 Lift Station	Remove existing subtidal outfall and pipe. Line existing pipe and construct a new intertidal outfall with shoreline diffuser. Remove existing riprap and replace with cobbles or gravel and shoreline plantings.	23	\$1,800,000
13th Street Improvements - Rainier to Whitney Ave	Construct new storm system from Rainier to Whitney on 13th Street, then tie system to existing mid-block on Whitney. Include basin 160 south on Bloomington.	23	\$280,000
Burwell St Improvements - Lafayette to Callow Ave	Construct new storm system from Lafayette to midblock Callow/Wycoff Avenue	23	\$320,000
2131 Madrona Point Outfall Improvements	Replace existing outfall, improve water quality and secure easement.	12	\$100,000
Harlow Drive culvert replacement	Replace existing fish passage barrier culvert with a bridge.	22	\$500,000
Harlow Drive culvert replacement - Tweed Lane	Replace existing fish passage barrier culvert.	22	\$500,000
5th Street improvements - Warren to Park	Construct new storm system from Park 400-ft to Warren Ave. and replace existing bubble-up outfall and slip-lined basins.	21	\$150,000
1st Street Improvements - Arvon to Montgomery Ave	Bypass Rainier system to prevent surcharge during king tide flooding.	20	\$500,000
Hewitt Ave Improvements - 5th to 6th Street	Construct new storm system from 5th Street to 6th on Hewitt and remove existing basins out of sanitary system.	20	\$200,000
Gregory Way Improvements - High to Hewitt Ave	Construct new storm system from High to Naval on Gregory.	20	\$500,000
Wycoff Avenue Improvements - Burwell to 1st St	Construct new storm system from midblock down to 1st Street.	20	\$200,000
Cambrian Ave Improvements - Burwell to 6th St	Construct new storm system from Cambrian to Burwell.	20	\$120,000
Cascade Trails/E. 19th/Alder Street System Improvements	Basin assessment, capacity analysis, and design for new regional stormwater system.	19	\$1,000,000
Warren Avenue Bridge Pedestrian Improvements	Stormwater facilities for widen sidewalks on both side of the bridge with roadway improvements.	18	\$100,000
11th St and Callow	Stormwater facilities for intersection improvements, install EB to NB left turn pocket.	18	\$250,000
Alley improvements - Callow/Montgomery/6th/Burwell	Construct new storm system from basin to 6th Street.	15	\$80,000
Alley Improvements - Wycoff/Callow/Burwell/1st	Construct new storm system from basin to 1st Street.	15	\$150,000
Yew Creek	Basin assessment and preliminary capacity analysis to include inlet and downstream piping improvements.	14	\$50,000
Pleasant Avenue Stormwater Improvements	Construct a new storm main to connect with the storm system in Pacific Avenue.	12	\$120,000
Lion's Park Outfall Replacement	Replace deteriorated 24-inch concrete storm line and outfall that runs from Lebo Boulevard through main entrance of the park to the Port Washington Narrows.	11	\$1,000,000
TOTALS			\$38,540,000



SCALE IN FEET
0 3,000 6,000



Figure 9-1. 6-Year Capital Project Locations
Surface and Stormwater Comprehensive Plan
City of Bremerton

An important goal of all planning studies is to identify the specific capital projects that are to advance to the Stormwater CIP. Planning studies provide a basis for selecting a preferred BMP, as well as provide information on the relative priority of the project compared to other projects on the CIP. Specific BMP options that are evaluated in a planning study reflect the unique needs and conditions of the study area, and typically include a broad range of BMPs including bioretention, treatment wetlands, ponds and vaults.

Planning projects are typically not included in a CIP because they do not directly result in a specific capital asset. However, to account for the cost and scheduling of these planning projects they are included as part of this Plan. Most planning projects are contingent on grant funding. Proposed planning projects are shown in Table 9.3.

9.4 Rain Garden Program

Rain gardens are a bioretention stormwater treatment method that provides stormwater infiltration and treatment at a small, site-specific scale, typically a single family residence. A rain garden is typically a shallow bowl-shaped depression in the landscape that collects rainwater. They are often planted with native plants and are a natural way to manage rain on developed property while adding beauty to the landscape.

In an effort to increase the number of rain gardens in the City, the City contracts with the Kitsap County Conservation District to assist landowners with design and construction of rain gardens with the City limits. This voluntary program provides private landowners technical and financial assistance to install rain gardens on their property. The rain garden program is not included in the CIP because they do not directly result in a specific City owned capital asset. However, to account for the cost and scheduling of these planning projects they are included as part of this Plan. The program is currently funded at \$240,000 for a four year period 2023-2026 by a combination of the Stormwater and Wastewater Utilities due to the ability of raingardens to help reduce both combined sewer overflows, and stormwater related water quality and flooding impacts.

9.5 Prioritization Process

The stormwater CIP is prioritized using a process where City staff score projects using consistent ranking criteria. The objective of the prioritization process is to develop a ranked list of projects and a schedule for project implementation that reflects the City's most significant needs and financial status. While the prioritization metric allows for a quantitative ranked list, other factors are also considered annually to establish the 6-year CIP. Primary considerations are avoidance of future conflicts and the ability to secure grant funding. It is common for lower ranked projects to be pulled into the 6-year CIP to coordinate construction of multiple projects, or when grant funding is secured. The criteria used to establish the prioritized list is as follows:

Table 9-3. Planning Projects, 2022-2027.

PROJECT NAME	SUMMARY DESCRIPTION	SCORE	Rq'd By NPDES	Total Project Budget	YEAR AND BUDGET						TOTAL 6-YEAR BUDGET
					2022	2023	2024	2025	2026	2027	
Kitsap Lake Water Quality Improvements	SMAP preparation per NPDES Permit	-	YES	\$100,000	\$25,000	\$75,000	\$0	\$0	\$0	\$0	\$100,000
Oyster and Ostrich Bay Stormwater Quality Imps.	Basin Assessment and Preliminary Capacity Analysis for Regional Retrofit	26	no	\$100,000	\$25,000	\$75,000	\$0	\$0	\$0	\$0	\$100,000
Pine Road Basin Stormwater System Improvements	Basin Assessment and Preliminary Capacity Analysis for Regional Retrofit	26	no	\$150,000	\$0	\$0	\$150,000	\$0	\$0	\$0	\$150,000
PSIC Stormwater System Improvements.	Basin Assessment and Preliminary Capacity Analysis for Regional System	26	no	\$150,000	\$0	\$0	\$150,000	\$0	\$0	\$0	\$150,000
Phinney Bay Stormwater System Imps.	Collaborative Project with Kitsap County for Stream and WQ Improvements	26	no	\$80,000	\$0	\$0	\$0	\$80,000	\$0	\$0	\$80,000
Warren Avenue Basin Stormwater Quality Imps.	Basin Assessment and Preliminary Capacity Analysis for Regional Retrofit	26	no	\$80,000	\$0	\$0	\$0	\$80,000	\$0	\$0	\$80,000
Cherry Basin Stormwater Quality Imps.	Basin Assessment and Preliminary Capacity Analysis for Regional Retrofit	26	no	\$80,000	\$0	\$0	\$0	\$0	\$80,000	\$0	\$80,000
Callow Avenue Stormwater Quality Imps.	Basin Assessment and Preliminary Capacity Analysis for Regional Retrofit	26	no	\$80,000	\$0	\$0	\$0	\$0	\$80,000	\$0	\$80,000
Anderson Cove Basin/Inflow Reduction for CW-4	Basin Analysis	26	no	\$80,000	\$0	\$0	\$0	\$0	\$0	\$80,000	\$80,000
Siesko Lane/Marion Basin Pond Assessment	Assessment and capacity analysis for Pond Imps.	21	no	\$50,000	\$0	\$0	\$0	\$0	\$0	\$50,000	\$50,000
TOTAL PLANNING PROJECTS		-	-	\$950,000	\$50,000	\$150,000	\$300,000	\$160,000	\$160,000	\$130,000	\$950,000

- **Strategic Benefit** is based on funding opportunities and the ability to combine projects with a transportation or other City sponsored development project.
- **Infrastructure and Equipment Replacement** criteria reflect three general project types:
 - Improvements to the artificial and natural stormwater systems, such as conveyance capacity improvements, pipe replacement or rehabilitation, replacement of facilities that have reached the end of their useful life or have insufficient capacity for the existing conditions,
 - Continue the City’s efforts of separating the combined storm and sanitary sewer systems and reduce combined sewer overflow (CSO) events in the future,
 - Purchase/replace larger maintenance equipment, such as vactor trucks, excavators, and truck and trailers.
- **Environmental** criteria focus on protecting, restoring, and enhancing water quality, fish, and wildlife habitat (including fish passage barrier correction), correcting a known water quality deficiency, or implementing a priority action associated with the Dyes and Sinclair Inlet TMDL Plan.
- **Sustainability and Economic Development** criteria consider benefits of infiltration or reduction of surface flow. These criteria also reflect the City Council and Mayor’s goals for future economic development or, address a liability by solving a stormwater problem affecting a potential developed or undeveloped area.

Project scoring criteria is summarized in Table 9.4 on the following page. Tables 9.1 and 9.2 include prioritization scores for each project.

9.6 Capital Project Descriptions

Table 9.5 provides summary descriptions of specific projects in the 6-year CIP.

9.7 CIP Review and Modification

The CIP is continuously reviewed to reflect changes in project priorities and funding. New projects are added as they are identified, and project budgets are adjusted as more detailed design and cost information implementation timelines are developed. Project schedules are also adjusted to reflect changes in funding availability, permitting timelines and other factors. Budget and timing estimates shown in Tables 9.1 and 9.2 are therefore considered preliminary and subject to change on an annual basis

Table 9-4. Capital Project Prioritization Criteria.

CRITERIA	POTENTIAL POINTS	MAX. POINTS FOR CRITERION
Flooding Damage		
Damages Private Homes or Affects Usage	15	
Damages Public Property or Right of Way for Major Infrastructure or Road	15	30
Floods Private Driveway or Garage	10	
Strategic Benefit		
Project could be included in a transportation improvement project (TIP)	10	
Strong candidate for external grant funding	10	20
Moderate candidate for external grant funding	5	
Table 9.3 Capital Project Prioritization Criteria (cont.)		
Infrastructure and Equipment Replacement		
New or upgrades stormwater infrastructure	10	
In-kind replacement of existing stormwater infrastructure	6	
Improvements benefit a basin area of 2 acres or more	6	
Improvements benefit an area of less than 2 acres	3	24
Reduces City maintenance responsibility for the area of improvement	4	
Project completes a CSO separation of less than 1 acre or more	4	
Project completes a CSO separation of less than 1 acre	2	
Environmental		
Addresses fish passage	6	
Addresses fish passage, but limited benefit due to other barriers	4	
Corrects or creates significant habitat restoration of 2 acres or more	6	18
Moderate or minor habitat restoration of 1 to 2 acres	4	
Provides major water quality improvements from PGIS or impacted water body	6	
Provides minor water quality improvements	4	
Sustainability and Economic Development		
Project has significant sustainability value, uses infiltration or reduces surface flow volumes	5	15
Project supports economic development or solves stormwater problem affecting subarea	10	
Total Maximum Possible Score		107

Table 9-5. Capital Project Descriptions.

RANK	PROJECT NAME	PROBLEM DESCRIPTION	PROJECT DESCRIPTION	EST. COST	YEAR
Projects in East Bremerton, including Stephenson Creek Basin, Pine Road Basin, and Schley Canyon					
2	E. 9th Street Stormwater Improvements	Existing Perry Avenue storm system is undersized and does not provide water quality treatment.	Replace storm system to accommodate Perry Avenue flows and consider water quality improvements. Construct new storm main on Shore Drive from E.11th to E. 9th Streets and reconstruct storm water outfall.	\$4,100,000	2022-24
-	E. 11th St. and Perry Avenue Reconstruction	Perry Avenue reconstruction requires new stormwater conveyance and treatment system	Provide stormwater treatment and conveyance facilities for Perry Avenue and 11th St. project.	\$1,614,151	2022
4	Pine Road Basin Stormwater Improvements	Non-existent and undersized storm system in the area results in flooding issues during major storm events.	New storm mains on Eagle and Robin Avenues between Dibb St. and Sheridan Blvd. with reconstruction of the outfalls at Lebo Blvd/Sheridan Park and for Stephenson Cr. south of Sheridan and west of Robin Ave. Includes reconstruction of the storm inlet for Stephenson Creek at Stephenson Circle.	\$3,317,506	2022-23
5	Schley Canyon Culvert Repair	Existing 36-inch concrete culvert and outfall is failing and needs repair.	Culvert pipe repair (CIPP) and gabion baskets repair for slope stabilization.	\$600,000	2022
10	Riddell Rd Conveyance – Parkside Apartments to Pine Road	Riddell Road lacks stormwater infrastructure and flooding occurs at the intersection with Wheaton Way during heavy rain events.	Add 1,300 LF of new stormwater conveyance on Riddell Road from the west side of Wheaton Way upstream to Parkside Apartments/city limits.	\$320,000	2023-24
-	View Ridge Elementary Safe Routes to School	Stormwater infrastructure to support sidewalk and bike lanes	Sidewalk and bike lane improvements	\$750,000	2025-26
15	Eastpark Stormwater Outfall	Erosion/sediment export from area around outfall discharge.	Replace beach nourishment around outfall	\$50,000	2022

Table 9.5. Capital Project Descriptions (cont.)					
PRIORITY SCORE	PROJECT NAME	PROBLEM DESCRIPTION	PROJECT DESCRIPTION	EST. COST	YEAR
18	Jacobson Blvd. Stormwater Outfall	Deteriorated outfall erosion protection.	Replace erosion protection at existing outfall	\$200,000	2023-24
Projects in Ostrich Bay Creek Basin and Oyster Bay Basin					
3	Price Road Culvert Replacement	The existing 24-inch-diameter culvert at Price Road is undersized, resulting in flooding that has overtopped and washed out the road in the past. The culvert is a total fish barrier on Ostrich Creek.	Replace the existing culvert with a 40-foot bridge.	\$1,000,000	2023
3	Brentwood Drive Culvert Replacement	The existing culvert is listed as a partial fish barrier and stream has documented presence of coho and fall chum salmon. Making the culvert fish-passable is a condition of the City's permit to line upstream 42-inch CMP pipe.	Replace existing culvert with 62-ft wide bridge.	\$1,500,000	2023
6	Oyster Bay Avenue Improvements	Reconstruct roadway including upgrades to stormwater conveyance and treatment systems.	Stormwater facilities for roadway reconstruction	\$1,725,000	2023
13	Oyster Bay Outfall Replacement at OB-1	The existing outfall is partially plugged and in poor condition, resulting in flooding north of the intersection of Kitsap Way and Oyster Bay Avenue South. Severe flooding could endanger the adjacent pump station and risk a sewage spill to Oyster Bay.	Remove existing subtidal outfall and pipe. Line existing pipe and construct a new intertidal outfall with shoreline diffuser. Remove existing riprap and replace with cobbles or gravel and shoreline plantings.	\$1,800,000	2024-25

Table 9.5. Capital Project Descriptions (cont.)					
PRIORITY SCORE	PROJECT NAME	PROBLEM DESCRIPTION	PROJECT DESCRIPTION	EST. COST	YEAR
14	Ostrich Bay Creek Stormwater Treatment Retrofit	Ostrich Bay water quality does not support commercial or recreational shellfish harvest. This grant funded project is part of a larger suite of actions proposed to improve water quality.	Treat stormwater from a 15-acre basin using 13 treatment vaults.	\$1,725,000	2023
Projects in Kitsap Lake and Kitsap Creek Basin					
8	Northlake Way Fish Passage	The existing Kitsap Creek culvert at Northlake Way is undersized and is a partial fish barrier. Kitsap Creek is documented habitat for winter steelhead, coho and fall chum.	Replace existing culvert with an appropriately sized 3-sided bottomless box culvert.	\$9,654,000	2026-27
11	Kitsap Lake Stormwater Treatment Retrofit	Kitsap Lake experiences toxic algal blooms and exceedances of <i>E. coli</i> water quality standard. Stormwater has been identified as a source of contamination and nutrients.	Install a treatment retrofit for existing untreated stormwater at four outfalls.	\$1,700,000	2022-24
12	Francis St. Outfall Replacement	Erosion protective measures on outfall are failing.	Replacement of the erosion protection for the outfall.	\$1,200,000	2022-23
16	Kitsap Lake Stormwater Treatment Retrofit at Park	Kitsap Lake experiences toxic algal blooms and exceedances of <i>E. coli</i> water quality standard. Stormwater has been identified as a source of contamination and nutrients.	Install a treatment vault at the existing City Park parking lot.	\$85,000	2022
-	Kitsap Lake Algae Control Treatment	Kitsap Lake experiences excessive aquatic algae and weed growth.	Algae and aquatic weed treatment	\$1,200,000	2022-27

Table 9.5. Capital Project Descriptions (cont.)					
PRIORITY SCORE	PROJECT NAME	PROBLEM DESCRIPTION	PROJECT DESCRIPTION	EST. COST	YEAR
Projects In Gorst Creek Basin					
1	Parish Creek Flood Reduction	Existing culvert is undersized and a partial fish barrier. Sediment has filled the creek above the Old Belfair Highway (alluvial fan), and flows have overtopped the stream banks during multiple recent storm events, damaging property and the roadway.	Construct new three-sided culvert parallel to existing culvert and reestablish channel to allow for future sediment deposition.	\$1,450,000	2027
Other Construction Projects					
8	Quincy Square on 4th Street	Existing street system does not support curb less pedestrian/festival boulevard.	Street reconstruction will support curb less boulevard with innovative stormwater improvements for catchment and treatment.	\$450,000	2022
8	Evaluate Separation of Marion Basin (Callow 5)	Potential combined sewer overflow reduction project.	Evaluate directional drill connection to Callow basin.	\$175,000	2025-26
15	6th Street Phase III	Stormwater utility participation in street improvements project.	Stormwater facilities for overlay and partial reconstruction of 6th Street from Naval to Warren Avenues.	\$50,000	2022
15	Naval Avenue Road diet	Stormwater utility participation in street improvements project.	Rechannelize Naval Avenue to provide bike lanes.	\$50,000	2024
17	Washington Avenue Roundabout	Stormwater utility participation in street improvements project.	Stormwater facilities for a roundabout at west end of Manette Bridge and reconstruct Washington Ave. to Pacific Ave.	\$910,000	2022
17	Washington Avenue Sidewalks	Stormwater utility participation in street improvements project.	Stormwater facilities for a new sidewalks reconstruct Washington Ave. to Pacific Ave.	\$910,000	2022

Table 9.5. Capital Project Descriptions (cont.)					
PRIORITY SCORE	PROJECT NAME	PROBLEM DESCRIPTION	PROJECT DESCRIPTION	EST. COST	YEAR
-	Chester Stormwater Outfall Reconstruction	The historical 12-inch outfall has failed, and the final segment was temporarily replaced with a 10-inch-diameter PVC pipe, which is under capacity and causing upstream flooding.	Reconstruct outfall and add diffuser	\$510,000	2022&2027
-	Oyster Bay Facilities Expansion	Utility participation in expansion of operations and maintenance facility.	Contribution to facility expansion	\$100,000	2022
-	Storm Drainage Improvements	Utility participation in expansion of operations and maintenance facility.	Contribution to site development costs.	\$100,000	2022
General Stormwater Infrastructure Repair and Replacement					
-	CIPP Rehabilitation of Storm lines	Older pipes have deteriorated and reached the end of their useful life.	CIPP repair of deteriorated storm drains	\$1,650,000	2022-27
-	Video Inspection and Cleaning	Inspect and clean conveyance piping as required by NPDES Permit.	Inspect and clean storm drains	\$700,000	2022-27
-	Storm Drainage Replacement Program	Older pipes have deteriorated and reached the end of their useful life.	Conventional repair of deteriorated storm drains	\$1,285,000	2022-27
-	Storm Main Replacement with Paving	Older pipes have deteriorated and reached the end of their useful life.	Conventional repair of deteriorated storm drains with replacement of overlying deteriorated pavement.	\$1,285,000	2022-27
-	Asset Management Implementation	Upgrade software to improve record keeping as required by NPDES Permit.	Implement new/upgraded software system	\$50,000	2023

Table 9.5. Capital Project Descriptions (cont.)					
PRIORITY SCORE	PROJECT NAME	PROBLEM DESCRIPTION	PROJECT DESCRIPTION	EST. COST	YEAR
Planning Projects					
-	Stormwater Management Action Plan	NPDES Permit requires SMAP preparation in 2022-23	SMAP preparation per NPDES Permit.	\$50,000	2022-23
-	PSIC (SKIA) Stormwater System Improvements	No storm system or planning has been done for a majority of the PSIC area.	Basin Assessment and Preliminary Capacity Analysis for Regional System.	\$150,000	TBD
-	Phinney Bay Creek Stormwater System Improvements	Watershed and stream have been heavily impacted by urbanization, takes drainage from 11th Street/Kitsap Way.	Collaborative project with Kitsap County for stream and water quality Improvements.	\$150,000	TBD
-	Warren Ave drainage basin stormwater quality improvement	Pollutants in stormwater flowing to Port Washington Narrows/Sinclair Inlet.	Basin Assessment and Preliminary Capacity Analysis for Regional Retrofit.	\$80,000	TBD
-	Pine Road basin stormwater quality improvement	Pollutants in stormwater flowing to Port Washington Narrows/Sinclair Inlet.	Basin Assessment and Preliminary Capacity Analysis for Regional Retrofit.	\$80,000	TBD
-	Cherry Ave basin Stormwater quality improvement	Pollutants in stormwater flowing to Port Washington Narrows/Sinclair Inlet.	Basin Assessment and Preliminary Capacity Analysis for Regional Retrofit.	\$80,000	2022
-	Callow Ave Storm water quality improvement	Pollutants in stormwater flowing to Port Washington Narrows/Sinclair Inlet.	Basin Assessment and Preliminary Capacity Analysis for Regional Retrofit.	\$80,000	TBD
-	Siesko Lake/Marion Basin Pond Assessment	Infiltration pond assessment needed to determine if issues with the system or overtopping.	Assessment and Capacity Analysis for Pond Improvements.	\$50,000	TBD
-	Anderson Cove basin/Inflow Reduction for CW-4	Eliminate additional infiltration from stormwater that is affecting CW-4.	Basin Analysis	\$80,000	TBD

10 FINANCIAL ASSESSMENT

This chapter describes the current and estimated future finances of the Utility and summarizes the financial resources anticipated to be needed to implement this Plan. This financial chapter includes the following elements:

- Financial overview of the Utility;
- Summary of revenues and costs over the prior 5 year period (2016-2021);
- Summary of estimated expenses and revenues over the planning period (2022-2027); and
- Potential future financial needs.

10.1 Financial Overview of Stormwater Utility

The primary source of funds for the Utility are the retail stormwater rates. This is a monthly fee based on the extent that a property is developed with impervious surfaces. Rates and general facility charges (GFCs) are based on impervious surface area, which is measured in impervious hard surface units (IHSU). Each IHSU is equivalent to 2,500 square feet of impervious surface. The link between impervious surfaces, runoff contribution, increased flooding, water quality degradation, and damage to wildlife habitat is scientifically strong and defensible. This rate basis appropriately links land development with issues addressed in this plan, such as flooding, conveyance capacity, water quality and habitat enhancement and protection.

The City's monthly stormwater rate for 2023 is set at \$21.50 per IHSU. As shown in Table 10-1, this rate is comparable to other peer jurisdictions in the region. Rates are established annually through ordinance where rate revenue is used to account for operations, maintenance, permit requirements, and projects in the approved CIP. Under BMC 15.06.015, rates are automatically adjusted to the Seattle Consumer Price Index (CPI) each year if City Council doesn't approve a separate rate ordinance. Ordinance 5461 was approved by the City Council in November 2022 and became effective January 01, 2023. On-going rate increases resulting from this review will ensure the Utility's projected financial needs are met including operations and maintenance, new staff, debt service, capital projects and financial reserves.

Table 10-1. Stormwater Monthly Rate Comparison Based on 2,500 sq-ft IHSU.

Jurisdiction	Rate (2022)
City of Tacoma	\$26.83
City of Seattle	\$28.21
City of Edmonds	\$22.56
City of Bremerton	\$21.50
City of Poulsbo	\$20.88
City of Bainbridge Island	\$18.83
City of Olympia	\$17.12
City of Port Townsend	\$17.01
City of Gig Harbor	\$15.67
City of Port Orchard	\$14.00
Kitsap County	\$10.42

10.2 Current Revenues

Current revenues are generated from a combination of retail utility rates, general facility charges (GFC), loans/bonds and grants. Table 10-2 on the following page summarizes utility revenues for the prior five-year period, 2017 through 2021.

In general, rate revenues first go to covering annual operating expenses and taxes. Revenues that exceed these annual expenses are available to fund capital projects. In 2021, the Utility collected approximately \$4.9 million in rate and GFC revenue. Rate and GFC revenue has increased an average of approximately 7.4 percent per year in the 2017 to 2021 period, which reflects a combination of consumer price index (CPI) inflation adjustment (2.6% annual average) and an increase in the number of ISUs and general facility charges (GFCs) associated with recent development growth in the City (4.8% annual average).

10.3 Current Expenses

Utility expenses generally consist of a combination of O&M, equipment replacement, debt service, and capital improvement projects. The Utility also contributes to the City General Fund via a utility tax. Table 10-2 summarizes expenses over the 5 year period 2017 through 2021.

10.3.1 Operation and Maintenance Expenses

Operation and maintenance expenses consist of normal operation, maintenance and repair of the stormwater system, equipment, customer service and system management and administration. As shown in Table 10-2, O&M costs have increased on average approximately 10 percent per year between 2017 and 2021. Cost increases are generally associated with additional O&M costs associated with NPDES permit requirements and utility taxes.

10.3.2 Debt Service

The Utility secured a \$8.3M Public Works Trust Fund (PWTF) in 2018 to pay for fish passage improvements at three locations on Ostrich Creek (see Chapter 9). the Kitsap Way culvert replacement was established as a top priority due to structural concerns of the existing culvert. The PWTF re-payment period is 20 years, with an annual debt service requirement of approximately \$800,000 after all projects are completed (see section 10.4 for future cost and expenses).

10.4 Capital Projects

Annual capital projects costs over the 2017 to 2021 period have varied from a low of approximately \$255,000 in 2018 to \$2.6 million in 2021. Major capital projects initiated or completed during this period include Ostrich Creek Fish Passage, Oyster Bay Stormwater Retrofit and Kitsap Lake Water Quality Improvements. Refer to Chapter 9 for additional detail on specific capital projects.

10.5 2022 – 2027 Financial Assessment

The financial assessment for the six-year period 2022 through 2027 is based on a combination of O&M costs, debt service requirements and CIP implementation. Financial projections for the 2022 through 2027 period are based on the rate and GFC sufficiency study, which is currently in process (FCS 2022). Table 10-3 summarizes projected revenues and expenses for the 2022-2027 period.

Table 10-2. Summary of Stormwater Utility Revenue and Expenses, 2017 through 2021.

OPERATION AND MAINTENANCE FUND 481					
O&M Revenues	2017	2018	2019	2020	2021
Stormwater Rates and Fees	\$3,404,195	\$3,704,459	\$4,103,471	\$4,299,228	\$4,784,781
Intergovernmental Funds - Grants	\$7,734	\$6,089	\$19,457	\$6,133	\$65,026
Unrealized Gains (loss)	-\$2,740	\$382	\$1,907	\$1,215	-\$3,021
Bonds / Investment earning	\$9,544	\$6,867	\$7,039	\$5,139	\$2,890
Other (plan check, fines, misc.)	\$23,686	\$24,735	\$70,041	\$71,272	\$8,350
Capital Contributions	\$851,974	\$1,359,275	\$0	\$1,166,252	\$0
General Fund Transfer to SW	\$0	\$0	\$0	\$103,000	\$75,000
Total O&M Revenues	\$4,294,394	\$5,101,807	\$4,201,916	\$5,652,238	\$4,933,025
O&M Expenses					
Administration	\$130,775	\$119,301	\$148,851	\$180,222	\$165,153
Operations	\$843,679	\$725,723	\$846,920	\$1,124,720	\$1,237,362
Maintenance	\$777,920	\$631,751	\$827,634	\$761,023	\$759,617
Sweeping	\$245,401	\$175,022	\$216,594	\$214,302	\$231,609
Customer Service	\$154,130	\$106,039	\$150,954	\$152,165	\$155,603
Contracted services	\$38,537	\$25,174	\$42,593	\$216,123	\$38,040
Equipment Interfund	\$100,000	\$100,000	\$150,000	\$94,982	\$94,982
Garbage/Waste Disposal	\$51,165	\$37,585	\$53,359	\$33,728	\$30,821
Equipment Repair Interfund	\$79,697	\$88,490	\$103,155	\$118,689	\$100,638
Debt Service (revenue bond, loans)	\$74,664	\$86,664	\$89,064	\$116,044	\$140,275
Debt Service (Interest)	\$73,116	\$54,542	\$55,820	\$56,738	\$71,612
Taxes/PILOT	\$687,123	\$820,255	\$834,703	\$874,100	\$1,051,314
Transfer to SW Capital Projects	\$104,900	\$1,234,864	\$434,649	\$180,000	\$740,000
Total O&M Expenses	\$3,361,105	\$4,205,411	\$3,954,295	\$4,122,836	\$4,817,026
CAPITAL IMPROVEMENT FUND 484					
Capital Revenues	2017	2018	2019	2020	2021
Grants	\$63,781	\$42,041	\$558,046	\$178,731	\$48,034
Investment Earnings	\$29,238	\$45,113	\$90,674	\$68,724	\$30,369
Unrealized Gains (loss)	-\$2,120	\$6,862	\$25,843	\$13,875	-\$30,564
General Facility Charges	\$142,409	\$733,928	\$871,035	\$998,383	\$669,245
Loan Proceeds	\$0	\$0	\$374,308	\$328,528	\$580,050
Transfer from Lebo Blvd (317)	\$0	\$0	\$237,714	\$0	\$0
General Fund Transfer from Fund 481	\$104,900	\$1,234,864	\$434,649	\$180,000	\$740,000
Total Capital Revenues	\$338,207	\$2,062,808	\$2,592,270	\$1,768,241	\$2,037,133
Capital Expenses					
Staff	\$44,395	\$8,025	\$47,567	\$16,501	\$16,976
Contracted Services	\$2,198,884	\$247,170	\$1,515,679	\$1,051,190	\$2,540,170
Total Capital Expenses	\$2,243,279	\$255,195	\$1,563,246	\$1,067,692	\$2,557,146
NET REVENUES - EXPENSES	\$(971,784)	\$2,704,010	\$1,276,645	\$2,229,951	\$(404,014)

As described in Chapter 6, three new FTE staff are anticipated to be added to the Utility during the 2023-2027 period. These new staff are necessary to implement requirements of the City's SW Permit as well as provide support related to growth of the City's stormwater system. Permit requirements are described in detail in Chapter 5, and are generally summarized as follows:

- Inspection and maintenance of over 96 miles of stormwater piping;
- O&M for new stormwater facilities associated with City growth;
- Inspection and enforcement of private facility maintenance;
- Implementation of required Source Control program.

Table 10.3 reflects costs for two additional new staff that will be added in 2023. The need for, timing, costs and budgeting of the third O&M staff person will be determined as part of the Utility's annual planning and budgeting processes.

10.6 Evaluation of Potential Revenue Requirements

Estimated utility expenses and costs for the 2022-2027 period are shown in Table 10.4 on the following page. Revenues shown in Table 10.4 reflect a rate increase for 2023 approved by the City Council in November 2022. A stormwater rate and GFC sufficiency review was initiated in 2022 and will be completed in 2023. This review indicates that additional rate increases may need to be phased in over the 2023 – 2027 period with annual increases varying from 13.0 percent in 2023, to 8.75 percent in each of years 2024 through 2027.

On-going rate increases resulting from the rate and revenue review will ensure the Utility's projected financial needs are met including operations and maintenance, new staff, debt service, capital projects and financial reserves. As shown in Table 10.4, revenues are expected to be sufficient to meet the utility's projected needs including operations and maintenance, new staff, debt service, capital projects and reserve funding needed to meet minimum balance targets.

10.6.1 O&M Expenses and Revenues

O&M expenses including new staff and inflation, are expected to increase from \$5.1 million in 2022, to approximately \$7.4 million in 2027, with an average annual increase of approximately 8 percent. The majority of O&M cost increases (approximately 50 percent) are due to debt service requirements. The remaining 50 percent of cost increase is associated with new staff, utility taxes and support services (administration and customer service).

10.6.2 Capital Expenses and Revenues

For the 2022-2027 planning period, total estimated capital project costs are approximately \$28.8 million as shown in Chapter 9. Capital funding expectations, including expected revenue from existing and future grants, are shown in Table 9-1. Table 10-3 summarizes capital program funding and costs for the 2022 – 2027 period.

Table 10-3. Estimated Revenue and Expense Summary, 2022-2027.

REVENUES	Year					
	2022	2023	2024	2025	2026	2027
Stormwater Rates	\$4,853,873	\$5,559,272	\$6,106,166	\$6,680,298	\$7,308,413	\$7,995,586
Non-Rate Revenue (Grants and Loans)	\$247,500	\$242,500	\$69,308	\$71,510	\$74,998	\$78,448
In-Lieu of Taxes	\$0	-\$139,105	-\$247,354	-\$365,743	-\$495,835	-\$638,733
Total O&M Revenues	\$5,101,373	\$5,662,667	\$5,928,120	\$6,386,065	\$6,887,576	\$7,435,302
Annual Rate Adjustment	0%	13.00%	8.75%	8.75%	8.75%	8.75%
OPERATING FUND 481						
Administration	\$209,743	\$257,927	\$268,694	\$280,074	\$292,126	\$304,906
Taxes	\$1,064,213	\$1,228,995	\$1,103,125	\$1,106,983	\$1,114,184	\$1,121,448
Stormwater Operations	\$1,441,459	\$1,664,280	\$1,732,030	\$1,789,859	\$1,850,008	\$1,912,608
Stormwater Maintenance	\$1,168,379	\$1,372,939	\$1,435,460	\$1,502,425	\$1,573,788	\$1,649,922
Customer Service	\$242,970	\$267,737	\$280,034	\$292,794	\$306,374	\$320,840
Street Cleaning	\$235,827	\$213,481	\$223,064	\$232,151	\$241,750	\$251,900
Subtotal Operations	\$4,362,591	\$5,005,359	\$5,042,407	\$5,204,285	\$5,378,230	\$5,561,623
Existing Debt Service	\$339,041	\$337,613	\$336,402	\$325,567	\$324,845	\$323,980
New Debt Service	\$430,119	\$486,230	\$486,230	\$839,039	\$839,039	\$1,544,656
Total Expenses	\$5,131,751	\$5,829,202	\$5,865,040	\$6,368,891	\$6,542,113	\$7,430,260
Operating Reserve Beginning Balance	\$1,273,830	\$1,243,452	\$1,076,918	\$1,139,922	\$1,157,016	\$1,502,373
Operating Fund Ending Balance	\$1,243,452	\$1,076,918	\$1,139,997	\$1,157,096	\$1,502,479	\$1,507,415
CAPITAL IMPROVEMENT FUND 484						
Beginning Balance	\$4,714,809	\$4,249,969	\$3,013,216	\$1,678,460	\$2,814,596	\$963,447
Additional Proceeds from Loans (Costs)	\$2,382,946	\$1,085,000	\$4,007,600	\$1,389,612	\$530,732	\$548,961
General Facilities Charge Revenue	\$500,000	\$595,204	\$471,458	\$297,131	\$310,871	\$325,245
Revenue Bond Proceeds	\$0	\$0	\$0	\$4,000,000	\$0	\$8,000,000
Other Loan Proceeds	\$7,196,691	\$938,844	-	-	-	-
Interest Earnings	\$60,000	\$50,000	\$12,053	\$6,714	\$11,258	\$3,854
Total Funding Sources	\$14,854,446	\$6,919,017	\$7,504,326	\$7,371,918	\$3,667,457	\$9,841,507
Less Capital Expenditures	-\$10,604,477	-\$3,905,801	-\$5,825,866	-\$4,557,322	-\$2,704,011	-\$4,050,790
Capital Fund Ending Balance	\$4,249,969	\$3,013,216	\$1,678,460	\$2,814,596	\$963,447	\$5,790,717
COMBINED BEGINNING FUND BALANCE	\$5,988,638	\$5,493,421	\$4,090,133	\$2,818,382	\$3,971,612	\$2,465,819
COMBINED ENDING FUND BALANCE	\$5,493,421	\$4,090,133	\$2,818,382	\$3,971,612	\$2,465,819	\$7,298,002

10.7 Revenue and Rate Assessment Summary

Based on existing fund balances, the proposed CIP and the proposed O&M staffing plan, the City's currently approved rates and the expected future rate adjustments identified in the preliminary rate and GFC sufficiency study will be sufficient to fund the City's stormwater program through 2027.

Existing Capital Fund balances and future rate and GFC revenue appear sufficient to fund expected capital costs. The CIP financial assessment reflects that existing and future grants and loans are expected to fund approximately 30 percent of the City's capital budget over the 2022-2027 period. This funding expectation is subject to change as grant funding sources and priorities shift over time. Although grant funding can help reduce the need for rate revenue to fund capital projects, the need for a robust stormwater CIP is not expected to decline and is likely to increase. This reflects that major capital project drivers such as the SW Permit, increased tribal commercial shellfish harvest, delays in meeting ESA listed salmon recovery targets and age of the City system, will continue to increase in both public importance and regulatory emphasis.

The Utility fund balance at the end of 2027 is estimated at approximately \$7.3M, which indicates future rate increases above those identified in the rate and GFC sufficiency review are not likely to be needed to fully implement this plan, including proposed staff increases and the CIP. The need for future rate and GFC adjustments will be reviewed annually to determine whether costs, revenues and new system or compliance requirements warrant consideration of rate adjustments.

11 RECOMMENDATIONS AND IMPLEMENTATION PLAN

This chapter presents recommendations for addressing identified deficiencies and potential gaps in the City’s stormwater program. Recommendations include increases in Utility staffing, and management actions that address changes in regulatory requirements and costs of built stormwater infrastructure. Supporting details and background information are included in previous chapters and appendices. Table 11-1 summarizes primary recommended implementation actions, priorities, and schedule.

Table 11-1. Summary of Stormwater Plan Implementation Major Action Items.

DESCRIPTION	REQUIRED BY SW Permit?	SCHEDULE OF IMPLEMENTATION BY YEAR
Source control site inventory	Yes	2022
Update BMC to address Source Control and Private System maintenance requirements	Yes	2022-23
Develop and implement facility inspection and O&M record keeping system	Yes	2022
Update and implement SWPPPs for applicable City facilities	Yes	2022
Prepare Stormwater Management Action Plan	Yes	2022-23
Add 1.0 FTE Senior Service Specialist staff position to implement SW Permit Source Control requirement	Yes	2023
Add 1.0 FTE Service Specialist to meet increased O&M requirement	Yes	2023
Add 1.0 FTE Service Specialist to meet increased O&M requirement	Yes	2024-27
Implement source control and private facility inspection and enforcement program	Yes	2023
Evaluate requirements of draft 2025-2029 SW Permit	Yes	2023-24
Update CIP	No	Annually

11.1 Adaptive Management

Evolving regulatory standards, increased public interest and support for stormwater management, uncertain funding sources, and potential impacts from climate change result in a potentially uncertain and rapidly changing program management context. The challenge confronting stormwater managers is to make informed decisions in this complex environment. Adaptive management strategies that are

responsive to these changes and uncertainties can be a helpful tool to support management and decision making.

Adaptive management (AM) is a systematic approach for improving resource management by learning from management outcomes. The objective of AM is to promote understanding of how systems work and respond to management actions, and thereby improve management decision making. Key questions and uncertainties to be addressed using an AM context may include:

- What will the next iteration of the SW Permit require and what will be the costs for implementation and compliance;
- How and where can water quality and habitat be improved and sustained in an environment of continued population growth and development;
- How is climate change influencing precipitation patterns and intensity, and how can flooding and erosion be managed in the long term given climate change uncertainties;
- What is the range of costs necessary to meet the future SW Permit, climate change and resource protection needs, and how do those costs relate to current and long term utility financial plans.

Adaptive management is considered particularly well suited for surface and stormwater management where outcomes are responsive to management decisions (such as a treatment facility or habitat restoration) but there is uncertainty about outcomes of alternative decisions (type and size of treatment, effect on receiving water, species recovery, etc.).

11.2 Stormwater Utility Financial Assessment Updates

Adequate utility funding is crucial to the successful implementation of this plan and compliance with the SW Permit. A primary goal for the City is to set the rates at a level sufficient to maintain compliance with the SW Permit and to fund the capital program.

Upcoming SW Permit requirements have potential to significantly affect Utility finances. These include the unknown capital costs associated with conveyance system maintenance, and repair; as well as implementation of water quality improvements and other measures that may be required under the next iteration of the SW Permit, which is anticipated in 2024. The Utility may therefore consider potential financial assessment updates as part of the annual program and capital plan review process.

12 REFERENCES

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- Ecology 2023a. Municipal Stormwater Permit Reissuance Draft Permit Topics. Accessed February 13, 2023. Available at <https://ecology.wa.gov/Regulations-Permits/Permits-certifications/Stormwater-general-permits/Municipal-stormwater-general-permits/Municipal-stormwater-permit-reissuance>
- Ecology 2023b. Water Quality Assessment 305(b) Report – Current. Available at <https://geo.wa.gov/datasets/waecy::waecy-water-quality-assessment-305b-report-current/explore?layer=1&location=47.575245%2C-122.634094%2C13.50>
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- Ecology 2016. Lake Whatcom Watershed Total Phosphorus and Bacteria Total Maximum Daily Loads Volume 2. Water Quality Improvement Report and Implementation Strategy. Water Quality Program Bellingham Field Office, Washington State Department of Ecology. February 2016.
- FCS Group 2022. Bremerton Utility Rate Study (in development). Prepared for City of Bremerton Public Works and Utilities. December 2022.
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- KPHD 2017. Water Pollution Identification & Correction Program. 2017 Annual Water Quality Report. Kitsap Public Health District 2017.
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- KPHD 2005. Kitsap Lake and Chico Bay Pollution Identification and Correction Project Final Report. Kitsap County Health District, Environmental Health Division Water Quality Program. December 31, 2005.
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Tetra Tech 2010. Final Report on Long Lake Water Quality 2006-2010. Prepared for Kitsap County and CILL. December 2010.

WDFW 2023. Salmonscape Mapping Tool. Available at:

<https://apps.wdfw.wa.gov/salmonscape/map.html>

Washington Stormwater Center 2023. Tire Chemicals and Coho Salmon. Available at:

<https://www.wastormwatercenter.org/research/tiresandsalmon/>

APPENDIX A: SEPA CHECKLIST

**City of Bremerton
Department of Community Development**

DETERMINATION OF NONSIGNIFICANCE

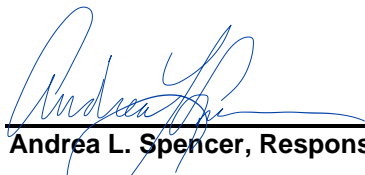
PROPOSAL: Stormwater Comprehensive Plan Update
FILE NUMBER: BP23 00117
APPLICATION DATE: April 26, 2023
NOTICE OF COMPLETE: May 25, 2023
LOCATION: Citywide
PROPONENT: City of Bremerton Public Works and Utilities
LEAD AGENCY: City of Bremerton Department of Community Development

The lead agency for this proposal has determined that it does not have a probable significant adverse impact on the environment. An environmental impact statement (EIS) is not required under RCW 43.21C.030(2)(c). The decision was made after review of a completed environmental checklist and other information on file with the lead agency. This information is available to the public on request.

The DNS is issued pursuant to WAC 197-11-340(2)(a)(v); the lead agency will not act on this proposal for 14 days from the date of issue.

RESPONSIBLE OFFICIAL: **Andrea L. Spencer, Director**
Department of Community Development
City of Bremerton
345 6th Street, Suite 600
Bremerton, WA 98337

STAFF CONTACT: **Kelli Lambert, Planner (360) 473-5245**
DATE OF ISSUE: **June 2, 2023**
COMMENT DEADLINE: **June 16, 2023**



Andrea L. Spencer, Responsible Official

NOTE: Pursuant to RCW 43.21C.075 and City of Bremerton environmental regulations (BMC Chapter 20.04.210), decisions of the Responsible Official may be appealed. Appeals must be filed with the appropriate fees at the Department of Community Development located at the Bremerton Permit Center, 345 6th Street, Suite 100, Bremerton, WA. 98337. Appeals must be filed by the date indicated above as "Administrative Appeal Deadline." If you appeal, you should be prepared to make specific factual objections.

NOTE: The issuance of this DNS does not constitute project approval. The applicant must comply with all other applicable requirements of the City of Bremerton and the State of Washington.

SEPA ENVIRONMENTAL CHECKLIST

A. Background

1. Name of proposed project, if applicable:

City of Bremerton Stormwater Comprehensive Plan

2. Name of applicant:

City of Bremerton Public Works & Utilities

3. Address and phone number of applicant and contact person:

**Chance Berthiaume, Stormwater Permit Coordinator
City of Bremerton Public Works & Utilities
Engineering Division
345 6th Street, Suite 100
Bremerton, WA 98337
Phone: (360) 473-5929
Email: Chance.Berthiaume@ci.bremerton.wa.us**

4. Date checklist prepared:

April 7, 2023

5. Agency requesting checklist:

City of Bremerton

6. Proposed timing or schedule (including phasing, if applicable):

The Stormwater Comprehensive Plan (SWCP) is expected to be adopted by the City Council in spring of 2023.

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.

This is a non-project action proposal. The City is proposing updates to the City's stormwater management program and associated capital improvement plan (CIP). Project specific environmental review will occur at a later date as specific projects are proposed.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

This is a non-project action. The projects identified in the stormwater CIP will require environmental review prior to implementation as required under SEPA rules and Bremerton Municipal Code (BMC).

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.

None known.

10. List any government approvals or permits that will be needed for your proposal, if known.

The Bremerton City Council will adopt a resolution approving the SWCP.

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)

The proposal is a periodic update to the City's stormwater comprehensive plan. Plan updates typically occur approximately every 6-years. This update to the City's stormwater plan reflects regulatory requirements, population growth, operation and maintenance (O&M) needs, and proposed CIP projects.

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.

The SWCP is applicable city-wide.

B. Environmental Elements

1. Earth

a. General description of the site:

(circle one): Flat, rolling, hilly, steep slopes, mountainous, other varies

Bremerton's topography varies throughout the city, from flat to areas of steep slopes.

b. What is the steepest slope on the site (approximate percent slope)?

There are areas within the City with slopes exceeding 50 percent, and potential geohazard areas are mapped on the City's critical areas maps. This proposal is a non-

project action. Potential site-specific conditions and impacts will be identified and evaluated as part of future project specific applications.

- c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any agricultural land of long-term commercial significance and whether the proposal results in removing any of these soils.

Not applicable. This proposal is a non-project action. Potential site-specific conditions and impacts will be identified and evaluated as part of future project specific applications.

- d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

Not applicable. This proposal is a non-project action. Potential site-specific conditions and impacts will be identified and evaluated as part of future project specific applications.

- e. Describe the purpose, type, total area, and approximate quantities and total affected area of any filling, excavation, and grading proposed. Indicate source of fill.

Not applicable. This proposal is a non-project action and no filing, excavation, or grading is proposed. Potential site-specific activities will be identified and evaluated as part of future project specific applications.

- f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

Not applicable. This proposal is a non-project action, and no filing, excavation, or grading is proposed. Potential site-specific activities will be identified and evaluated as part of future project specific applications. Erosion control would be addressed through existing City ordinances, including the clearing and grading and critical areas regulations.

- g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

Not applicable. This proposal is a non-project action. Potential site-specific conditions will be identified and evaluated as part of future project specific applications.

- h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:

None. This proposal is a non-project action. Potential site-specific impacts and mitigation measures will be identified and evaluated as part of future project specific applications. When future projects are submitted for review and approval, potential erosion-related impacts created during clearing and construction activities will be mitigated in accordance with the City's adopted stormwater management regulations.

2. Air

- a. What types of emissions to the air would result from the proposal during construction, operation, and maintenance when the project is completed? If any, generally describe and give approximate quantities if known.

Not applicable. This proposal is a non-project action. Potential site-specific conditions and impacts will be identified and evaluated as part of future project specific applications.

- b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

Not applicable. This proposal is a non-project action.

- c. Proposed measures to reduce or control emissions or other impacts to air, if any:

None. This proposal is a non-project action. Potential site-specific impacts and mitigation measures will be identified and evaluated as part of future project specific applications.

3. Water

- a. Surface Water:

- 1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.

Primary surface waters in the City of Bremerton include Sinclair and Dyes Inlet, Kitsap Lake, Anderson Creek, Ostrich Creek, Enetai Creek, and Gorst Creek. Site specific surface water features will be identified and evaluated as part of future project applications.

- 2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.

Not applicable. This proposal is a non-project action. Potential site-specific surface water conditions and impacts will be identified and evaluated as part of future project specific applications.

- 3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.

Not applicable. This proposal is a non-project action. Potential site-specific conditions and impacts will be identified and evaluated as part of future project specific applications.

- 4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.

Not applicable. This proposal is a non-project action. Potential site-specific conditions and impacts will be identified and evaluated as part of future specific applications.

- 5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.

Not applicable. This proposal is a non-project action, and no specific development is proposed at this time.

- 6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.

Not applicable. This proposal is a non-project action, and no specific development is proposed at this time.

b. Ground Water:

- 1) Will groundwater be withdrawn from a well for drinking water or other purposes? If so, give a general description of the well, proposed uses and approximate quantities withdrawn from the well. Will water be discharged to groundwater? Give general description, purpose, and approximate quantities if known.

Not applicable. This proposal is a non-project action, and no specific development is proposed at this time.

- 2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals. . . ; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.

Not applicable. This proposal is a non-project action, and no specific development is proposed at this time.

c. Water runoff (including stormwater):

- 1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.

Runoff would be generated from hard surfaces and developed areas within the City. Water runoff is typically collected and conveyed in a combination of ditches and pipes, which discharge to various streams, wetlands, and marine waters within and surrounding the City.

- 2) Could waste materials enter ground or surface waters? If so, generally describe.

Not applicable. This proposal is a non-project action, and no specific development is proposed at this time. Potential site-specific conditions and impacts will be identified and evaluated as part of future specific applications.

- 3) Does the proposal alter or otherwise affect drainage patterns in the vicinity of the site? If so, describe.

Not applicable. This proposal is a non-project action, and no specific development is proposed at this time. Potential site-specific conditions and impacts will be identified and evaluated as part of future specific applications.

- d. Proposed measures to reduce or control surface, ground, and runoff water, and drainage pattern impacts, if any:

Not applicable. This proposal is a non-project action, and no specific development is proposed at this time. Potential site-specific conditions and impacts will be identified and evaluated as part of future project specific applications. At the time of development review, projects will be reviewed for compliance with the City's adopted storm water management regulations and critical areas ordinance.

4. Plants

- a. Check the types of vegetation found on the site:

- deciduous tree: alder, maple, aspen, other
- evergreen tree: fir, cedar, pine, other
- shrubs
- grass
- pasture
- crop or grain
- Orchards, vineyards or other permanent crops.
- wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other
- water plants: water lily, eelgrass, milfoil, other
- other types of vegetation

The checked vegetation is found throughout Bremerton. No development is proposed at this time. Existing vegetation on specific sites will be determined at the time a specific project is proposed.

- b. What kind and amount of vegetation will be removed or altered?

Not applicable. This proposal is a non-project action, and no specific development is proposed. When a specific application is submitted, the kind and amount of vegetation to be removed or altered will be reviewed in accordance with City requirements.

- c. List threatened and endangered species known to be on or near the site.

Not Applicable, this is a non-project action.

- d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

Not Applicable, this is a non-project action.

- e. List all noxious weeds and invasive species known to be on or near the site.

Not Applicable, this is a non-project action.

5. Animals

- a. List any birds and other animals which have been observed on or near the site or are known to be on or near the site.

Examples include:

birds: hawk, heron, eagle, songbirds, other:
mammals: deer, bear, elk, beaver, other:
fish: bass, salmon, trout, herring, shellfish, other _____

There are a variety of birds, fish, and mammals within the City.

- b. List any threatened and endangered species known to be on or near the site.

Not Applicable, this is a non-project action. There are several T&E species that occur and/or have critical habitat within the City including Puget Sound Chinook salmon, Puget Sound winter steelhead, Bull trout and Orca whales.

- c. Is the site part of a migration route? If so, explain.

Sinclair and Dyes Inlets and associated streams are known to contain anadromous salmonids. The city is located within the Pacific Flyway - a flight corridor for migrating waterfowl and other birds - that extends from Alaska to Mexico and South America.

- d. Proposed measures to preserve or enhance wildlife, if any:

Not Applicable, this is a non-project action. No development is proposed at this time. Impacts and mitigation determination will be made at the time specific projects are proposed. The City's Critical Areas Ordinance, state and federal regulations provide protection for wildlife.

- e. List any invasive animal species known to be on or near the site.

Not Applicable, this is a non-project action.

6. Energy and Natural Resources

- a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.

Not Applicable, this is a non-project action. Electric energy is available city-wide and natural gas is available at specific locations.

- b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

Not Applicable, this is a non-project action.

- c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:

This is not applicable to this non-project action. No development is proposed at this time. Measures to reduce and control energy impacts will be determined at the time a specific project is proposed. Future development will meet the energy code in effect at the time of application as identified in the International Building Code.

7. Environmental Health

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe.

- 1) Describe any known or possible contamination at the site from present or past uses.

Not Applicable, this is a non-project action.

- 2) Describe existing hazardous chemicals/conditions that might affect project development and design. This includes underground hazardous liquid and gas transmission pipelines located within the project area and in the vicinity.

Not Applicable, this is a non-project action.

- 3) Describe any toxic or hazardous chemicals that might be stored, used, or produced during the project's development or construction, or at any time during the operating life of the project.

Not Applicable, this is a non-project action.

- 4) Describe special emergency services that might be required.

Not Applicable, this is a non-project action.

- 5) Proposed measures to reduce or control environmental health hazards, if any:

Not Applicable, this is a non-project action, and no measures are necessary to reduce or control environmental health hazards.

b. Noise

- 1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?

The city has a typical level of noise expected in an urban environment.

- 2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.

Not Applicable. This is a non-project action that would not result in any noise.

- 3) Proposed measures to reduce or control noise impacts, if any:

This is not applicable to this non-project action. No development is proposed at this time. Measures to reduce and control noise impacts will be determined at the time a specific project is proposed. Noise is regulated in the Bremerton Municipal Code.

8. Land and Shoreline Use

- a. What is the current use of the site and adjacent properties? Will the proposal affect current land uses on nearby or adjacent properties? If so, describe.

The city has a variety of single-family residential development along with commercial areas, and other uses including multifamily residential, light industrial, institutional and parks.

- b. Has the project site been used as working farmlands or working forest lands? If so, describe. How much agricultural or forest land of long-term commercial significance will be converted to other uses as a result of the proposal, if any? If resource lands have not been designated, how many acres in farmland or forest land tax status will be converted to nonfarm or nonforest use?

Not Applicable, this is a non-project action.

- 1) Will the proposal affect or be affected by surrounding working farm or forest land normal business operations, such as oversize equipment access, the application of pesticides, tilling, and harvesting? If so, how:

Not Applicable, this is a non-project action.

- c. Describe any structures on the site.

Not Applicable, this is a non-project action.

- d. Will any structures be demolished? If so, what?

Not Applicable, this is a non-project action.

- e. What is the current zoning classification of the site?

The SWCP applies to all zones throughout the City.

- f. What is the current comprehensive plan designation of the site?

Not Applicable, this is a non-project action.

- g. If applicable, what is the current shoreline master program designation of the site?

Not Applicable, this is a non-project action.

- h. Has any part of the site been classified as a critical area by the city or county? If so, specify.

Not Applicable, this is a non-project action. Critical areas are located throughout the City. Some of the projects identified in the CIP are located near critical areas. However, no development is proposed at this time, so no site-specific impacts are applicable. The development of specific sites will be subject to additional environmental review at the time of application. Identification of environmentally sensitive areas will be made based on the City's Critical Area Ordinances, maps and site-specific environmental information prepared during the development review process.

- i. Approximately how many people would reside or work in the completed project?

Not Applicable, this is a non-project action.

- j. Approximately how many people would the completed project displace?

Not Applicable, this is a non-project action that would not displace people.

- k. Proposed measures to avoid or reduce displacement impacts, if any:

Not Applicable, this is a non-project action. and no measures to avoid or reduce displacement impacts are necessary.

- l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:

Not Applicable. This is a non-project action, and no measures are necessary to ensure the proposal is compatible with existing and projected land uses.

- m. Proposed measures to reduce or control impacts to agricultural and forest lands of long-term commercial significance, if any:

Not Applicable. This is a non-project action, and no measures are necessary to reduce or control impacts to agricultural and forest lands of long-term commercial significance.

9. Housing

- a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.

Not Applicable, this is a non-project action.

- b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.

Not Applicable, this is a non-project action.

- c. Proposed measures to reduce or control housing impacts, if any:

Not Applicable, this is a non-project action.

10. Aesthetics

- a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?

Not Applicable, this is a non-project action.

- b. What views in the immediate vicinity would be altered or obstructed?

Not Applicable, this is a non-project action.

- b. Proposed measures to reduce or control aesthetic impacts, if any:

Not Applicable, this is a non-project action. Building height and design review requirements are set forth in the City's zoning ordinance.

11. Light and Glare

- a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

Not Applicable, this is a non-project action.

- b. Could light or glare from the finished project be a safety hazard or interfere with views?

Not Applicable, this is a non-project action.

- c. What existing off-site sources of light or glare may affect your proposal?

Not Applicable, this is a non-project action.

- d. Proposed measures to reduce or control light and glare impacts, if any:

Not Applicable, this is a non-project action. The City's zoning ordinance contains lighting requirements.

12. Recreation

- a. What designated and informal recreational opportunities are in the immediate vicinity?

Bremerton has a variety of public parks and recreation opportunities throughout the City.

- b. Would the proposed project displace any existing recreational uses? If so, describe.

Not Applicable, this is a non-project action.

- c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:

This is not applicable to this non-project action. Measures to reduce and control recreation impacts will be determined at the time a specific project is proposed.

13. Historic and cultural preservation

- a. Are there any buildings, structures, or sites, located on or near the site that are over 45 years old listed in or eligible for listing in national, state, or local preservation registers ? If so, specifically describe.

Unknown at this time. This is a non-project action. Determination will be made at the time a specific project is proposed.

- b. Are there any landmarks, features, or other evidence of Indian or historic use or occupation? This may include human burials or old cemeteries. Are there any material evidence, artifacts, or areas of cultural importance on or near the site? Please list any professional studies conducted at the site to identify such resources.

Unknown at this time. This is a non-project action. Determination will be made at the time of a specific project proposal. Three Native American tribes, the Suquamish Tribe, the Port Gamble S'Klallam Tribe, and the Skokomish Tribe have historically inhabited areas that are within the City limits. As such, there may be evidence, artifacts, or areas of cultural importance within the City's jurisdiction.

- c. Describe the methods used to assess the potential impacts to cultural and historic resources on or near the project site. Examples include consultation with tribes and the department of archeology and historic preservation, archaeological surveys, historic maps, GIS data, etc.

Unknown at this time. This is a non-project action. Determination will be made at the time a specific project is proposed.

- d. Proposed measures to avoid, minimize, or compensate for loss, changes to, and disturbance to resources. Please include plans for the above and any permits that may be required.

This is a non-project action. Development that is authorized consistent with the City's development regulations will be required to comply with City, State, and Federal requirements regarding cultural preservation. If at the time of site-specific development, evidence of historic or cultural resources are found, appropriate inadvertent discovery protocols and notifications will be initiated.

14. Transportation

- a. Identify public streets and highways serving the site or affected geographic area and describe proposed access to the existing street system. Show on site plans, if any.

Major highway and streets in Bremerton include State Highways 3 and 303, Kitsap Way, 11th Street, 6th Street, Lebo Boulevard, Sheridan Road, Sylvan Way and Riddell Road.

- b. Is the site or affected geographic area currently served by public transit? If so, generally describe. If not, what is the approximate distance to the nearest transit stop?

Kitsap Transit provides public transit throughout the city.

- c. How many additional parking spaces would the completed project or non-project proposal have? How many would the project or proposal eliminate?

Not Applicable, this is a non-project action.

- d. Will the proposal require any new or improvements to existing roads, streets, pedestrian, bicycle or state transportation facilities, not including driveways? If so, generally describe (indicate whether public or private).

Not Applicable. This is a non-project action. Determination will be made at the time of specific project proposals.

- e. Will the project or proposal use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

Water transportation includes the Bremerton-Seattle state ferry, and the Port Orchard-Bremerton and Annapolis-Bremerton foot ferries.

- f. How many vehicular trips per day would be generated by the completed project or proposal? If known, indicate when peak volumes would occur and what percentage of the volume would be trucks (such as commercial and nonpassenger vehicles). What data or transportation models were used to make these estimates?

Not Applicable. This is a non-project action and will not generate any additional vehicular trips per day.

- g. Will the proposal interfere with, affect or be affected by the movement of agricultural and forest products on roads or streets in the area? If so, generally describe.

Not Applicable. This is a non-project action. Determination will be made at the time of specific development proposals.

- h. Proposed measures to reduce or control transportation impacts, if any:

Not Applicable. This is a non-project action. Determination will be made at the time of specific development proposals.

5. Public Services

- a. Would the project result in an increased need for public services (for example: fire protection, police protection, public transit, health care, schools, other)? If so, generally describe.

Not Applicable. This is a non-project action that would not result in the need for increased public services, such as fire protection, police protection, public transit, health care, and schools.

- b. Proposed measures to reduce or control direct impacts on public services, if any.

Not Applicable. This is a non-project action that would not create need to reduce or control impacts on public services.

16. Utilities

- a. Circle utilities currently available at the site: electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other _____


Not Applicable, this is a non-project action. Utilities are available throughout the City.

- b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.

Not Applicable, this is a non-project action.

C. Signature

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: _____  _____
.....

Name of signee: Chance Berthiaume.....

Position and Agency/Organization: Stormwater Permit Coordinator.....

Date Submitted: 4/25/2023.....

D. Supplemental sheet for non-project actions

1. How would the proposal be likely to increase discharge to water; emissions to air; production, storage, or release of toxic or hazardous substances; or production of noise?

The SWCP is a non-project action that would not directly result in any of these impacts. All capital projects and private development that are listed or potentially affected by policies, regulations or actions identified in the SWCP will be subject to all applicable local, state and federal regulatory requirements and will be reviewed on a case-by-case basis as part of the City's development review process. This will include further review under SEPA.

Proposed measures to avoid or reduce such increases are:

Measures to avoid and/or reduce impacts will be identified as necessary during the development permit and environmental review process for specific projects. Compliance with federal, state and City regulations, and other appropriate mitigation measures, would reduce increases.

1. How would the proposal be likely to affect plants, animals, fish, or marine life?

The proposed SWCP is not anticipated to negatively affect plants, animals, fish or marine life. Specific projects listed in or resulting from the SWCP may require further review under SEPA.

Proposed measures to protect or conserve plants, animals, fish, or marine life are:

The City's Critical Areas Ordinance provides regulatory protective measures to protect and conserve vegetation and wildlife habitat. Additional measures may be identified during the development permit and environmental review process for specific projects.

2. How would the proposal be likely to deplete energy or natural resources?

The proposed SWCP is not anticipated to affect the depletion of energy or natural resources. Projects listed in or resulting from the SWCP will require further environmental review at the time of development application.

Proposed measures to protect or conserve energy and natural resources are:

Measures would be identified during the project specific development permit and environmental review. Compliance with city regulations and other appropriate mitigation measures would identify appropriate actions to avoid and/or reduce impacts.

4. How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection; such as

parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, floodplains, or prime farmlands?

The SWCP is not anticipated to affect areas that are environmentally sensitive or eligible for government protection. No specific development is proposed as part of the SWCP project. There will be no negative effects to environmentally sensitive areas designated or under study for protection, such as parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, floodplains, or prime farmlands. Projects listed in or resulting from the SWCP will require further environmental review at the time of development application.

Proposed measures to protect such resources or to avoid or reduce impacts are:

Measures would be identified during the project specific development permit and environmental review. Compliance with city regulations and other appropriate mitigation measures would identify appropriate actions to avoid and/or reduce impacts.

5. How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans?

The SWCP will not affect land and shoreline use. Specific projects listed in or resulting from the SWCP will require further land use review at the time of development application.

Proposed measures to avoid or reduce shoreline and land use impacts are:

All applicable specific capital project and private development applications will be subject to further review under SEPA, the city's zoning code and other sections of City code where appropriate and applicable.

6. How would the proposal be likely to increase demands on transportation or public services and utilities?

No specific development is proposed as part of the SWCP. Future specific development proposals may have increased demands, which would be identified during the specific project review.

Proposed measures to reduce or respond to such demand(s) are:

Measures to reduce impacts on transportation, public services and utilities would be identified during project specific review. Compliance with city regulations and other appropriate mitigation measures will provide the appropriate actions to avoid and/or reduce impacts.

7. Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment.

None known. The proposed SWCP does not conflict with any local, state, or federal laws or requirements for the protection of the environment. All future project specific proposals would be required to follow all applicable regulations regarding the protection of the environment.

APPENDIX B: LIST OF INDIVIDUAL INDUSTRIAL STORMWATER PERMITS IN CITY OF BREMERTON

Table B-1. Individual Industrial and Sand and Gravel NPDES Permits in the City of Bremerton (as of February 2023).

Facility Name	Water Quality Name	Permit Number	Permit Type	Permit Status	Address	Active Documents
ACE PAVING CO ACE QUARRY	BREMERTON QUARRY	WAG503256	Sand and Gravel GP	Active	9000 WERNER RD	10
Amazon.com Services LLC DSE8	Amazon.com Services LLC - DSE8	WAR309424	Industrial SW GP	Active	7555 Airport Way	13
Brem Air Disposal	WASTE MANAGEMENT BREM AIR DISPOSAL	WAR004629	Industrial SW GP	Active	9300 SW BARNEY WHITE RD	19
Bremerton PW Operations Center	Public Works Operations Center	CNE311180	Industrial SW GP	Active	100 Oyster Bay Ave N	2
BREMERTON NATIONAL AIRPORT	BREMERTON NATIONAL AIRPORT & OVIP	WAR000901	Industrial SW GP	Active	8850 SW STATE HWY 3	15
BREMERTON STP NGP	BREMERTON STP	WAG994550	Puget Sound Nutrient GP	Active	1600 OYSTER BAY AVE S	6
BREMERTON STP WWP	BREMERTON STP	WA0029289	Municipal NPDES IP	Active	1600 OYSTER BAY AVE S	175
BREMERTON WWTP ISGP	CITY OF BREMERTON WWTP	WAR310854	Industrial SW GP	Active	1600 Oyster Bay Ave S	10
Defiance Boats Factory	Defiance Boats Factory	WAR311218	Industrial SW GP	Active	5120 SW Nixon Loop	5
FRED HILL MATERIALS AIRPORT PLANT	PORT OF BREMERTON BATCH PLANT	WAG503247	Sand and Gravel GP	Active	8430 SW BARNEY WHITE RD	12
Kitsap Quarry	Kitsap Quarry	WAG503171	Sand and Gravel GP	Active	818 ARCHIE AVE W	19
KITSAP TRANSIT	KITSAP TRANSIT	WAR004098	Industrial SW GP	Active	200 CHARLESTON BLVD -	21
Miles Sand & Gravel Thoroughbred Plant	MILES SAND & GRAVEL BREMERTON PLANT	WAG507223	Sand and Gravel GP	Active	7000 WERNER RD	16
Pacific Ship Repair and Fabrication	Pacific Ship Repair and Fabrication	WAR311197	Industrial SW GP	Active	8390 SW Barney White Rd	7
PACIFIC WESTER TIMBERS INC BREMERTON	PACIFIC WESTERN TIMBERS INC BREMERTON	WAR311708	Industrial SW GP	Active	5555 Cruiser Loop SW -	8
Port Orchard S&G Brem Rock Pit	PORT ORCHARD S & G BREMERTON	WAG503265	Sand and Gravel GP	Active	7000 WERNER RD - STE C	15
Puget Sound Petroleum	Puget Sound Petroleum	WAR311271	Industrial SW GP	Active	1702 Pennsylvania Ave	15
SAFE Boats International Imperial Way	SAFE Boats International Imperial	WAR311761	Industrial SW GP	Active	5650 SW Imperial Way	9
SAFE BOATS INTERNATIONAL BREMERTON	Safe Boats International	WAR311760	Industrial SW GP	Active	8800 SW BARNEY WHITE RD	9
STRIPE RITE - BREMERTON	STRIPE RITE - BREMERTON	CNE311106	Industrial SW GP	Active	8320 SW Barney White Rd	4
Suquamish Gorst Creek Rearing Ponds	Suquamish Gorst Creek Rearing Ponds	WAG994615	Upland Fish Hatchery GP	Active	4398 W Belfair Valley Road -	16
SWIRE COCA-COLA OF BREMERTON	SWIRE COCA-COLA OF BREMERTON	WAR311838	Industrial SW GP	Active	5001 Auto Center Blvd -	14
Triton Marine Construction Corp	Triton Marine Construction Corp.	WAR311391	Industrial SW GP	Active	5405 Constance Dr SW -	6

APPENDIX C: INFILTRATION ASSESSMENT



Technical Memorandum

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Date:	June 9, 2017	From:	Jennifer H. Saltonstall, L.G., L.Hg.
To:	Herrera Environmental Consultants, Inc. 2200 Sixth Avenue, Suite 1100 Seattle, Washington 98121	Project Manager:	Jennifer H. Saltonstall, L.G., L.Hg.
		Principal in Charge:	Curtis J. Koger, L.G., L.E.G., L.Hg.
		Project Name:	City of Bremerton Infiltration Assessment
Attn:	Matt Fontaine, P.E.	Project No:	KH150388A
Subject:	Task 3A, Infiltration Assessment, City of Bremerton Stormwater Comprehensive Plan		

1.0 INTRODUCTION

Associated Earth Sciences, Inc. (AESI) is under subcontract to Herrera Environmental Consultants, Inc. (Herrera) to provide consultant support for City of Bremerton's stormwater comprehensive plan, including updating the plan for stormwater capital improvement projects (CIP), conducting a Low Impact Development (LID) retrofit evaluation, and providing stormwater program support.

This technical memorandum was completed under Herrera's **Task 3A - Infiltration Assessment** and documents geology, soil, and ground water characteristics, critical areas considerations, and infiltration opportunities in Bremerton, Washington (Figure 1). This technical memorandum specifically provides a summary of AESI's infiltration feasibility analysis and assessment of 'screening level' shallow and deep infiltration potential. This work was conducted to help the City understand infiltration best management practice (BMP) potential throughout the city limits and urban growth area.

The infiltration potential assessments provided in this technical memorandum are suitable for identification and evaluation of potential stormwater infiltration solutions. To determine the infiltration feasibility (or feasibility of a particular infiltration technique) at a specific location, site-specific hydrogeologic and geotechnical assessments would be required.

1.1 Objective and Scope

Infiltration facilities reduce peak stormwater runoff rates by allowing stormwater to soak into the ground, increasing ground water recharge, and maintaining baseflows to streams. This reduction in peak stormwater runoff can reduce streambank erosion and sediment discharge. Additional benefits can include improved water quality due to soil zone treatment.

The feasibility of infiltration techniques is primarily dependent on sediment permeability, depth to ground water or low-permeability sediments, the rate and quantity of runoff to be infiltrated, and proximity to geologic hazards. Other criteria which affect infiltration feasibility, including horizontal setbacks and vertical

separation criteria for siting infiltration BMPs, are described in the *2012 Stormwater Management Manual for Western Washington, as Amended in 2014* (Ecology Manual) adopted by the City of Bremerton as the reference document for the planning, design, and construction of stormwater facilities in Bremerton.

Infiltration facilities may be either shallow or deep or a combination of both techniques. Shallow and deep infiltration facilities for this document are generally described below, and discussed in more detail in Section 5.2.

- Shallow infiltration facilities may include permeable pavement or bioretention/raingardens (BMPs described in the 2014 Ecology Manual) or conventional infiltration ponds, vaults, or other infiltrating basins. Shallow infiltration facilities are best suited in settings where moderate- to high-permeability sediments are present near the ground surface in sufficient unsaturated thickness and lateral extent to allow the stormwater to spread-out, disperse, and avoid re-emergence. Moderate- to high-permeability sediments include Vashon recessional outwash and Vashon advance outwash as described in Section 3.2.3.
- Deep infiltration facilities may include infiltration trenches and drywells, both of which can also be referred to as Class V underground injection control (UIC) wells. Some types of deeper drywells are referred to as 'drilled drains' or 'pit drains.' Deep infiltration facilities are designed to penetrate low-permeability sediments and allow infiltration into the more permeable underlying sediments. Deep infiltration facilities could be considered in settings where surficial low-permeability geologic units (such as glacial till) are present at the surface and more permeable sediments (such as Vashon advance outwash, described in Section 3.2.3) are present below in sufficient unsaturated thickness. Deep infiltration facilities may be more costly to install and maintain than shallow infiltration facilities.

This technical memorandum discusses the feasibility of both types of infiltration systems in the City.

The purpose of our study was to conduct a City-wide assessment of stormwater infiltration characteristics. This task specifically excludes subsurface exploration. Work associated with this task evaluated four factors that influence infiltration potential:

- Infiltration potential as determined by geology, geomorphology, and soil type: This information was based on available geologic and hydrogeologic reports and maps, internal AESI files/information, and water well information on file with the Washington State Department of Ecology (Ecology).
- Topography/slope: Based on analysis of Light Detection and Ranging (LiDAR) and United States Geological Survey (USGS) topographic data.
- Risk to environment: Based on maps of environmentally sensitive areas, including steep slopes, surface water, and well head protection areas. The steep slope assessment was based on an analysis of topography, soils, geology, and geomorphology.
- Thickness of unsaturated permeable horizon and depth to ground water/seasonal high water table: This information was based on geology, well data, available hydrogeologic studies, and surface water elevations. The information is generally of poor quality and can be difficult to interpret but it should be useful for a screening level analysis.

1.2 Approach

AESI completed the following tasks to develop an understanding of the general hydrogeologic opportunities and constraints to evaluate both shallow and deep infiltration potential throughout the City:

- Review existing literature regarding the geologic/hydrogeologic conditions within the City. The literature review is listed in the references and included:
 - Regional geology and soils maps/reports available from the USGS, the Washington State Department of Natural Resources (DNR), and United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS);
 - Kitsap County LiDAR mapping;
 - City and County sensitive area maps, and Ecology shoreline hazard maps;
 - Water well reports on file with Ecology for wells located within the City;
 - Water supply system information on file with the Washington State Health Department (DOH) Office of Drinking Water (ODW) and Source Water Assessment Program (SWAP);
- Describe the hydrogeology of the City and conduct a qualitative evaluation of infiltration potential.
- Delineate areas potentially suitable for shallow and deep infiltration.
- Delineate areas not suitable for infiltration due to proximity to steep slopes, water wells, and other regional features that might be impacted by increased infiltration.
- AESI created Geographic information System (GIS) layers to represent each of these important site characteristics, specifically geology, geomorphology, soils, steep slopes, landslide hazards, and well head protection areas mapped by the State Health Source Water Assessment Program. AESI incorporated readily available GIS information available from Kitsap County on streams and wetlands. Unique combinations of these criteria will be used to assess infiltration feasibility.
- This technical memorandum summarizes the results of the site characteristics assessment, and includes a description of the hydrogeologic setting, infiltration feasibility approach, GIS maps for all the layers defined above, and a summary of the results.

2.0 REGIONAL SETTING

2.1 Project Location

The City of Bremerton, Washington is located on the shore of the Puget Sound in the central portion of Kitsap County, as shown on Figure 1, "Vicinity Map." As described within the *Kitsap County Initial Basin Assessment* (Kitsap Public Utility District [KPUD], 1997), the City is situated across four subareas of Kitsap Water Resource Inventory Area (WRIA) 15: Gorst, Union, Chico, and Manette. Major water bodies include Sinclair Inlet which borders the City to the south, Dyes Inlet which borders the City to the north, Port Washington Narrows connecting the two inlets, Kitsap Lake, and the Union River Reservoir. Major drainages include Chico Creek, Union River, and Gorst Creek. Several smaller streams and wetland areas are present in the City. The area receives about 40 inches of rain annually although higher elevation areas receive closer to 50 inches of rain.

2.2 Physiographic and Topographic Setting

The City of Bremerton is located on the Kitsap Peninsula, which lies in a broad lowland between the Olympic Mountains and the Cascade Range, which are situated over 30 to 40 miles to the west and east, respectively. The physiographic and topographic characteristics of the area are similar to the surrounding Puget Sound area commonly known as the Puget Sound Lowland. The Kitsap Peninsula is long, narrow, and irregular-shaped, indented by many bays or inlets. The peninsula is bordered by waters of the Puget Sound to the north and east, and by Hood Canal on the west and part of the south. The topography, predominately formed by glaciation, consists of broad upland with rolling ridges separated by long valleys. Glacial and subglacial meltwater channels and modern (post-glacial) streams have cut deep troughs and valleys into the uplands, many of which have been inundated by marine and fresh water. Much of the upland areas

terminate along the coast in steep bluffs created by wave action. The shallow ridges and low valleys on the upland are oriented northeast to southwest, in the direction of the ice movement. Wetlands, ponds, streams and lakes occupy many valleys and are therefore also oriented in this direction. Elevation of the majority of the peninsula ranges from 100 to 400 feet. Green and Gold mountains are a prominent group of Eocene volcanic rocks in the southwest portion of the City which rise to an elevation of about 1,700 feet above mean sea level (MSL).

The topography in the City can be divided into three general categories: (1) remnant rolling glacial drift upland areas, (2) flat valley floors, and (3) transitional slope areas that include steeply incised drainages, shoreline bluff terrain, and the Green and Gold mountain area.

The regional topography is illustrated on Figure 1, "Vicinity Map." Recently, human activities have caused large-scale modifications to the landscape through waterfront fills particularly at the Naval Shipyard where fills range up to 50 feet in thickness, extensive residential and commercial development, grading the ground into level building pads, and infrastructure including roadways and drainage facilities.

3.0 GEOLOGIC AND HYDROGEOLOGIC CONDITIONS

Our interpretation of surface and subsurface geologic/hydrogeologic conditions in the City is based on a review of the available geologic and hydrogeologic information, a brief reconnaissance, and our experience on similar projects. We also reviewed a limited number of water well reports from Ecology. Detailed review of water well logs was beyond the scope of this project. A regional composite geology map is presented on Figure 2, a geomorphology map is presented on Figure 3, and a soils map is presented on Figure 4. Community water supply wells are shown on Figure 5. Geologically hazardous areas are shown on Figure 6. Shallow and deep infiltration potential are presented on Figures 7 and 8. A schematic geologic cross-section illustrating conceptual geologic conditions for a portion of the City is presented on Figure 9. The location of Cross-Section A-A' is shown on Figure 2A.

3.1 Regional Geology

The Puget Lowland is a north-south trending structural basin that is flanked by Mesozoic and Tertiary rocks of the Cascade Range on the east and by Eocene rocks of the Olympic Mountains on the west. Quaternary glaciations and subsequent fluvial systems have shaped the basin by leaving behind a thick blanket of sediments (Barnett et al., 2010). The Puget Lowland encompasses this formerly glaciated plain, which fringes the surrounding mountains and contains Puget Sound and the eastern part of the Strait of Juan de Fuca. Most of the City is situated on the Seattle Fault Zone, a major fault zone trending east-west from the southern tip of Bainbridge Island across to the north side of Green and Gold mountains (Barnett et al., 2010). The structural setting provides context for why shallow bedrock is present in portions of the City. In effect, Quaternary glacial sediments were filled in around the existing bedrock features in the City and vicinity, resulting in the variable thicknesses of glacial deposits present today.

Surficial geologic conditions within the Puget Lowland and the City are primarily the result of multiple periods of continental glaciation, during which a vast ice sheet advanced south from the mountains of British Columbia as a broad ice tongue called the "Puget lobe" (Bretz, 1913) and covered much of the Lowland during the last 2.4 million years (Blunt et al., 1987). During each glacial advance and retreat, rivers emanating from the ice sheet deposited thick sequences of coarse-grained material (glacial outwash) and glacial till (an unsorted mixture of sand, silt, clay, and gravel). The outwash deposits are typically permeable and form the primary aquifers from which ground water is drawn, while the till is less permeable. The ice

sheets disrupted drainage systems and caused rivers to back up and form large lakes. These lake (lacustrine) sediments consist of fine sands and silts. During the time period between glaciations, the Puget Lowland was likely much like today; this non-glacial or inter-glacial time period characterized by primarily low-energy fine-grained deposition occurring within floodplains and deltas, sedimentation in tide flats, lakes, wetlands, bogs and streams, weathering of existing soils, and occasional large lahars or other volcanic events. The unconsolidated sediments have been subdivided into various geologic or hydrogeologic units in several areas of the Kitsap Peninsula by several investigators based on age, hydrogeologic properties, or other relationships (Kitsap, 1997). Individual units within the glacial and interglacial sediments are generally discontinuous over wide areas due to the complex depositional and erosional history.

3.2 Summary of Project Geology, Soils, and Geomorphology

3.2.1 Project Geology and Geomorphology

We reviewed several geologic maps that cover the City and compiled the data into a composite surficial geology map reproduced as Figure 2. The surficial geology of the Bremerton area is predominantly comprised of Vashon lodgement till (Qvt). A significant thickness of Vashon recessional outwash (Qvr) is mapped in the Gorst Creek channel in the southern portion of the City and other areas of Qvr are mapped in generally north-south trending low areas between till ridges. Of particular note in the Gorst Creek valley, Deeter (1979) described the depositional environment of the sand deposits in the Gorst Creek channel as *“outwash accumulated in quiet water burying many large ice blocks. Melting of the ice blocks resulted in formation of kettle topography and in deformation of the strata. Ice marginal streams deposited sand and gravel along the north valley wall.”* Vashon advance outwash (Qva) and older pre-Vashon-age fine-grained deposits (Qva(t) and Qc(w)) are mapped at the ground surface in small areas of the City. Regional studies indicate that Vashon advance outwash and older pre-Vashon-age fine- and coarse-grained units are present beneath the surficial deposits (Kitsap, 1997). Bedrock is present at the surface in the southwestern portion of the City in the Green and Gold mountain areas, and in the northern part of the City in the Rocky Point area. Where not present at ground surface, the depth to bedrock varies considerably, typically on the order of 100 to 600 feet but ranging to over 1,800 feet (Jones, 1996). Following retreat of the Vashon ice sheet, post-glacial streams incised into the landscape, creating steep-sided ravines. Narrow bands of alluvium have been deposited within the stream channels, and are composed mainly of sand and gravel. Wetlands occur throughout the City, particularly in closed depressions in the till-mantled surface.

We reviewed a geomorphic map of Kitsap County (Haugerud, 2009). A portion of the geomorphic map was produced as Figure 3, “Geomorphology.” The geomorphic map shows the surficial morphology is dominated by fluted and pock-marked glaciated surfaces. The pock-marked glaciated surfaces may be gradational with a kame-kettle topography. Hillslope morphology is generally dominated by colluvium (small incoherent deposits from upper slopes) and can include mass movement processes, such as debris flows or shallow landslides. Kame-kettle channel features were mapped on the western portion of the City. Four large areas of potentially deep-seated landslides were mapped in the City in the following areas: eastern Enetai area, east side of Phinney Bay and unnamed drainage into Phinney Bay, eastern Sherman Heights, and the lower Anderson Creek drainage. Hillslope morphology is also present within incised ravines and along the coast.

Geologic and geomorphic mapping at the published scale only shows regional trends in sediment type. Therefore, the boundaries between units and sediment/rock type in any given area are considered approximate on maps.

3.2.2 Project Soils

We reviewed the *Soil Survey of Kitsap County Area, Washington* (NRCS-USDA, 2016) available online at the web soil survey website. The soil survey identifies different soil map units based on parent material, climate, topography (slope), organisms (biota), and time. The soils of the City formed primarily from young glacial deposits and have not had sufficient time to develop the deep weathering profiles present in soils in unglaciated terrains. Instead, they exhibit a direct relationship to the underlying parent material, local climate, topography, and vegetation. As shown on Figure 4, "Soils," the majority of the City soils are comprised of soil map units with till parent materials. These till-derived soil units include Alderwood, Harstine, Kapowsin, McKenna, and Shelton Soil series.

For soils derived from deposits of glacial till, capacity of the most limiting layer to transmit water (Ksat) is described as very low to moderately low (nil to 0.06 inches per hour [iph]). These till soils are typically Hydrologic Class C. For soils derived from deposits of outwash, the infiltration capacity typically increases with depth if not saturated. These outwash soils are typically Hydrologic Class A or B. The soils mapping is generally consistent with the regional geology mapping though variations exist.

3.2.3 Recharge Characteristics

The near-surface geologic and soil units and their infiltration or recharge considerations are discussed below from youngest to oldest.

- Recent deposits (Qp, Qw, Qa, Qf, Qb): Deposits of stream alluvium, alluvial fan, wetlands, and beach deposits, highly variable in grain size and permeability, generally thin and of limited areal extent. Regularly contains shallow ground water, or interacts with surface water features such as wetlands, streams, lake, or Puget Sound fringe sediments. Infiltration suitability variable.
- Vashon recessional outwash (Qvr, Qvro, Qvru, Qgo): Typically moderate- to high-permeability sand and gravel deposits, but generally of limited thickness and extent. On upland surfaces, recessional outwash is commonly underlain by Vashon lodgement till, restricting infiltration capacity. Recessional outwash may contain a water table aquifer. **Recessional outwash if not saturated can be a suitable receptor horizon for dispersed or concentrated shallow infiltration facilities.**
- Vashon ice-contact deposits (Qvic, Qgic): Highly variable in grain size and permeability, generally thin and of limited areal extent. Infiltration suitability variable.
- Vashon lodgement till (Qvt, Qgt): Low-permeability silty fine sand with few gravel that has been consolidated by the weight of an ice sheet. Commonly referred as "hard pan." Typically 10 to 30 feet thick, and rarely more than 50 feet thick. The till generally acts as an aquitard or confining unit. Not suitable for infiltration facilities unless significant lateral dispersion area is present.
- Vashon advance outwash (Qva, Qga): Typically moderate permeability sand and gravel deposit that has been consolidated by the weight of an ice sheet, and can be extensive both laterally and vertically. Typically contains a regional aquifer used for domestic water supply and/or provides baseflow to streams. When mapped at the ground surface, infiltration facilities located on surficial exposures of Vashon advance outwash can provide direct recharge to underlying aquifers. **Vashon advance outwash can be a suitable receptor horizon for dispersed or concentrated (shallow or deep) infiltration facilities where sufficient unsaturated zone is present.**
- Glacial Drift, Undifferentiated (Qgd, Qgu): Highly variable in grain size and permeability, likely consolidated by the weight of an ice sheet. May include Vashon till or pre-Vashon-age deposits. Infiltration suitability variable, but generally not suitable for infiltration facilities.

- Pre-Vashon-age deposits - Fine-Grained (Qva(t), Qc(w), Qpff): Low-permeability clay, silt, and silty sand deposits that have been consolidated by the weight of an ice sheet. Fine-grained pre-Vashon-age deposits act as a regional aquitard. Spring flow commonly discharges at the geologic contact with overlying coarse-grained Vashon advance outwash deposits and underlying older fine-grained deposits. Not suitable for infiltration facilities.
- Pre-Vashon-age deposits - Coarse-Grained: Not mapped at ground surface; present in the subsurface based on water well reports. Moderate permeability sand and gravel deposits that have been consolidated by the weight of one or more glaciations. These deposits contain regional aquifers and are the target of municipal water supply wells. Typically saturated and therefore not suitable for infiltration facilities.
- Bedrock (OEm(b), Ev(c), Tcb, Tcbs, Ted): Rock mass typically very low permeability and acts as a perching layer. Not suitable for infiltration facilities.

3.3 Hydrogeology

Ground water conditions and aquifer properties are an important consideration for siting of infiltration facilities. Stormwater infiltration increases ground water recharge. Increases in ground water recharge are beneficial to stream baseflow and for maintaining ground water levels, but the effects of increasing ground water recharge can include ground water mounding and potentially ground water loading in areas of geologic instability. This section contains an overview of hydrogeologic conditions and for purposes of infiltration feasibility assessment, describes three principal ground water “regimes” and two intervening aquitard units in the City.

3.3.1 Overview

Water that is present in the pore spaces and sediments is part of the hydrologic cycle. In the natural state, the hydrologic cycle begins with infiltration of precipitation (recharge) and ends with discharge to springs, streams, wetlands, and/or wells. Under natural conditions, ground water recharge and discharge may shift with climatic cycles, but remain in overall balance. Ground water will flow under saturated conditions, preferentially through materials with greater porosity and permeability, such as clean gravels and sands. Where geologic conditions limit discharge, ground water accumulates in such permeable zones, which, if they can support production from wells, are termed aquifers. The sustainability of wells, or the long-term aquifer capacity, depends on the extent of the aquifer, its rate of recharge, and the amount of withdrawal by producing wells. Withdrawal of ground water by wells diverts a part of the ground water cycle, resulting in adjustments to natural recharge, discharge, or both.

City of Bremerton and Kitsap County regional hydrogeology is primarily described in the following reports:

- U.S. Geological Survey Water-Supply Paper 1413, 1957, *Geology and Ground-water Resources of Kitsap County, Washington*: Prepared by J.E. Sceva, Tacoma, Washington.
- Washington State Department of Conservation, Division of Water Resources, 1965, Water Supply Bulletin No. 18, *Water Resources and Geology of the Kitsap Peninsula and Certain Adjacent Islands* (including Plates 1 to 5): Prepared by M.E. Garling and Dee Molenaar, Olympia, Washington.
- *Kitsap County Initial Basin Assessment*, Open File Report 97-04, October 1997: Prepared by Kitsap Public Utility District in association with Economic and Engineering Services, Inc., Pacific Groundwater Group, Robinson and Noble, Inc., and KCM, Inc.: Prepared in cooperation with Ecology, Northwest Regional office, Bellevue Washington.

- U.S. Geological Survey Water Resources Investigations Report 96-4147, 1997, *Numerical Simulation of Ground-Water Flow Paths and Discharge Locations at Puget Sound Naval Shipyard, Bremerton, Washington*: Prepared by Edmund A. Prych, prepared in cooperation with Department of the Navy, Engineering Field Activity, Northwest, Naval Facilities Engineering Command, Tacoma, Washington (Prych, 1997).
- U.S. Geological Survey Scientific Investigations Report 2014-5106, 2014, *Hydrogeologic Framework, Groundwater Movement, and Water Budget of the Kitsap Peninsula, West-Central Washington*: Prepared by Wendy B. Welch, Lonna M. Frans, and Theresa D. Olsen in cooperation with the Kitsap Public Utility District, Tacoma, Washington.

The *Kitsap County Initial Basin Assessment* (KPUD, 1997) builds on the fundamental hydrogeologic field data contained in Sceva (1957) and Garling and Molenaar (1965) and includes more local geologic and hydrogeologic information including specific assessment of municipal ground water supply systems within the City. Prych (1997) contains information on the extent of artificial fill in the Shipyard but otherwise was not considered for evaluating infiltration potential. The Kitsap Peninsula Hydrogeologic Framework (Welch et al., 2014) compiled significant hydrogeologic and water system data information into numerical databases and GIS software. However, the scale of the study necessitated generalizing some of the detail contained in the previous studies and is less specific to the City. Of particular note, the Kitsap Peninsula Hydrogeologic Framework study characterized several areas mapped as Vashon recessional outwash instead as Vashon advance outwash without qualification. Both documents used somewhat different nomenclature to refer to the hydrogeologic units in the City and therefore for ease of reference, the hydrogeologic unit labels and terminology used by both reports are included. For infiltration considerations, we rely more on information in the *Kitsap County Initial Basin Assessment*.

Ground water in the City is contained within unconsolidated sediments of glacial and nonglacial origin. The uppermost water-bearing units include Recent alluvium, Vashon recessional outwash, and the weathered soils above Vashon lodgement till. The presence of shallow ground water is important to the locations of infiltration facilities and may inhibit the performance of infiltration facilities. Recent alluvium, Vashon recessional outwash, and the weathered till soils would provide fairly limited quantities of water to wells, but shallow water contained within these units may provide substantial baseflow to wetlands and small streams. Other aquifer units are contained primarily within glacial units, designed by the letter “g”, and separated by nonglacial units, designated by the letter “n” in the *Kitsap County Initial Basin Assessment* (KPUD, 1997). The Kitsap Peninsula Framework (Welch et al., 2014) divided the deeper geologic units into hydrogeologic units using names that correspond to aquifer (QA) or confining unit (QC).

It is important to recognize that all the geologic units are discontinuous in nature due to the complex erosional and depositional history of the area. Although the aquifer and aquitards are described as regionally extensive units, in actuality, textural variability within the units may result in a more complex assemblage of interfingering aquifers and aquitards (KPUD, 1997).

For purposes of infiltration feasibility assessment, three principal ground water “regimes” and two intervening aquitard units in the site vicinity are described below. The ground water regimes include shallow perched ground water, Vashon advance aquifer, and undifferentiated deep aquifer(s). The aquitards include Vashon lodgement till and pre-Vashon-age fine-grained units that includes fine-grained Vashon lake bed deposits (Qva(t)) and pre-Vashon nonglacial deposits (correlative to Unit Qn2 or QC1). Three principal aquifer systems are mapped within the City as identified in the Initial Basin Assessment (KUPD, 1997) and include Gorst Aquifer, Manette-North Bremerton Aquifer, and Anderson Creek Aquifer.

3.3.2 Shallow Perched Water

In upland areas, perched ground water occurs when surface water infiltrates down through relatively permeable soils, such as thin Vashon recessional outwash and the weathered portions of the glacial till, and becomes trapped or “perched” atop a comparatively impermeable barrier, such as unweathered till horizons or silty outwash horizons. The Vashon recessional outwash and weathered till deposits are included in unit Qg1 in the Initial Basin Assessment (KUPD, 1997) and unit Qvr in the Kitsap Peninsula Framework (Welch et al., 2014). This zone of shallow perched ground water is also commonly referred to as the “interflow zone.” The perched ground water can only slowly penetrate the underlying low-permeability zones. Given the topography of the City and the presence of wetlands in the low areas between till ridges, particularly in the southernmost portion of the City, it appears that the interflow zone is active and supplies water to various wetland areas. It should be noted that the presence and depth of interflow seepage in the City may vary in response to such factors as changes in season, precipitation, and land use.

3.3.3 Vashon Lodgement Till “Aquitard” (Qg1/Qvt)

Vashon lodgement till is exposed at ground surface across much of the City. The Vashon lodgement till is included in unit Qg1 in the Initial Basin Assessment (KUPD, 1997) and unit Qvt in the Kitsap Peninsula Framework (Welch et al., 2014). Where the lodgement till underlies the Vashon-age recessional outwash deposits, it forms an aquitard to ground water flow. The lodgement till is comprised of very dense, glacially compacted silty sand with varying amounts of gravel. The high silt content and high density impedes the movement of ground water in the lodgement till. The lodgement till has been eroded by streams and rivers in some areas exposing the underlying Vashon-age advance outwash.

3.3.4 Vashon Advance Outwash Aquifer (Qg1a/Qva)

Ground water contained in the Vashon advance outwash is referred to as the Vashon advance outwash aquifer. The advance outwash aquifer typically has fine-grained sediments at the base which grade upward into coarser deposits, and is typically overlain by a layer of glacial till. According to the Initial Basin Assessment (KUPD, 1997), the thickness of the advance outwash deposits is up to 250 feet. The advance outwash aquifer typically terminates abruptly in bluffs and steep slopes formed by erosion from rivers.

The Vashon advance aquifer corresponds with aquifer unit Qg1a in the Initial Basin Assessment (KUPD, 1997) and Qva in the Kitsap Peninsula Framework (Welch et al., 2014). The advance outwash aquifer is typically an unconfined aquifer. Very little information was readily available on ground water within the Vashon advance outwash in the City. Depth to water in wells interpreted as completed in Vashon advance outwash ranges from less than 50 feet to on the order of 250 feet and varies considerably across the City. Ground water elevations within the Vashon advance outwash north of downtown Bremerton near the intersection of Highway 3 and Highway 310 ranged from about elevation 10 to 15 feet relative to mean sea level (AESI, 2012). Ground water elevations within the Vashon advance outwash on the western side of Kitsap Lake ranged from about elevation 500 feet to 300 feet relative to mean sea level (AESI, 1999; AESI, 2000). The lower elevation water levels north of downtown Bremerton are a result of thicker, more laterally extensive Vashon advance outwash. The higher elevation water levels in the Kitsap Lake area are a result of shallow bedrock and other paleotopography effects constraining deposition of the Vashon advance outwash. A similar pattern was observed from a review of domestic water wells in the unincorporated area west of Sherman Heights, where depth to water increased from west to east, toward Sinclair Inlet and away from shallow bedrock.

Discharge from the advance outwash aquifer is likely in the form of seeps and springs where the advance outwash aquifer has been exposed in slopes and bluffs, downward seepage to underlying aquifers in the older undifferentiated sediments, and from withdrawal by water supply wells. Recharge to the advance outwash aquifer is likely from downward migration of precipitation and shallow ground water seepage through the lodgement till, where present.

3.3.5 Pre-Vashon-Age Fine-Grained Deposits “Aquitard” (Qn2/QC1)

Fine-grained deposits are interpreted to underlie the Vashon advance outwash deposits in the City. The fine-grained deposits correspond with aquitard unit Qn2 in the Initial Basin Assessment (KPUD, 1997) and QC1 in the Kitsap Peninsula Framework (Welch et al., 2014). The low-permeability clay, silt, and silty sand deposits have been consolidated by the weight of an ice sheet and act as a regional aquitard. Spring flow commonly discharges at the geologic contact with overlying coarse-grained material and underlying fine-grained deposits. Outcrops of undifferentiated pre-Vashon-age sediments are mapped along coastal bluffs and outcrops of ancient peat are exposed near sea level on the south side of the Manette Bridge (Deeter, 1979).

3.3.6 Pre-Vashon-Age Undifferentiated Deep Aquifer(s)

Pre-Vashon-age aquifer system designations in the Bremerton area as described in the Ground Water Management Plan (KPUD, 1991) and Initial Basin Assessment (KPUD, 1997) include the Gorst Aquifer System (hydrostratigraphic units Qg1a through Qg4), the Manette-North Bremerton Aquifer System (hydrostratigraphic unit Qg3), and the Anderson Creek Aquifer System (hydrostratigraphic unit Qg5).

These principal aquifers were determined by the following characteristics: several proven, major water supply wells or springs primarily drilled by the large water purveyors, sufficient test data to evaluate aquifer characteristics, and sufficient correlation of geologic characteristics to justify the assumption of continuity between wells. Community water systems are shown on Figure 5. The following is largely excerpted from the Initial Basin Assessment (KPUD, 1997):

- Gorst Aquifer System: four effective aquifers were identified in the area that was previously identified and generally shown by the Gorst principal aquifer. These aquifers are encountered from about 250 to -100 feet MSL and are called the Upland Aquifer, the Twin Lake Aquifer, the Gorst Creek Valley Aquifer, and the Sea Level Aquifer. All of these aquifers, except for the Upland Aquifer, are defined as being within the Gorst Aquifer System. The Upland Aquifer underlies the Sunnyslope Uplands to the south. The area is complex and includes glacial and inter-glacial hydrostratigraphic units Qg1a through Qg4.
- Manette-North Bremerton Aquifer System: this aquifer is located in the Qg3 unit and occurs between sea level and -250 feet MSL. This aquifer has a substantial lateral extent; however, the boundaries are poorly defined. Study of aquifers in the area for the North Perry Avenue Water District and Bremerton Water Utilities have referred to a portion of the aquifer as the Sea Level Aquifer. The Sea Level Aquifer occurs from 50 to -150 feet MSL, and is discontinuous.
- Anderson Creek Aquifer System: this aquifer was previously defined as a portion of the North Lake-Bremerton South Aquifer and now refers only to the deep aquifer defined entirely by the City of Bremerton wells in the Anderson Creek well field. The aquifer is located between -450 and -525 feet MSL within unit Qg5. The Anderson Creek Aquifer System has been referred to as the deep artesian

aquifer. The aquifer may have a large areal extent to the south and has been tentatively correlated with deep wells in the Port Orchard area.

3.3.7 Recharge and Discharge

Recharge to the shallow ground water aquifers and surface systems of the Kitsap Peninsula is from precipitation falling directly on the land surface and infiltrating to the water table. Natural and artificial surface storage basins, such as infiltration or retention facilities, collect precipitation or subsequent runoff and release the water slowly to the ground water system. Ground water recharge is areally distributed throughout the County, whereas ground water discharge is concentrated around surface water features, such as streams, rivers, lakes, wetlands, and marine bodies. Discharge tends to occur at lower elevations to both surface water and springs, but also occurs to wells regardless of their location.

Practically all streams in the Kitsap WRIA are augmented by ground water discharge and many would go dry if ground water were insufficient to maintain flows during periods of low precipitation. There is evidence that some aquifers are continuous beneath several drainage basins (KPUD, 1997). Often, the direction of ground water movement is independent of surface topography, allowing some of the precipitation received in one watershed to be transferred as ground water to adjacent or nearby basins.

Many springs and seeps issue from the top of low-permeability silts and clays of pre-Vashon-age deposits. The silts and clays serve as perching layers that impede downward migration of much of the precipitation that falls upon the area. The springs contribute an important part of the baseflow of surface streams and may provide domestic supplies for both individual homes and communities throughout the area.

3.3.8 Ground Water - Surface Water Interaction

Stream channels and wetlands in the City are surface water features which interact directly with ground water. Three general processes occur: (1) the surface water features gain water from inflowing ground water, (2) the surface water features lose water to ground water by outflow through the streambed or depression sidewalls or base, or (3) the systems vary between gaining water and losing water either seasonally or spatially, in particular for streams as the streambed intersects different geologic units or ground water discharge zones.

Wetlands also receive water from ground water, provide a source of recharge to ground water, or both. Wetlands located on the upland surfaces generally result from interflow or direct runoff collecting in depressions between till ridges, and can be an expression of a very shallow perched water table in topographically low areas on shallow, low-permeability sediments.

4.0 CRITICAL AREAS

According to the Kitsap County Critical Area Maps and State Source Water Assessment Program Maps, several geologic hazard areas, critical aquifer recharge zones, and well head protection areas are present in the City.

4.1 Critical Aquifer Recharges Area Categories

The 2014 Ecology Manual does not allow siting of shallow infiltration facilities within 100 feet of a water supply well. Additional infiltration siting considerations should be reviewed in Category 1 Critical Aquifer Recharge Areas. Critical Aquifer Recharge Areas means those land areas that contain hydrogeologic conditions that facilitate aquifer recharge and/or transmit contaminants to an underlying aquifer. Factors considered in the identification of Critical Aquifer Recharge Areas include depth to water table, presence of highly permeable soils (specifically Group A Hydrologic Soils), presence of flat terrain, and the presence of more permeable surficial geology.

4.1.1 Category 1 Critical Aquifer Recharge Areas

Based on the State Source Water Assessment Program Maps, portions of the City are located within the delineated well head protection areas for City of Bremerton water supply wells, and other Group A water supply wells, and Group B water supply wells as shown on Figure 5. These delineated well head protection areas are included in Kitsap County's Category 1 Critical Aquifer Recharge Area and defined as high potential for certain land use activities to adversely affect ground water. Other Category 1 areas include areas identified as Significant Recharge Areas due to special circumstances or identified in accordance with *Washington Administrative Code* (WAC) 365-190-080 (2) (c) as aquifer areas of significant potable water supply with susceptibility to ground water contamination, including the recessional outwash deposits in the Gorst Creek-Union River Valley. Aquifers in the Gorst basin are highly susceptible to the introduction of pollutants and provide significant potable water supplies for the City of Bremerton.

4.1.2 Category 2 Critical Aquifer Recharge Areas

Kitsap County's Category 2 Critical Aquifer Recharge Area is defined as providing recharge to aquifers that are currently or will become potable water supplies and are vulnerable to contamination based on the type of land use activity. Category 2 areas correspond to permeable geologic units present at the ground surface, such as recessional outwash, advance outwash, or alluvium (see Figure 2), or highly permeable (hydrologic group A) soils units, such as Indianola or Neilton loamy sand (see Figure 4).

4.2 Geologically Hazardous Areas

The 2014 Ecology Manual does not allow siting of shallow infiltration facilities within an erosion hazard, or landslide hazard area. The City defines areas of geologic hazard (which include erosion and landslide hazard areas) in land code section 20.14.620. High geologic hazard areas meet either of the following two criteria:

- 1) Areas with slopes greater than 40 percent with vertical relief of 10 or more feet, or
- 2) Areas with slopes greater than 30 percent with vertical relief of 10 or more feet, and any of the following characteristics:
 - a. Unstable soil or shoreline classified as "unstable" (U), "unstable old slides" (UOS), "unstable recent slides" (URS), or "intermediate" (I) by the USDA Soil Conservation Service, USGS, the Ecology Coastal Zone Atlas, or qualified geologist or geotechnical engineer;
 - b. Groundwater seepage or springs present on the slope, areas underlain by impermeable silts or clays, or mappable emergent water;
 - c. Erosion hazard as indicated by potential for stream or wave incision or as classified as "highly erodible" or "potentially erodible" by the NRCS;
 - d. Seismic areas subject to liquefaction from earthquakes such as hydric soils as identified by the NRCS, and areas that have been filled to make a site more suitable.

The City defines areas of moderate geologic hazard as areas with slopes of 30 percent or greater and vertical relief of 10 or more feet, and any areas with slopes of 15 to 30 percent with vertical relief of 10 or more feet and any of the characteristics listed in 2a through 2b under high hazard.

For this study, steeply sloping ground and areas of existing landslides or mass wasting will constrain infiltration opportunities. We compiled steep slope and existing unstable soil and geologic data available and illustrated the information on Figure 6. Data compiled includes the following:

- Areas with slopes greater than 40 percent.
- Areas with slopes greater than 30 percent to 40 percent.
- Unstable soil or shoreline classified as "unstable" (U), "unstable old slides" (UOS), "unstable recent slides" (URS), or "intermediate" (I) by the Ecology Coastal Zone Atlas.
- Geologic map unit: landslide deposits (Qls).
- NRCS soil units: Dystric Xerorthents, 45 to 70 percent slopes, Indianola-Kitsap complex, 45 to 70 percent slopes, and Kilchis-Shelton complex, 30 to 50 percent slopes.
- Geomorphic map units: hillslope (h), older hillslope (ho), rilled slope (r), and landslide (ls, ls?).

As shown on Figure 6, significant steep slope and landslide hazards are present along steeply sided valleys, ravines, and shoreline bluffs. Four large areas of potentially deep-seated landslides were mapped in the City in the following areas: eastern Enetai area, east side of Phinney Bay and unnamed drainage into Phinney Bay, eastern Sherman Heights, and the lower Anderson Creek drainage. The illustrated hazard areas represent approximate locations and should be considered guidelines that generally identify the potential unstable ground conditions that may be impacted by stormwater infiltration. The actual risk should be evaluated and the critical areas ordinance should be consulted and applied on a site-specific basis.

5.0 INFILTRATION POTENTIAL

5.1 Conceptual Infiltration Strategies

Infiltration feasibility is dependent on the permeability of the infiltration receptor horizon, the vertical and lateral extent of the unsaturated material, the depth to ground water for perched water, the transmissivity of the underlying aquifer, proximity to geologic hazards, and considerations for other nearby water users such as water wells, springs, and streams. Conceptual geologic conditions of the Manette Peninsula are illustrated on Figure 9. The unsaturated portion of the Vashon advance outwash layer shown in the Figure 9 concept would be the receptor for deep infiltration in the Manette Peninsula. Figure 10 illustrates conceptual shallow and deep infiltration strategies.

Infiltration facilities may be either shallow or deep. Shallow infiltration facilities could be considered in settings where high-permeability sediments (such as Vashon recessional outwash) are present in sufficient unsaturated thickness and lateral extent to allow the stormwater to spread out, disperse, and avoid re-emergence. Deep infiltration facilities could be considered in settings where low-permeability geologic units (such as glacial till) are present at the surface and more permeable sediments are present below. Deep infiltration facility strategies would be dependent on the thickness of the low-permeability unit at the surface and the depth to ground water in the infiltration receptor horizon.

Shallow infiltration strategies include:

- Long or linear infiltration systems that spread out recharge such as infiltration trenches, bioretention swales, or permeable pavements.
- Concentrated infiltration facilities may be considered, such as a series of basins, ponds, or bioretention cells if the infiltration receptor horizon has sufficient unsaturated thickness and lateral extent.

Deep infiltration strategies include:

- Conventional large infiltration ponds, trenches, or vaults that are excavated through the surficial glacial till (or surficial fill and fine-grained sediments) and into underlying higher permeability units (such as Vashon advance outwash). If the infiltration receptor horizon is present within 10 to 15 feet of the ground surface, this type of deep infiltration facility could be considered. In our experience, large conventional infiltration ponds, trenches, or vaults situated in Vashon advance outwash have long-term design infiltration rates on the order of 0.5 to 5 iph.
- Combination large infiltration pond, trench, or vault modified with a series of pit drains (short infiltration trenches) to increase the effective infiltration rate. In our experience, including pit drains increases the effective infiltration rate on the order of 4 to 10 times, resulting in facilities with long-term design infiltration rates typically ranging from 2 to 5 iph. Some facilities have achieved full-scale performance rates of 20 iph using this approach.
- UIC Well Systems. UIC wells could be considered if the infiltration receptor horizon is too deep to make conventional infiltration ponds, trenches, or vaults feasible. UIC well systems for this setting would be drilled through the surficial low-permeability unit and into the underlying higher permeability unit (such as Vashon advance outwash). In practice, our projects have had UIC design flow rates that ranged from 50 gallons per minute (gpm) per UIC well using shorted screens or in more sandy deposits to greater than 350 gpm per UIC well using longer screens or in more gravelly sands or gravel deposits.

5.2 Infiltration Potential Assessment

5.2.1 Shallow Infiltration Potential

For the shallow infiltration potential assessment, AESI assigned infiltration potential ratings to soil, geologic and geomorphic map units based primarily on permeability with the following exceptions: steeply sloping areas were assigned a very low rating and saturated soils were assigned a low rating. The data were organized into a GIS database. Infiltration potential ratings are summarized in Table 1 (attached). The resulting ratings include four shallow infiltration potential categories illustrated on Figure 7 and summarized below.

- **High Potential:** areas where multiple data sources map high permeability sediments such as recessional outwash or Vashon advance outwash and corresponding high permeability soil units.
- **Moderate Potential:** typically areas where data sources map varying units with variable permeability, such as Vashon ice-contact deposits or undifferentiated glacial drift; or areas where mapping is not consistent, for example: (1) an area may be mapped as Indianola soils (sandy outwash derived) by NRCS and glacial till by USGS or DNR, or (2) an area may be mapped as Vashon advance outwash (higher permeability) by USGS or DNR and Alderwood soils (silty till derived soils) by NRCS.

- **Low Potential:** areas where multiple data sources map lower permeability sediments such as glacial till or older pre-Vashon-age deposits, or areas where multiple data sources indicate saturated soils.
- **Very Low Potential:** areas of steep slope or other soil instability, and areas mapped as bedrock or soil units derived from the weathering of bedrock.

5.2.2 Deep Infiltration Potential

Because unsaturated Vashon advance outwash is the primary deep infiltration receptor layer in Bremerton, AESI reviewed the extent of mapped Vashon advance outwash as a first step in assessing deep infiltration potential. The Vashon advance outwash is laterally constrained by bedrock and underlain by fine-grained pre-Vashon-age sediments. Depth to ground water is also a critical element for deep infiltration. AESI delineated two deep infiltration potential categories illustrated on Figure 8 and summarized below.

- **Moderate potential:** Defined for areas not mapped as either bedrock, pre-Vashon-age, or geologic hazard areas and located at least 500 feet from mapped bedrock areas and pre-Vashon-age deposits, and above elevation 50 feet.
- **Low Potential:** All other areas.

6.0 CONCLUSIONS - INFILTRATION CONSIDERATIONS

6.1 General City-Wide Considerations

Our review of the available site information indicates the following regarding the general infiltration potential of the City:

- The City is primarily located on till-mantled uplands and significant areas of shallow bedrock are present. The distribution of till and bedrock are reflected in the areas of very low and low shallow infiltration potential shown on Figure 7. The presence of till limits shallow infiltration opportunities because unweathered till has a very low-permeability material (less than 0.06 iph). Bedrock limits both shallow and deep infiltration opportunities. Varying amounts of ground water seepage should be expected within the weathered till deposits and thin soil horizon over bedrock, and would also inhibit infiltration in the wetter winter months.
- Shallow infiltration opportunities:
 - Moderate to High opportunities are present where recessional outwash and coarse-grained ice-contact deposits were mapped as part of the regional geology, geomorphology, and/or soil surveys. These include areas in the Gorst Creek-Union River Valley, the area around Kitsap Lake and the higher elevation margins of southern Kitsap Lake trough, in smaller low areas between till ridges, and in other irregular areas. If present, the recessional outwash and coarse-grained ice-contact deposits could serve as an infiltration receptor horizon if permeable and not saturated. Varying amounts of ground water seepage may be encountered within the recessional outwash deposits, and may inhibit infiltration in the wetter winter months.
 - Moderate opportunities are present where limited areas of advance outwash were mapped at the ground surface as part of regional maps, excluding areas of advance outwash exposed in steeper incised ravine areas and coastal bluffs.
- Deep infiltration opportunities: Vashon advance outwash where present at depth beneath thicker surficial till or other low-permeability deposits could serve as an infiltration receptor horizon using deeper infiltration techniques such as deep drywells (UIC wells) or deep infiltration trenches. Deep

infiltration systems are limited by ground water. Ground water should be expected at depth within Vashon advance outwash. Deep infiltration into Vashon advance outwash was investigated as part of the Bay Vista redevelopment project about ¼ mile south of Oyster Bay and was found to be a feasible method for treated stormwater disposal (AESI, 2012).

6.2 Target Areas Considerations - Manette Peninsula Focus Area

We understand that several potential CIPs are under consideration. Based on discussions with Herrera, we reviewed the Manette Peninsula focus area located in the northern portion of the City on the Manette Peninsula (see Manette Peninsula focus area outline on Figure 7a). Information on critical areas, shallow and deep infiltration potential for Manette Peninsula focus area overall and specific areas (View Ridge Elementary Property, and the Robin and Dibb area) are described in more detail below. Conceptual geologic conditions are illustrated on Figure 9. Schematic infiltration details are shown on Figure 10.

6.2.1 Manette Peninsula Focus Area - Overall

Critical Areas: The focus area is situated on the western slope of the Manette Peninsula and drains to Port Washington Narrows. Ground surface elevations range up to 460 feet. Linear areas of steep slopes are present in the lower portion of the focus area, generally below elevation 200 feet and along the steep shore-face. A small landslide is mapped within an incised ravine feature east of Highway 3. No community water supply wells are mapped within the focus area. We did not map individual domestic water supply wells.

Shallow Infiltration: Moderate to very low potential for shallow infiltration BMPs. Moderate potential associated with mapped recessional outwash deposits and Indianola and Neilton soils (derived from the weathering of outwash). Low potential includes areas mapped as glacial till and Alderwood, Harstine, or Kapowsin soils (derived from the weathering of glacial till). Very low potential in areas of steeply sloping ground and landslides.

Deep Infiltration: Moderate to high potential for deep infiltration beneath glacial till in higher elevations of the focus area. Vashon advance outwash is mapped at the ground surface near the northern focus area boundary and is interpreted to extend to about elevation 50 feet to elevation 200 feet beneath most of the focus area. Deep infiltration system design would be dependent on the till thickness and depth to ground water in the Vashon advance outwash. In the absence of site-specific data, no areas were mapped as having high potential for deep infiltration.

6.2.2 View Ridge Elementary School Property

Regionally, the View Ridge Elementary School parcel is mapped by NRCS as Alderwood gravelly sandy loam, which typically forms from the weathering of glacial till. The USGS also mapped the site as glacial till. We were provided with a soils report (EnviroSound Consulting, Inc. [EnviroSound], 2011) that documented native soils consisting of interbedded silt and sand, and shallow ground water seepage. The interbedded silt and sand deposits are not consistent with glacial till or glacial outwash. Instead, interbedded silt and sand on an upland setting could represent thin low-energy stream sediments deposited during post-glacial time, either as the ice receded, or from more recent stream activity. Conceptual geologic conditions are illustrated on Figure 9. Schematic infiltration facilities are shown on Detail 1 on Figure 10.

Critical Areas: The site is located near the center of the upland, relatively distant from areas of steep slopes and landslide deposits. No community water supply wells are mapped within ½ mile of the property. Other critical areas were not a part of this assessment.

Shallow Infiltration: Low potential for shallow infiltration BMPs due to the mapped glacial till and the local soils information indicating perched seepage within fine-grained silt and sand deposits.

Deep Infiltration: Moderate to high potential for deep infiltration beneath the glacial till. Moderate depth and deeper infiltration strategies may be feasible if Vashon advance outwash is present beneath the Vashon glacial till. Vashon advance outwash is mapped at the ground surface about ¼ mile southwest of the site and is interpreted to extend to depths of elevation 50 to 100 feet beneath the View Ridge property. Deep infiltration system design would be dependent on the till thickness and depth to ground water in the Vashon advance outwash. In the absence of site-specific data, no areas were mapped as having high potential for deep infiltration. Conceptual infiltration strategies are illustrated on Detail 1 on Figure 10. The till thickness was varied for illustration purposes and to highlight how different deep infiltration strategies for this location vary primarily based on till thickness.

Exploration Recommendations: Initial infiltration feasibility can be assessed for a relatively low cost with targeted backhoe exploration pits to establish presence/absence of glacial till and shallow/perched ground water described by others. Geotechnical soil drilling would be necessary to assess deep infiltration feasibility. The geotechnical soil borings work would establish thickness of overlying low-permeability till if present, and provide information on the presence, quality, and preliminary thickness and extent of the underlying outwash. The soil boring(s) should be completed as monitoring wells to capture information on seasonal ground water fluctuations. Fall is an excellent time to complete monitoring wells, observe the seasonal rise in ground water as the wet season approaches, and determine seasonal high water level to inform potential design alternatives.

6.2.3 Robin and Dibb

Two areas near the intersection of Robin Avenue and Dibb Street were reviewed for infiltration potential and are described as Area 1 and Area 2 as follows: Area 1 is rectangular area roughly delineated by Robin Avenue on the east, Sheridan Road on the south, a church and parking area on the west, and single-family residential parcels on the north. From a review of aerial maps and topography, Area 1 is gently sloping and is grass-covered with no developed buildings. Area 2 includes the Eagle Avenue right of way south of East 31st Street to near East 29th Street, and the right-of-way on East 31st Street between Eagle Avenue and Wheaton Way. Both Areas 1 and 2 are mapped by NRCS as Neilton gravelly loamy sand which typically forms from the weathering of glacial outwash. The USGS also mapped Area 1 as Vashon recessional outwash, but mapped Area 2 as glacial till. Area 2 is upslope from Area 1, and the difference in regional mapping could reflect a thinning of surficial outwash on the higher elevations of Area 2.

Critical Areas: An area of steep slopes associated with the Stephenson Canyon ravine is present on the south side of Area 1 (Detail 2 on Figure 10). The geomorphology map (Figure 3) describes the slopes nearest to Area 1 as hillslope erosion features. Piped stormwater is discharged high in the ravine, on the south side of Area 1 and likely exacerbates erosion within the ravine. Lower in the ravine, landslides are mapped. Provisionally, we interpret the steep slopes and landslides to be a result of stream erosion and downcutting, not part of a deep-seated feature. No community water supply wells are mapped within a ½ mile of the property. Other critical areas were not a part of this assessment.

Shallow Infiltration: Mixed. Infiltration potential is moderate where recessional outwash is present at the ground surface. Where glacial till is present at or near the surface, shallow infiltration would not be considered feasible. Shallow infiltration into recessional outwash in this setting could be considered if the outwash is demonstrated to be unsaturated during the winter wet season and present in sufficient thickness and lateral extent to allow the stormwater to spread out, disperse, and avoid re-emergence within the upper portion of Stephenson Canyon. Recessional outwash can have a moderate to high permeability, on the order of 1 to 10 iph. Recessional outwash on the upland is typically underlain at shallow depths by glacial till that can perch shallow ground water. Conceptual infiltration strategies are illustrated on Detail 2 on Figure 10. Constraints for infiltration in recessional outwash in this setting include depth to seasonally high shallow ground water and lateral extent of the outwash.

Deep Infiltration: Moderate potential for deep infiltration. Both Area 1 and Area 2 are situated high enough on the upland that unsaturated Vashon advance outwash or coarse-grain pre-Vashon deposits may be present at depth beneath the recessional outwash and glacial till. Vashon advance outwash, where unsaturated, is an excellent receptor for concentrated stormwater infiltration facilities. An infiltration vault with pit drains is potentially preferred over a large pond for this setting due to the potential for lateral seepage through thin recessional outwash. If the recessional outwash is very thin or absent (reducing the shallow seepage potential), a moderate depth infiltration trench excavated through glacial till completed with pit drains into advance outwash could also be considered. The trench feasibility is dependent on thin glacial till overlying permeable Vashon advance outwash.

Exploration Recommendations: Initial shallow infiltration feasibility can be assessed for a relatively low cost with targeted backhoe exploration pits in Area 1 and a series of vacuum-excavated boreholes along the right-of-way in Area 2. The subsurface exploration work would establish presence, quality, and preliminary thickness and extent of the recessional outwash. If recessional outwash is present and on the order of 10 feet in thickness or greater, targeted monitoring wells should be installed to capture information on seasonal ground water fluctuations. Fall is an excellent time to complete monitoring wells, observe the seasonal rise in ground water as the wet season approaches, and determine seasonal high water level to inform potential design alternatives.


7.0 LIMITATIONS

The feasibility mapping provided in this technical memorandum is suitable for identification and evaluation of potential infiltration solutions. For infiltration projects, additional subsurface explorations, infiltration testing, and analysis will be required by the City of Bremerton stormwater design manual and Critical Areas Code, and are recommended to verify the information that provides the basis for the assessments included in this technical memorandum and to refine the analysis for site-specific infiltration target areas of interest.

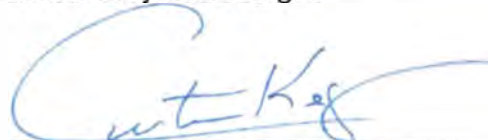
We have prepared this technical memorandum for use in the City of Bremerton's stormwater comprehensive plan. The conclusions and interpretations presented in this technical memorandum should not be construed as a warranty of the subsurface conditions. Our conclusions and recommendations are based on information provided by others and our experience in the area. Our experience has shown that soil and ground water conditions can vary significantly over small distances.

Within the limitations of scope, schedule, and budget, AESI attempted to execute these services in accordance with generally accepted professional principles in the fields of geology and hydrogeology at the time this memorandum was prepared. No warranty, express or implied, is made. If you should have any questions, or require further assistance, please do not hesitate to call.

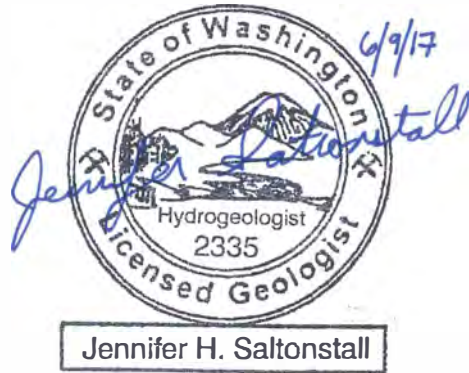
Sincerely,
ASSOCIATED EARTH SCIENCES, INC.
Kirkland, Washington



Suzanne S. Cook, L.G.
Senior Project Geologist



Curtis J. Koger, L.G., L.E.G., L.Hg.
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Attachments:

- Table 1. Infiltration Potential Ratings
- Figure 1. Vicinity Map
- Figure 2. Geology
- Figure 3. Geomorphology
- Figure 4. Soils
- Figure 5. Community Water Supply Wells
- Figure 6. Geologically Hazardous Areas
- Figure 7. Shallow Infiltration Potential
- Figure 8. Deep Infiltration Potential
- Figure 9. Schematic Geologic Cross-Section A-A'
- Figure 10. Schematic Infiltration Details 1 and 2

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Table 1. Infiltration Potential Rating

USDA/NRCS SCS Soil Units			
Soil Name (NRCS)	AESI_GeoCorrelation	Geologic Age (Parent Material)	Rating
Urban land-Alderwood complex	Af/MI	Recent	1
Pits	Af/MI	Recent	1
Semiahmoo muck	Qw	Recent	1
Shalcar muck	Qw	Recent	1
Beaches	Qal	Recent	2
Belfast loam	Qal	Recent	2
Tacoma silt loam	Qal	Recent	1
Dystric Xerorthents, 45 to 70 percent slopes	Qmw/steep	Recent	0
Norma fine sandy loam	Qal/Qvr	Recent-Vashon	2
Grove very gravelly sandy loam	Qvr	Vashon	3
Indianola loamy sand	Qvr	Vashon	3
Neilton gravelly loamy sand	Qvr	Vashon	3
Ragnar fine sandy loam	Qvr	Vashon	3
Alderwood gravelly sandy loam	Qvt	Vashon	1
Harstine gravelly ashy sandy loam	Qvt	Vashon	1
Kapowsin gravelly ashy loam	Qvt	Vashon	1
Kapowsin variant gravelly clay loam	Qvt	Vashon	1
McKenna gravelly loam	Qvt	Vashon	1
Shelton very gravelly sandy loam	Qvt	Vashon	1
Kitsap silt loam	varies, typ Qpvf	Vashon-Pre-Vashon	1
Indianola-Kitsap complex, 45 to 70 percent slopes	Qmw/steep	Vashon-Pre-Vashon	0
Kilchis-Shelton complex, 30 to 50 percent slopes	Qmw/steep	Vashon-Bedrock	0
Cathcart silt loam	Br	Bedrock	0
Kilchis very gravelly sandy loam	Br	Bedrock	0
Schneider very gravelly loam	Br	Bedrock	0

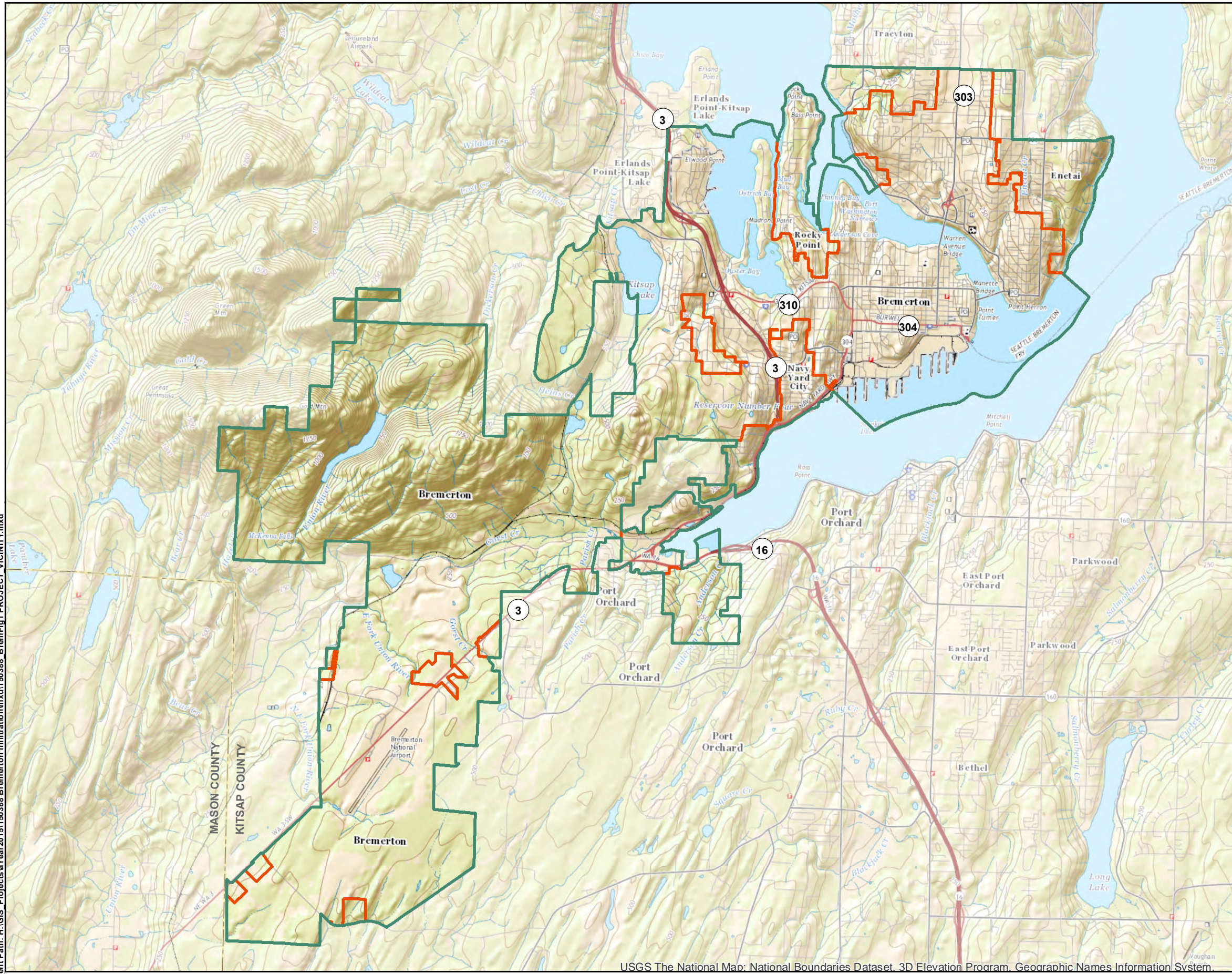
Geologic Map Units - 24K Quadrangles			
Geologic Unit Symbol (24K) and Description		Geologic Age	Rating
Artificial fill	af	Recent	1
Peat	Qp	Recent	1
Wetland deposits	Qw	Recent	1
Alluvium	Qa	Recent	2
Alluvial fan	Qf	Recent	2
Landslide deposits	Qls	Recent	0
Older alluvium	Qoa	Holocene	2
Older alluvium	Qoa1	Holocene	2
Older alluvium	Qoa2	Holocene	2
Vashon recessional lacustrine	Qvrl	Vashon	2
Vashon recessional sublacustrine landslide deposits	Qvls	Vashon	2
Vashon recessional outwash	Qgo	Vashon	3
Vashon recessional outwash	Qvro	Vashon	3
Vashon recessional outwash	Qvru1	Vashon	3
Vashon recessional outwash	Qvru2	Vashon	3
Vashon ice-contact deposits	Qvri	Vashon	2
Vashon ice-contact deposits	Qgic	Vashon	2
Vashon till	Qgt	Vashon	1
Vashon till	Qvt	Vashon	1
Vashon advance outwash	Qva	Vashon	3
Glacial Drift, Undifferentiated	Qgd	Vashon-Pre-Vashon	2
Crescent Formation	Tcb	Bedrock	0
Crescent Formation	Tcbs	Bedrock	0
Eocene intrusive dikes	Ted	Bedrock	0

Table 1. Infiltration Potential Rating

Geologic Map Units - 100K Quadrangles			
Geologic Unit Symbol (100K) and Description		Geologic Age	Rating
Artificial Fill	Qf	Recent	1
Beach deposits	Qb	Recent	2
Alluvium	Qa	Recent	2
Landslide deposits	Qls	Recent	0
Vashon recessional outwash	Qgo	Vashon	3
Vashon till	Qgt	Vashon	1
Vashon advance outwash	Qga	Vashon	3
Glacial drift, undifferentiated	Qgd	Vashon-Pre-Vashon	2
Glacial drift, undifferentiated	Qgu	Vashon-Pre-Vashon	2
Pre-Vashon fine-grained	Qga(t)	Pre-Vashon	1
Whidbey Formation	Qc(w)	Pre-Vashon	1
Bedrock	OEm(b)	Bedrock	0
Bedrock	Ev(c)	Bedrock	0



Geomorphology of Kitsap County Map Units			
Geomorphic Unit and Description		AESI_GeoCorrelation	Rating
Artificial Fill	fill	Af/MI	1
Modified Land	m	Af/MI	1
Wetland	w	Qw	1
Tide flat	tf	Qal	1
Alluvial Flat	al	Qal	2
Beach Face	bf	Qal	2
Backshore Area	bs	Qal	2
Holocene alluvial flat	hal	Qal	2
Alluvial Fan	af	Qaf	2
hillslope	h	Qmw/steep	0
older hillslope	h0	Qmw/steep	0
Landslide	ls	Qls	0
Landslide?	ls?	Qls?	0
Rilled slope	r	Qmw/steep	0
Old Beach	ob	Qal	2
outwash flat of Russell age	owr	Qvr	2
Channel	ch	Qvr	3
Delta Face	df?	Qvr	3
Kame-kettle	kk	Qvr/Qvic	3
Pockmarked Glaciated Surface	gp	Qvr/Qvic	2
Glacial trough wall	gtw	Qvic/Qvt	2
Glaciated Surface	g	Qvt	1
Fluted Glaciated Surface	gf	Qvt	1
Glaciated Bedrock Surface	gb	Br	0

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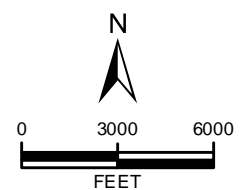
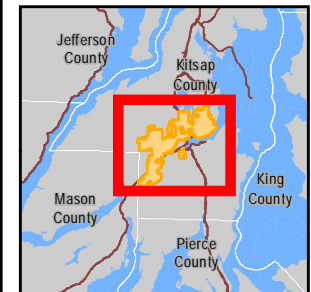
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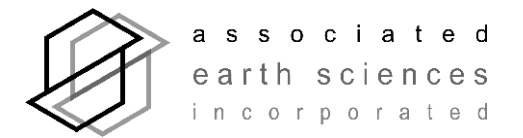
-  URBAN GROWTH BOUNDARY
-  CITY OF BREMERTON

DATA SOURCES / REFERENCES:
 USGS TOPO
 KITSAP CO: CITY BOUNDARY, URBAN GROWTH BOUNDARY,
 WSDOT: HIGHWAYS

LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE



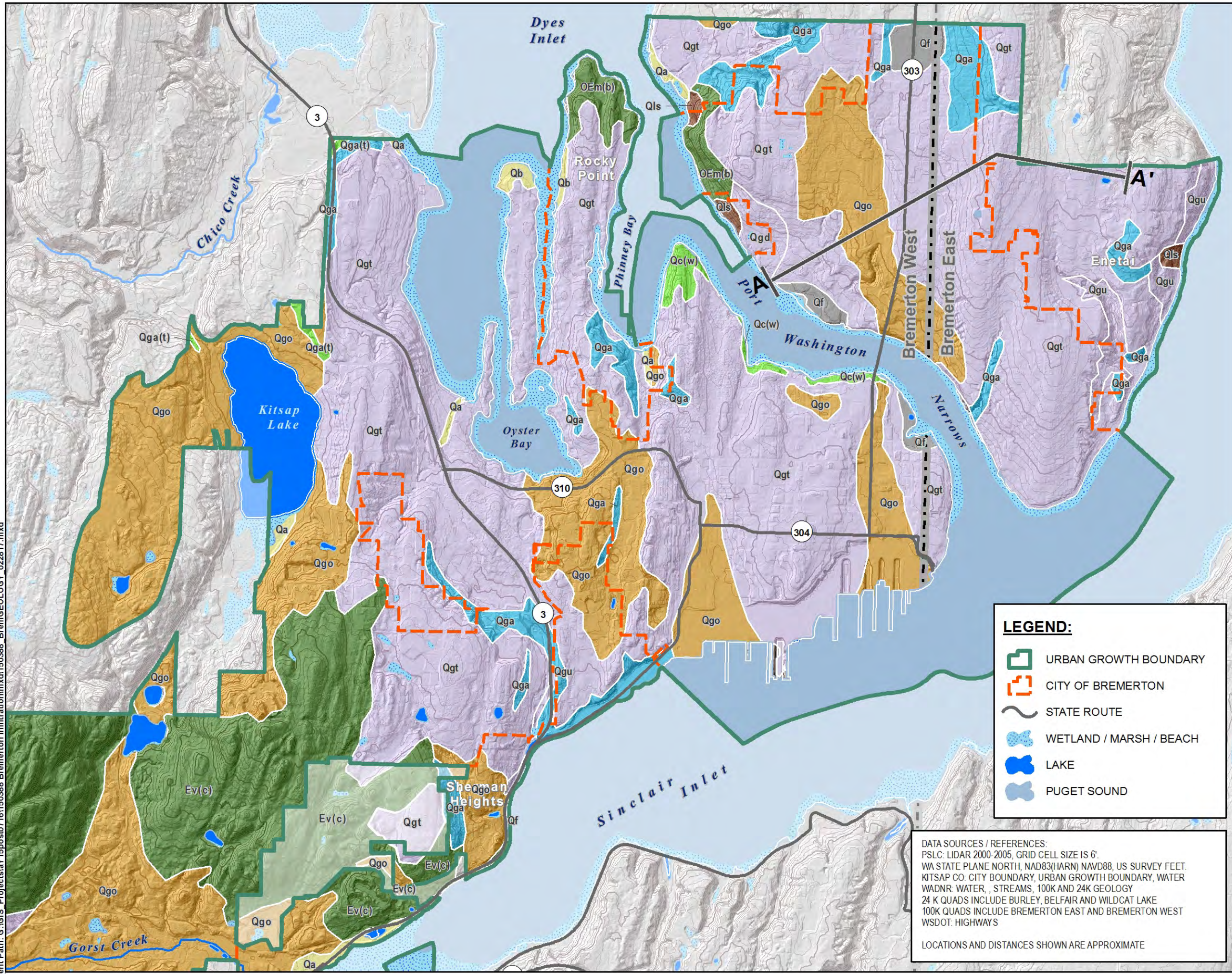
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 INFILTRATION ASSESSMENT
 BREMERTON, WASHINGTON

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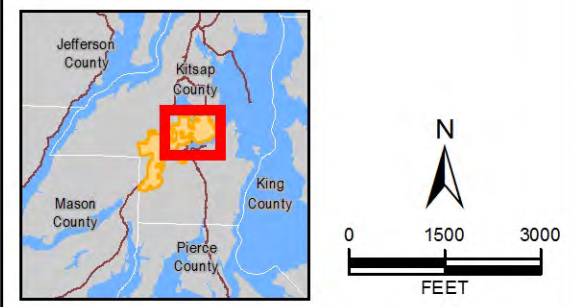
LEGEND:

- URBAN GROWTH BOUNDARY
- CITY OF BREMERTON
- STATE ROUTE
- WETLAND / MARSH / BEACH
- LAKE
- PUGET SOUND

DATA SOURCES / REFERENCES:
 PSLC: LIDAR 2000-2005, GRID CELL SIZE IS 6'.
 WA STATE PLANE NORTH, NAD83(HARN) NAVD88, US SURVEY FEET.
 KITSAP CO: CITY BOUNDARY, URBAN GROWTH BOUNDARY, WATER
 WADNR: WATER, STREAMS, 100K AND 24K GEOLOGY
 24 K QUADS INCLUDE BURLEY, BELFAIR AND WILDCAT LAKE
 100K QUADS INCLUDE BREMERTON EAST AND BREMERTON WEST
 WSDOT: HIGHWAYS
 LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE

LEGEND:

- CROSS SECTION, SEE FIGURE 9
- BURLEY, BELFAIR, WILDCAT LAKE 24 K QUADS
- af - ARTIFICIAL FILL
- Qw, Qp WETLAND; PEAT
- Qa - ALLUVIUM
- Qvls; Qls - LANDSLIDE
- Qgo, Qvro, Qvru1,2 - V. RECESS. OUTWASH
- Qgic, Qvri - ICE CONTACT DEPOSIT
- Qvt, Qgt, Qgd - VASHON GLACIAL TILL / DRIFT
- Qva - VASHON ADVANCE OUTWASH
- Tcb, Tcbs, Ted - BEDROCK
- BREMERTON WEST, EAST 100K SERIES
- Qf - ARTIFICIAL FILL
- Qa; Qb - ALLUVIUM / BEACH DEPOSITS
- Qls - LANDSLIDE DEPOSIT
- Qgo - VASHON RECESSONAL OUTWASH
- Qgd; Qgt; Qgu - VASHON GLACIAL TILL / DRIFT
- Qga - VASHON ADVANCE OUTWASH
- Qga(t); Qc(w) - PRE-VASHON FINE-GRAINED
- Ev(c); OEm(b) - BEDROCK
- USGS QUADRANGLE BOUNDARY

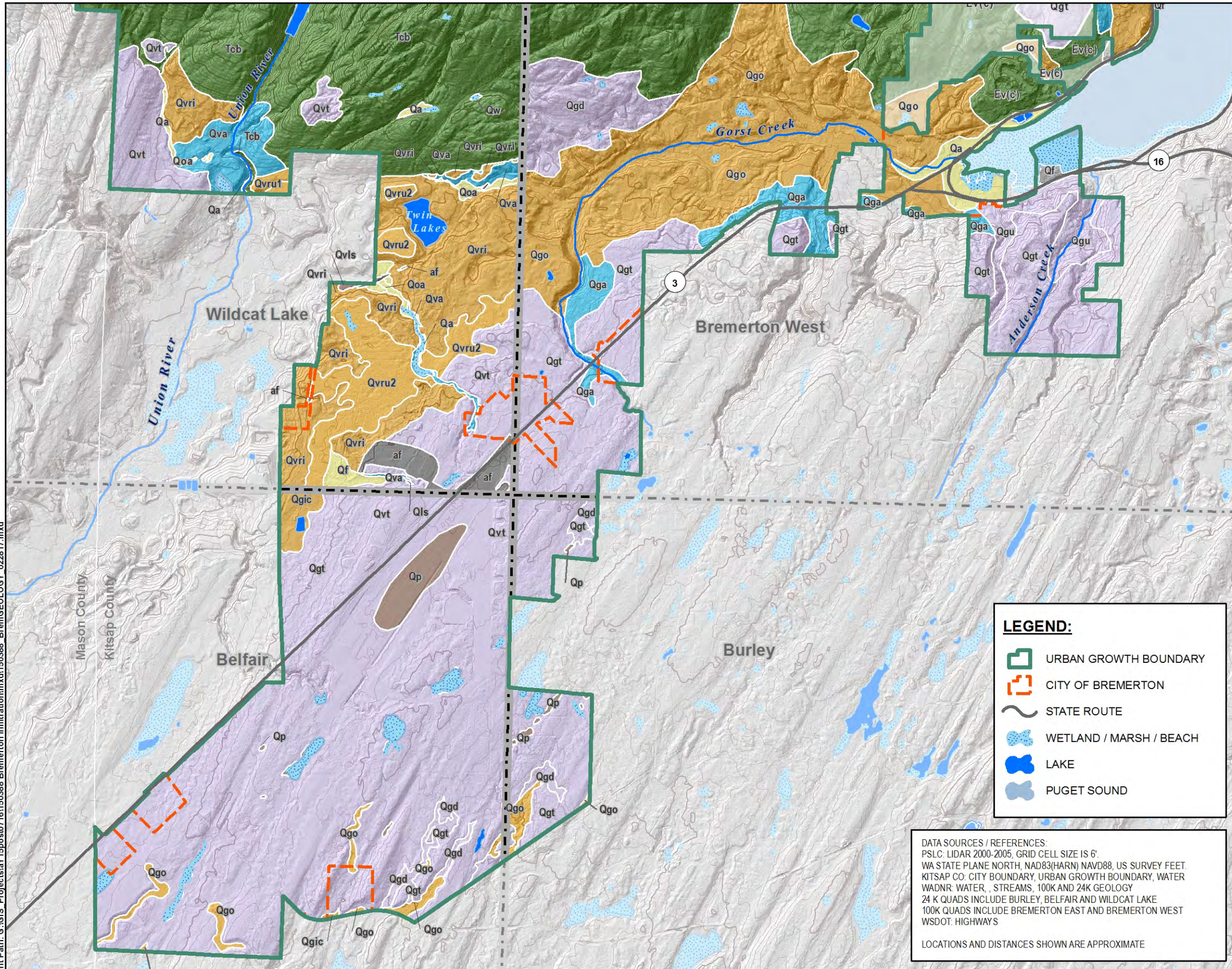


BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION



GEOLOGY
 CITY OF BREMERTON
 INFILTRATION ASSESSMENT
 BREMERTON, WASHINGTON

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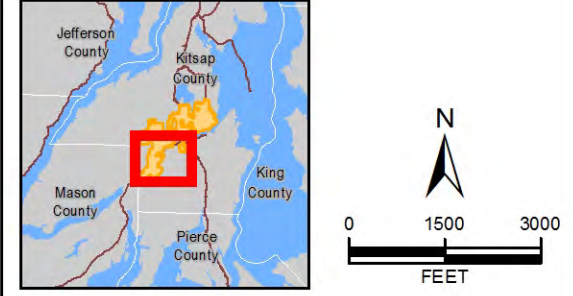
LEGEND:

- CROSS SECTION
- BURLEY, BELFAIR, WILDCAT LAKE 24 K QUADS
 - af - ARTIFICIAL FILL
 - Qw, Qp WETLAND; PEAT
 - Qa - ALLUVIUM
 - Qvls; Qls - LANDSLIDE
 - Qgo, Qvro, Qvru1,2 - V. RECESS. OUTWASH
 - Qgic, Qvri - ICE CONTACT DEPOSIT
 - Qvt, Qgt, Qgd - VASHON GLACIAL TILL / DRIFT
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 - Qgd; Qgt; Qgu - VASHON GLACIAL TILL / DRIFT
 - Qga - VASHON ADVANCE OUTWASH
 - Qga(t); Qc(w) - PRE-VASHON FINE-GRAINED
 - Ev(c); OEm(b) - BEDROCK
 - USGS QUADRANGLE BOUNDARY

LEGEND:

- URBAN GROWTH BOUNDARY
- CITY OF BREMERTON
- STATE ROUTE
- WETLAND / MARSH / BEACH
- LAKE
- PUGET SOUND

DATA SOURCES / REFERENCES:
 PSLC: LIDAR 2000-2005, GRID CELL SIZE IS 6'.
 WA STATE PLANE NORTH, NAD83(HARN) NAVD88, US SURVEY FEET.
 KITSAP CO: CITY BOUNDARY, URBAN GROWTH BOUNDARY, WATER
 WADNR: WATER, STREAMS, 100K AND 24K GEOLOGY
 24 K QUADS INCLUDE BURLEY, BELFAIR AND WILDCAT LAKE
 100K QUADS INCLUDE BREMERTON EAST AND BREMERTON WEST
 WSDOT: HIGHWAYS
 LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE

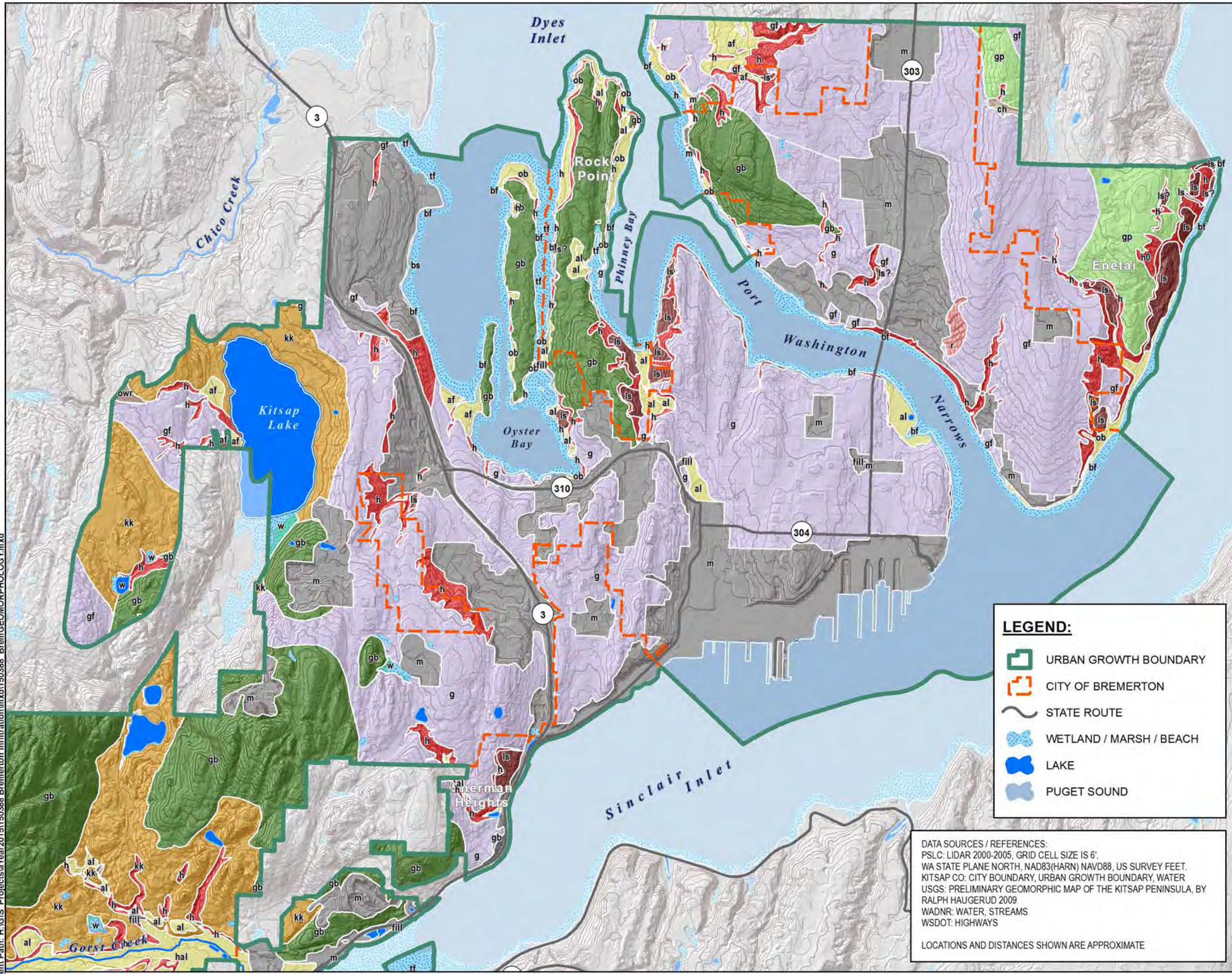


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GEOLOGY
 CITY OF BREMERTON
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 BREMERTON, WASHINGTON

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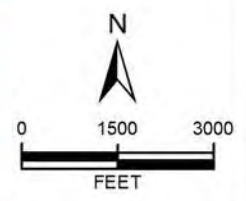
- UNIT and DESCRIPTION**
- fill; m - ARTIFICIAL FILL, MODIFIED LAND
 - af; bf; bs; al; hal; ob; tf. SEE NOTE BELOW
 - w - WETLAND
 - ls; ls? - LANDSLIDE, LANDSLIDE?
 - ch; df? - CHANNEL, DELTA FACE
 - kk - KAME-KETTLE
 - owr - OUTWASH FLAT OF RUSSELL AGE
 - g; gf - GLACIATED SURFACE AND FLUTED
 - gp - POCKMARKED GLACIATED SURFACE
 - gtw - GLACIAL TROUGH WALL
 - h; h0 - HILLSLOPE, OLDER HILLSLOPE
 - r - RILLED SLOPE
 - gb - GLACIATED BEDROCK SURFACE
 - CONTOUR 100 FT
 - CONTOUR 20 FT

NOTE: AF; BF; BS; AL; HAL; OB; TF; =
 ALLUVIAL FAN
 BEACH FACE
 BACKSHORE AREA
 ALLUVIAL FLAT
 HOLOCENE ALLUVIAL FLAT
 OLD BEACH
 TIDE FLAT

LEGEND:

- URBAN GROWTH BOUNDARY
- CITY OF BREMERTON
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 WADNR: WATER, STREAMS
 WSDOT: HIGHWAYS
 LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE

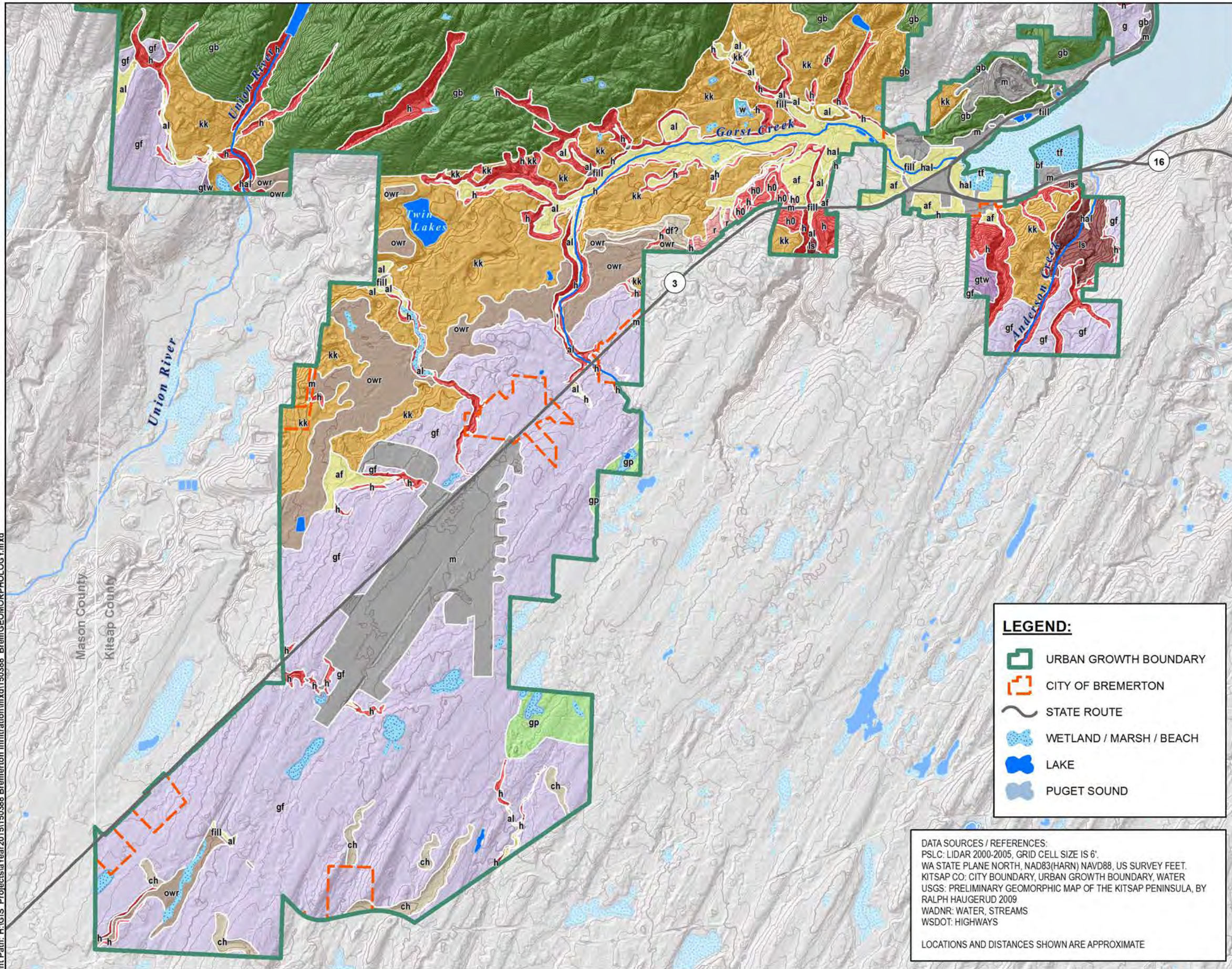


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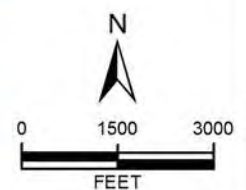
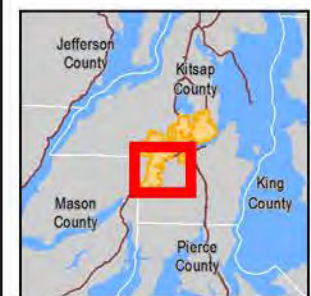
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 - r - RILLED SLOPE
 - gb - GLACIATED BEDROCK SURFACE
 - CONTOUR 100 FT
 - CONTOUR 20 FT

NOTE: AF; BF; BS; AL; HAL; OB; TF; =
 ALLUVIAL FAN
 BEACH FACE
 BACKSHORE AREA
 ALLUVIAL FLAT
 HOLOCENE ALLUVIAL FLAT
 OLD BEACH
 TIDE FLAT

LEGEND:

- URBAN GROWTH BOUNDARY
- CITY OF BREMERTON
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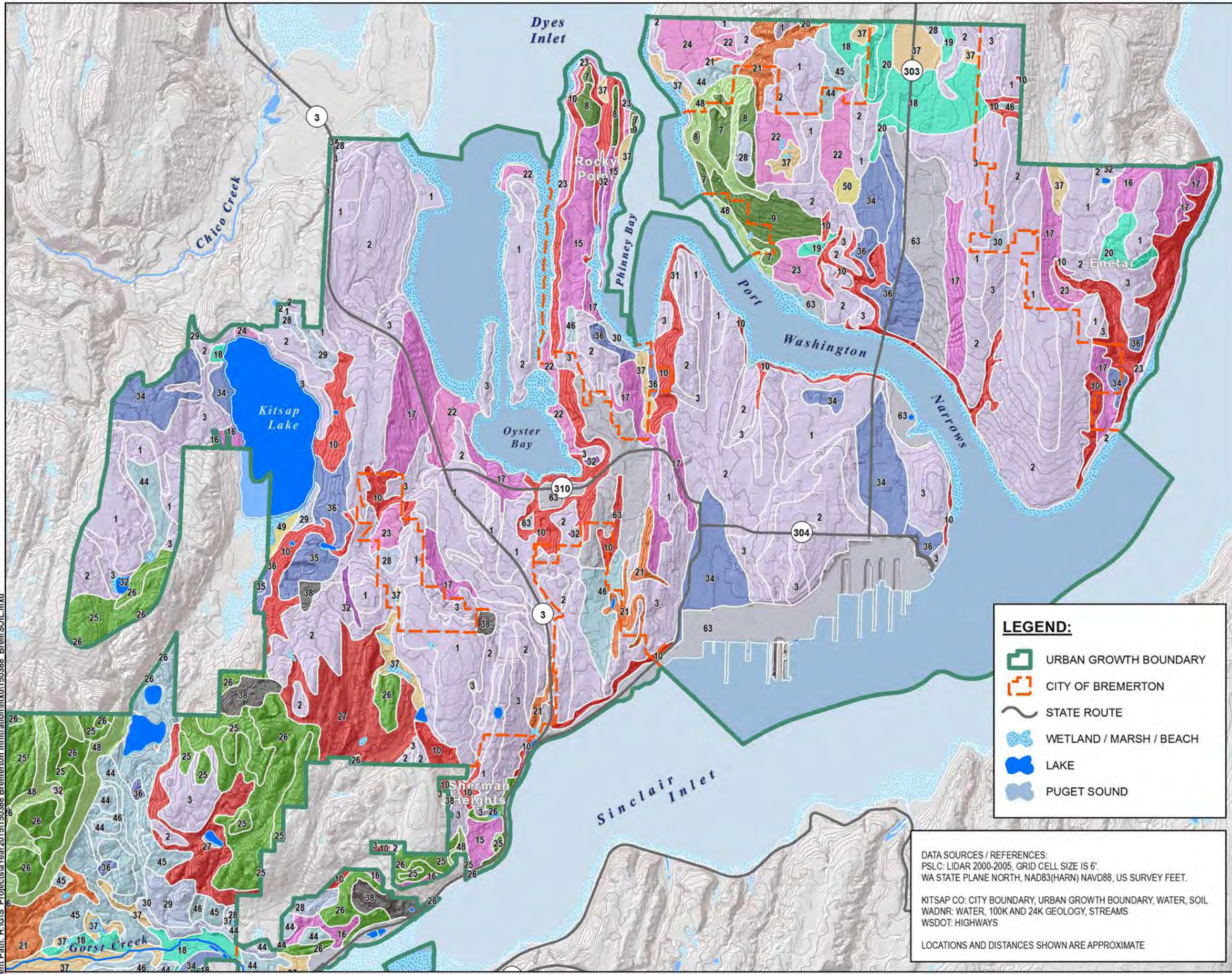


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GEOMORPHOLOGY
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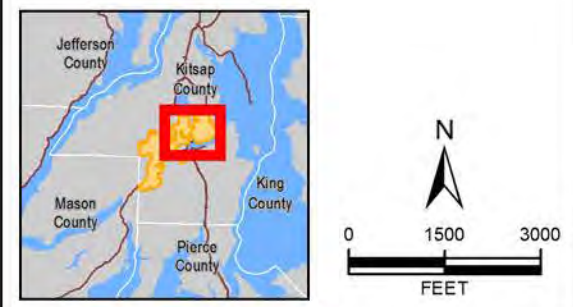
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- LEGEND:**
- 63 = ALDERWOOD COMPLEX - URBAN LAND
 - 1-3 = ALDERWOOD GRAVELLY SANDY LOAM
 - 5 = BELFAST LOAM
 - 7-9 = CATHCART SILT LOAM
 - 10 = DYSTRIC XEROTHENTS
 - 11, 12 = GROVE VERY GRAVELLY SANDY LOAM
 - 14-17 = HARSTINE GRAVELLY ASHY SANDY LOAM
 - 18-20 = INDIANOLA LOAMY SAND
 - 21 = INDIANOLA - KITSAP LOAMY SAND
 - 22, 23, 24 = KAPOWSIN GRAVELLY ASHY LOAM
 - 25, 26 = KILCHIS VERY GRAVELLY SANDY LOAM
 - 27 = KILCHIS - SHELTON COMPLEX
 - 28-31 = KITSAP SILT LOAM
 - 32 = MCKENNA GRAVELLY LOAM
 - 34-36 = NEILTON GRAVELLY LOAMY SAND
 - 37 = NORMA FINE SANDY LOAM
 - 38 = PITS
 - 44-46 = RAGNAR FINE SANDY LOAM
 - 48 = SCHNEIDER VERY GRAVELLY LOAM
 - 49 = SEMIAHMOO MUCK
 - 50 = SHALCAR MUCK
 - 51-54 = SHELTON VERY GRAVELLY SANDY LOAM
 - 62 = TACOMA SILT LOAM

- LEGEND:**
- URBAN GROWTH BOUNDARY
 - CITY OF BREMERTON
 - STATE ROUTE
 - WETLAND / MARSH / BEACH
 - LAKE
 - PUGET SOUND

DATA SOURCES / REFERENCES:
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 WADNR: WATER, 100K AND 24K GEOLOGY, STREAMS
 WSDOT: HIGHWAYS
 LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE

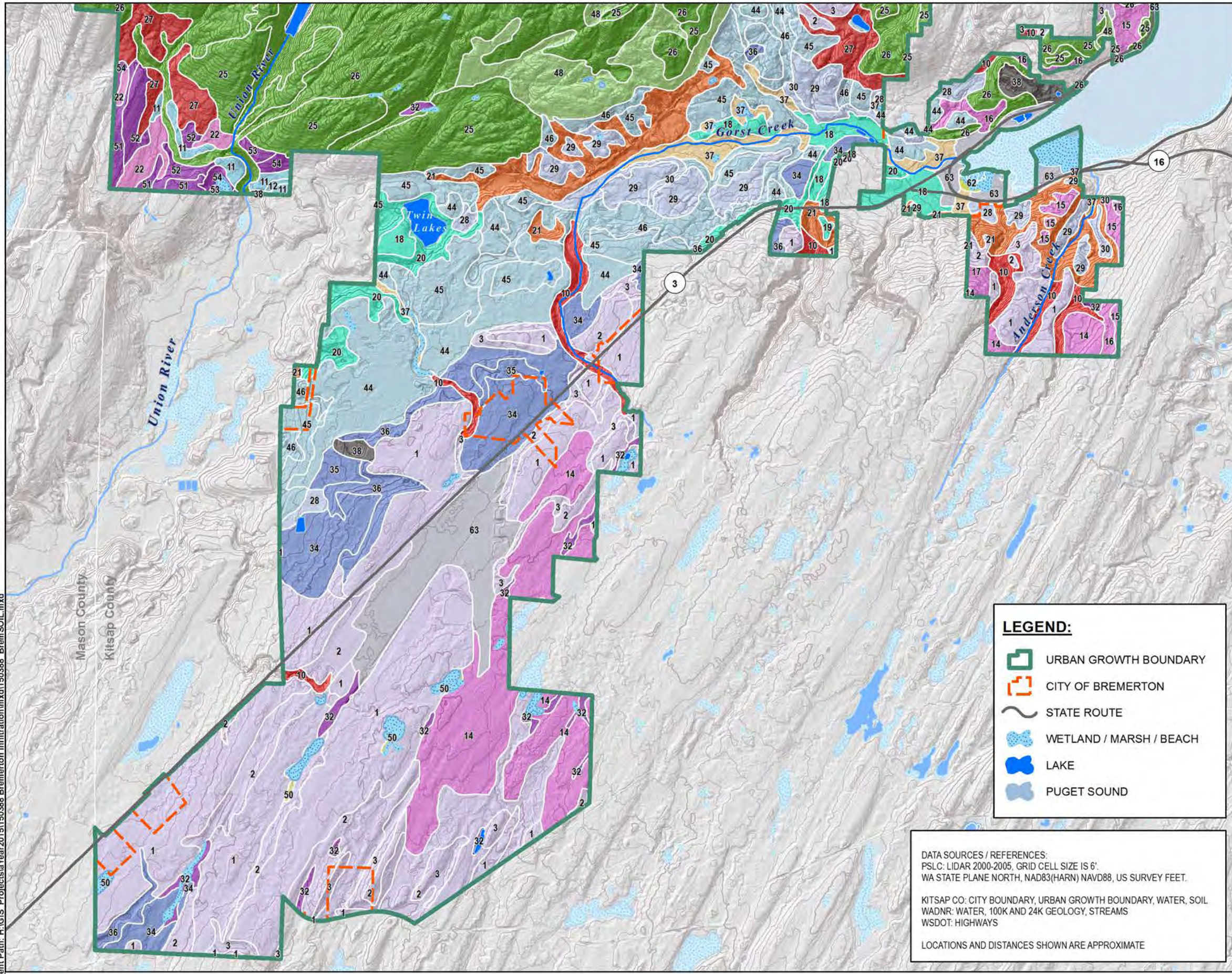


BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION



SOILS
 CITY OF BREMERTON
 INFILTRATION ASSESSMENT
 BREMERTON, WASHINGTON

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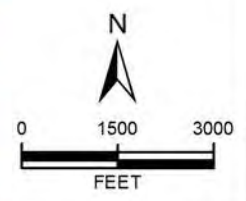
LEGEND:

- 63 = ALDERWOOD COMPLEX - URBAN LAND
- 1-3 = ALDERWOOD GRAVELLY SANDY LOAM
- 5 = BELFAST LOAM
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LEGEND:

- URBAN GROWTH BOUNDARY
- CITY OF BREMERTON
- STATE ROUTE
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- LAKE
- PUGET SOUND

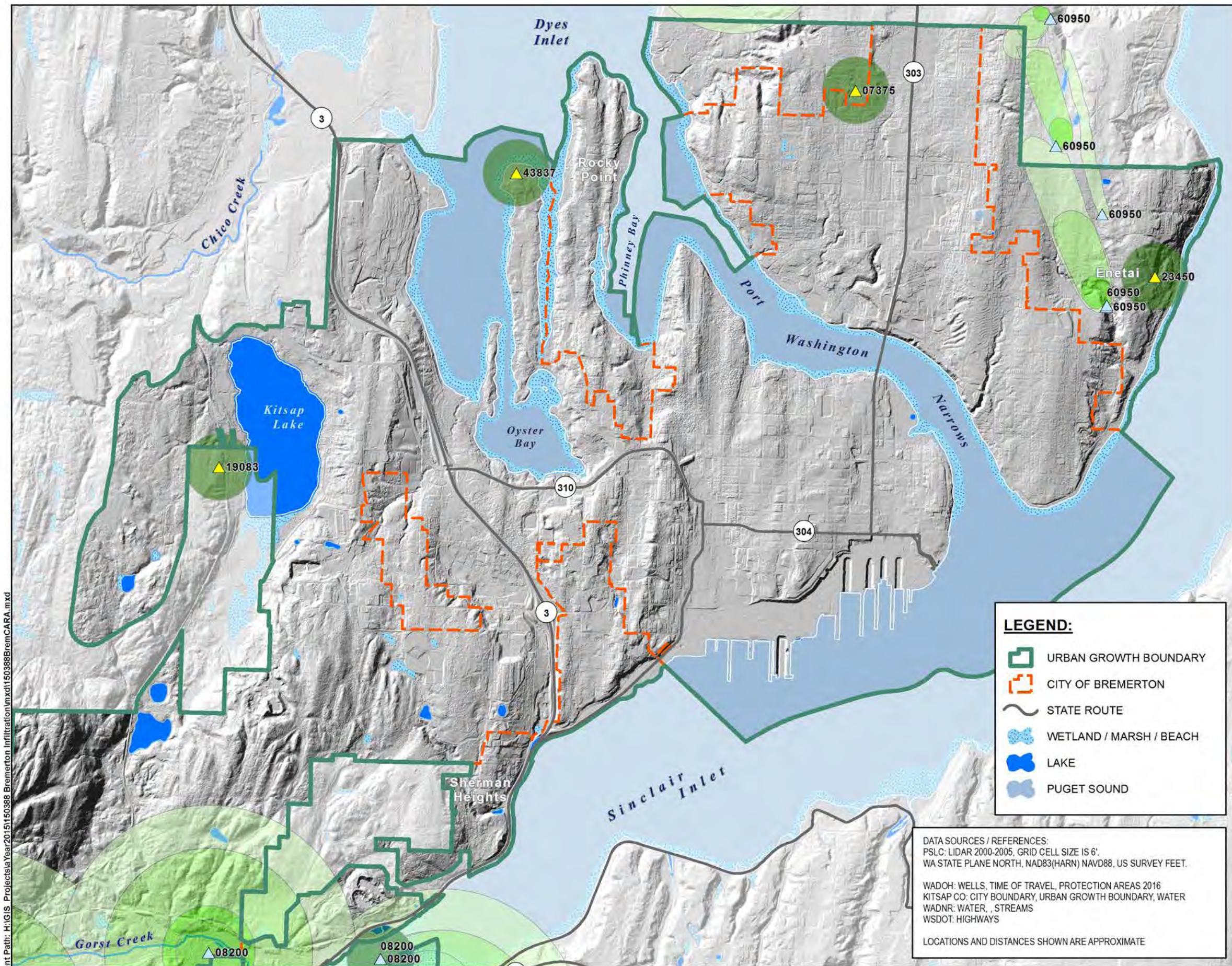
DATA SOURCES / REFERENCES:
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 WA STATE PLANE NORTH, NAD83(HARN) NAVD88, US SURVEY FEET.
 KITSAP CO: CITY BOUNDARY, URBAN GROWTH BOUNDARY, WATER, SOIL
 WADNR: WATER, 100K AND 24K GEOLOGY, STREAMS
 WSDOT: HIGHWAYS
 LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE



BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION



SOILS
CITY OF BREMERTON
INFILTRATION ASSESSMENT
BREMERTON, WASHINGTON



LEGEND:

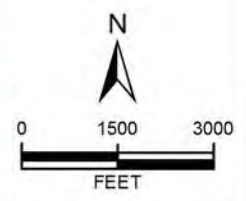
- ▲ GROUP A COMMUNITY WATER SYSTEM
- ▲ GROUP B WATER SYSTEM
- TIME OF TRAVEL ASSIGNED
- TIME OF TRAVEL 6 MO
- TIME OF TRAVEL 1 YR
- TIME OF TRAVEL 5 YR
- TIME OF TRAVEL 10 YR
- SURFACE WATER PROTECTION AREA

WELLS LABELED WITH PUBLIC WATER SUPPLY ID

LEGEND:

- ▭ URBAN GROWTH BOUNDARY
- ▭ CITY OF BREMERONTON
- STATE ROUTE
- WETLAND / MARSH / BEACH
- LAKE
- PUGET SOUND

DATA SOURCES / REFERENCES:
 PSLC: LIDAR 2000-2005, GRID CELL SIZE IS 6'.
 WA STATE PLANE NORTH, NAD83(HARN) NAVD88, US SURVEY FEET.
 WADOH: WELLS, TIME OF TRAVEL, PROTECTION AREAS 2016
 KITSAP CO: CITY BOUNDARY, URBAN GROWTH BOUNDARY, WATER
 WADNR: WATER, STREAMS
 WSDOT: HIGHWAYS
 LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE



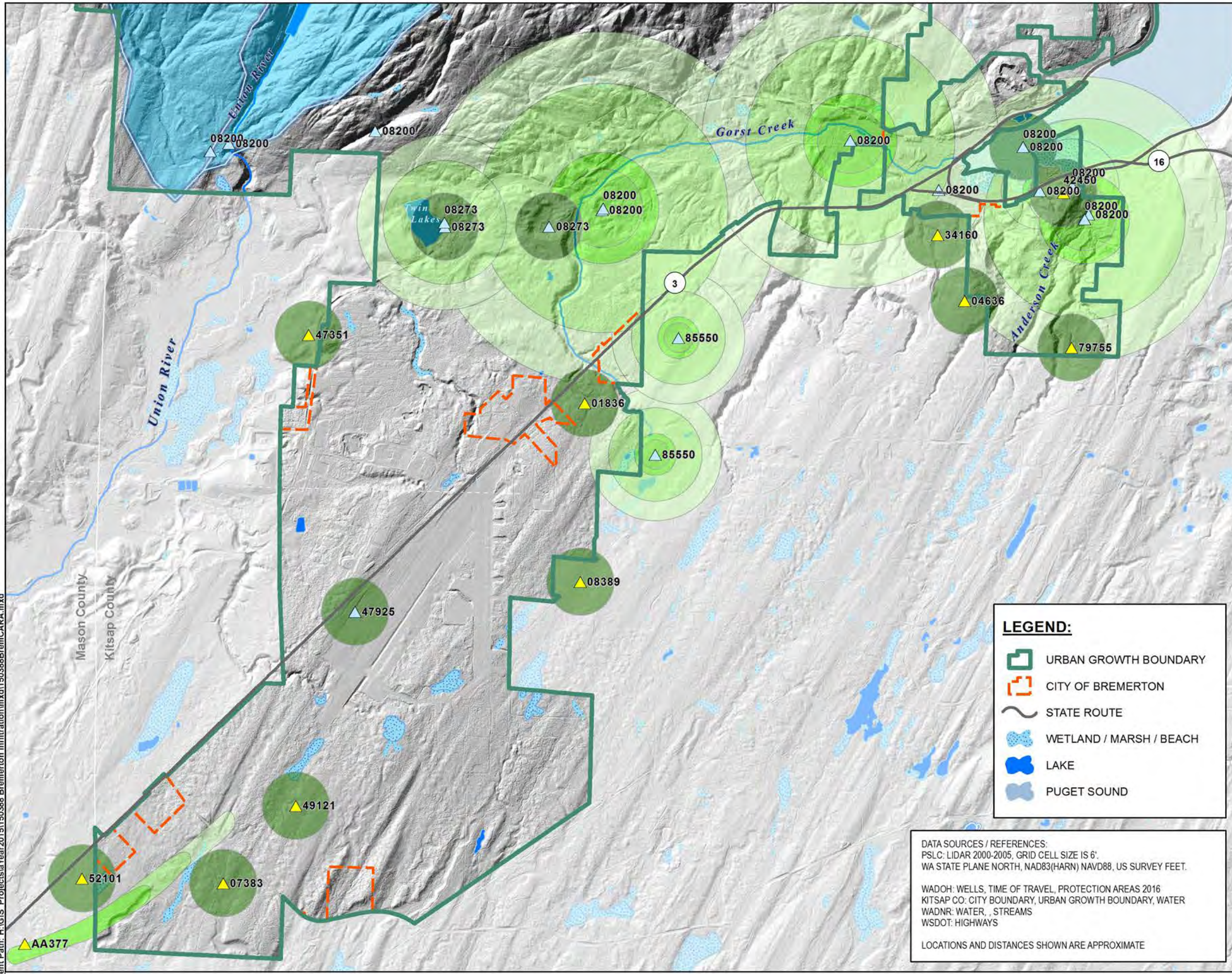
BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION



COMMUNITY WATER SUPPLY SYSTEMS
 CITY OF BREMERONTON
 INFILTRATION ASSESSMENT
 BREMERONTON, WASHINGTON

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LEGEND:

- ▲ GROUP A COMMUNITY WATER SYSTEM
- ▲ GROUP B WATER SYSTEM
- TIME OF TRAVEL ASSIGNED
- TIME OF TRAVEL 6 MO
- TIME OF TRAVEL 1 YR
- TIME OF TRAVEL 5 YR
- TIME OF TRAVEL 10 YR
- SURFACE WATER PROTECTION AREA

WELLS LABELED WITH PUBLIC WATER SUPPLY ID

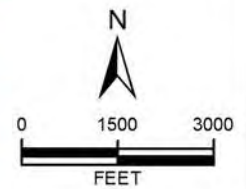
LEGEND:

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- ▭ CITY OF BREMEROTON
- STATE ROUTE
- WETLAND / MARSH / BEACH
- LAKE
- PUGET SOUND

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 WA STATE PLANE NORTH, NAD83(HARN) NAVD88, US SURVEY FEET.

WADOH: WELLS, TIME OF TRAVEL, PROTECTION AREAS 2016
 KITSAP CO: CITY BOUNDARY, URBAN GROWTH BOUNDARY, WATER
 WADNR: WATER, STREAMS
 WSDOT: HIGHWAYS

LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE

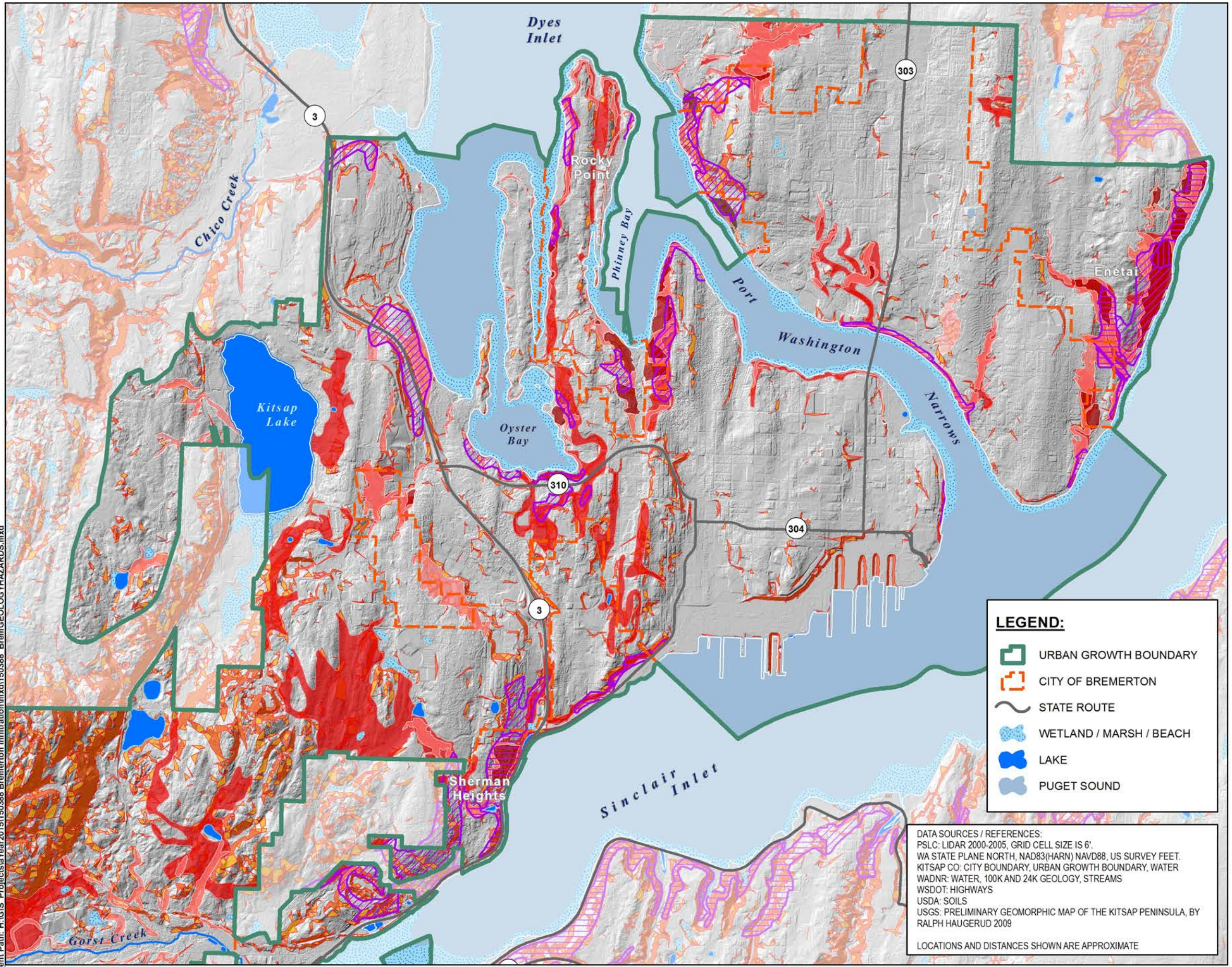


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COMMUNITY WATER SUPPLY SYSTEMS
 CITY OF BREMEROTON
 INFILTRATION ASSESSMENT
 BREMEROTON, WASHINGTON

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LEGEND:

- URBAN GROWTH BOUNDARY
- CITY OF BREMEROTON
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- WETLAND / MARSH / BEACH
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 WSDOT: HIGHWAYS
 USDA: SOILS
 USGS: PRELIMINARY GEOMORPHIC MAP OF THE KITSAP PENINSULA, BY RALPH HAUGERUD 2009

LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE

LEGEND:

COASTAL ZONE ATLAS - SLOPE CLASS

- INTERMEDIATE SLOPE
- UNSTABLE SLOPE
- UNSTABLE OLD SLIDE
- UNSTABLE RECENT SLIDE

GEOMORPHOLOGY HILLSLOPE UNIT

- r - RILLED SLOPE
- h; h0 - HILLSLOPE, OLDER HILLSLOPE
- ls; ls? - LANDSLIDE, LANDSLIDE?

SOIL STEEP SLOPE AREA

- STEEPLY SLOPING

GEOLOGY 24K QUADS

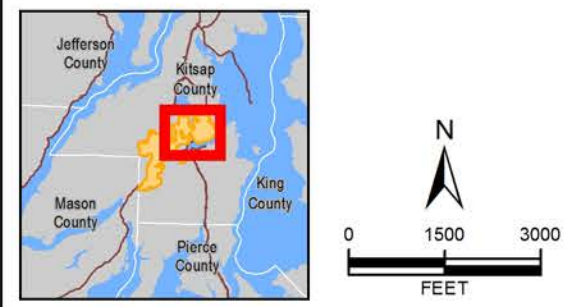
- Qvls; Qls - LANDSLIDE

GEOLOGY 100K SERIES

- Qls - LANDSLIDE DEPOSIT

PERCENT SLOPE FROM LIDAR

- >40%
- 30 - 40 %

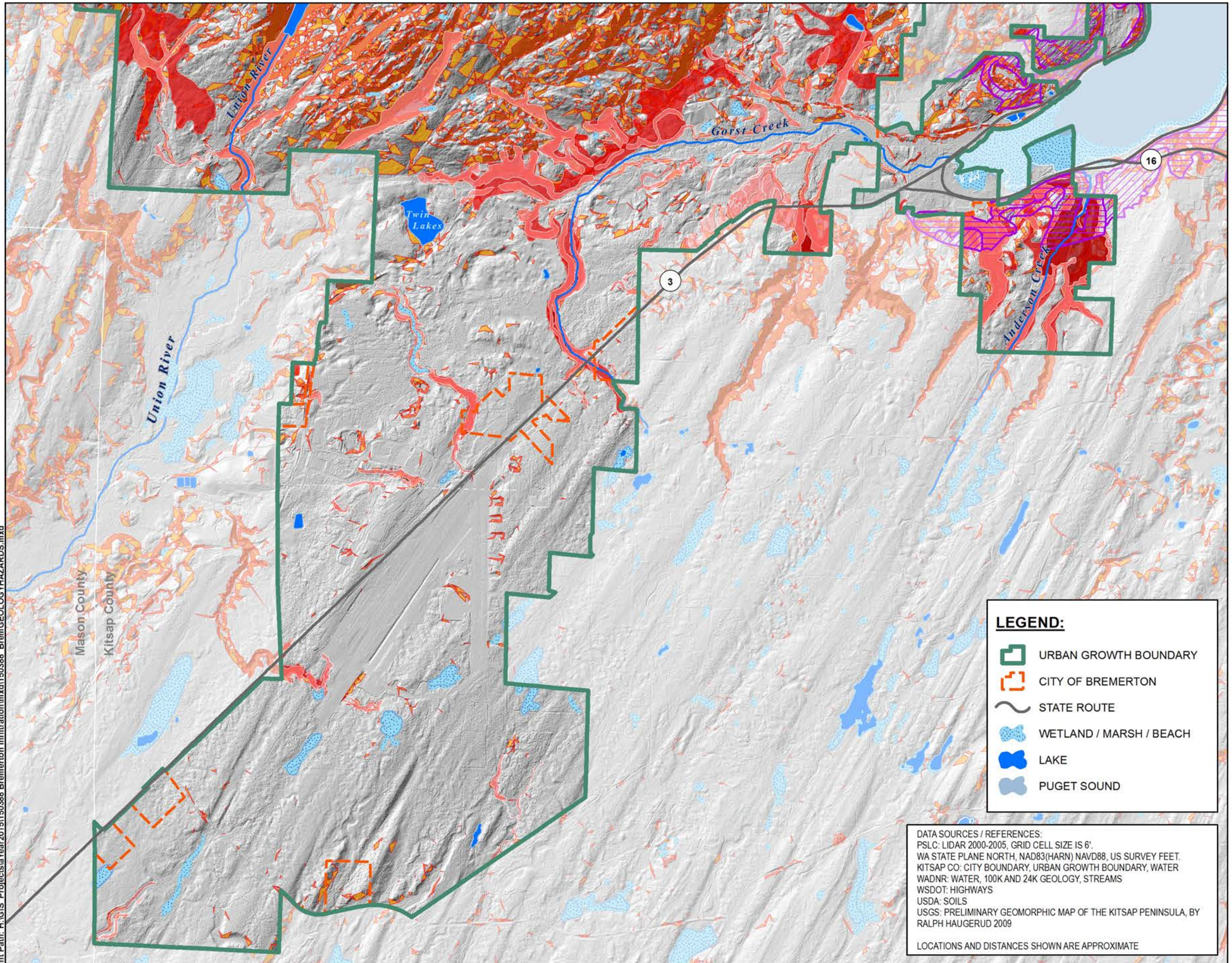


BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION



GEOLOGICALLY HAZARDOUS AREAS
 CITY OF BREMEROTON
 INFILTRATION ASSESSMENT
 BREMEROTON, WASHINGTON

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LEGEND:

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LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE

LEGEND:

COASTAL ZONE ATLAS - SLOPE CLASS

- INTERMEDIATE SLOPE
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- UNSTABLE OLD SLIDE
- UNSTABLE RECENT SLIDE

GEOMORPHOLOGY HILLSLOPE UNIT

- r - RILLED SLOPE
- h; h0 - HILLSLOPE, OLDER HILLSLOPE
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SOIL STEEP SLOPE AREA

- STEEPLY SLOPING

GEOLOGY 24K QUADS

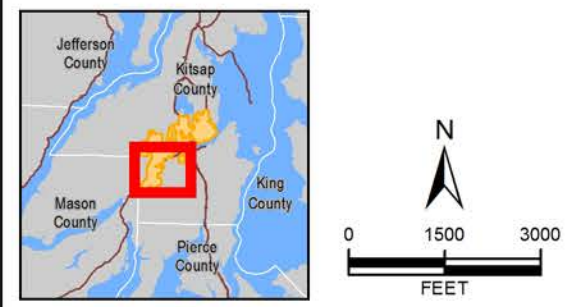
- Qvls; Qls - LANDSLIDE

GEOLOGY 100K SERIES

- Qls - LANDSLIDE DEPOSIT

PERCENT SLOPE FROM LIDAR

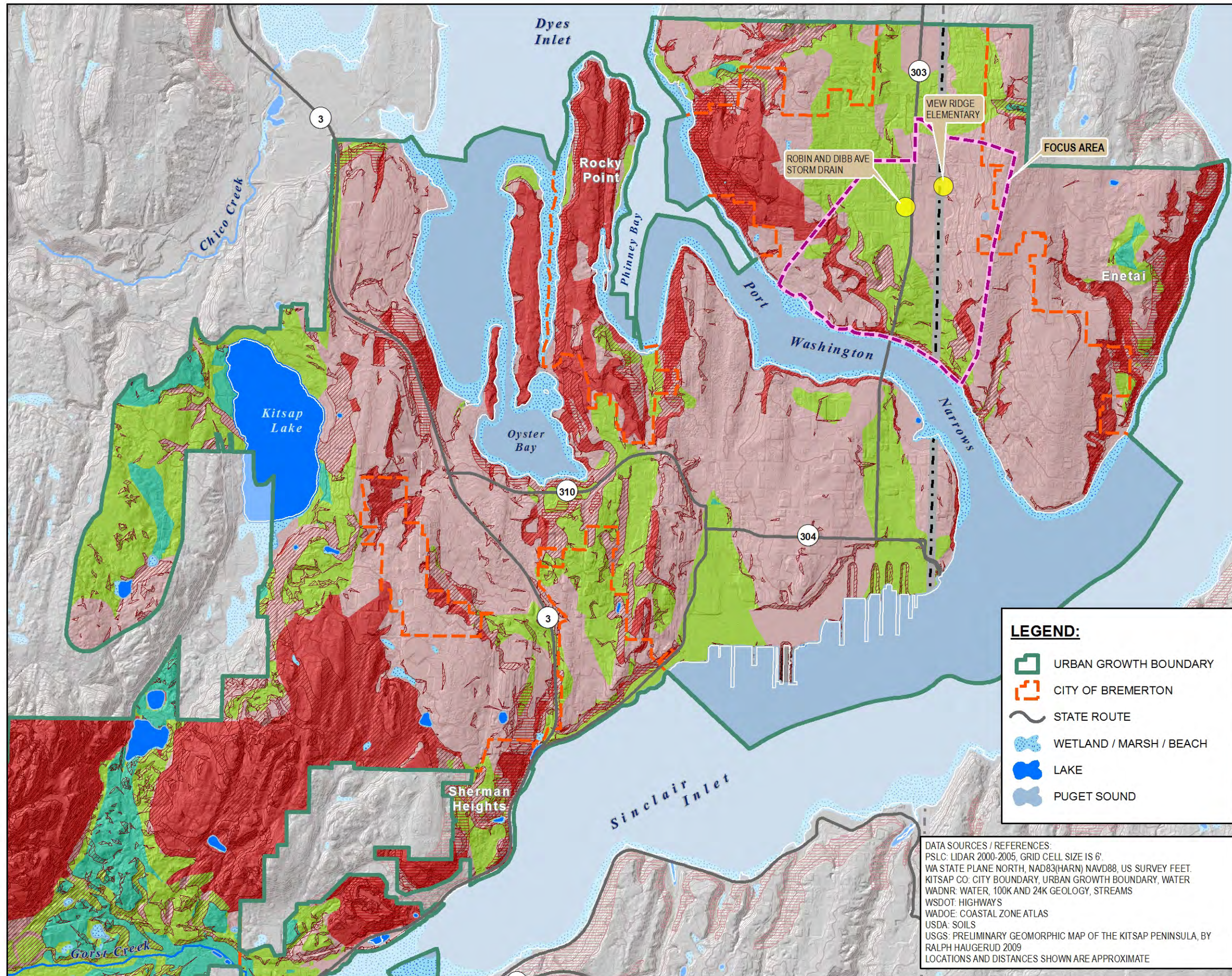
- >40%
- 30 - 40 %



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GEOLOGICALLY HAZARDOUS AREAS
 CITY OF BREMERONTON
 INFILTRATION ASSESSMENT
 BREMERONTON, WASHINGTON



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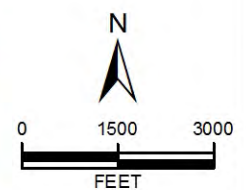
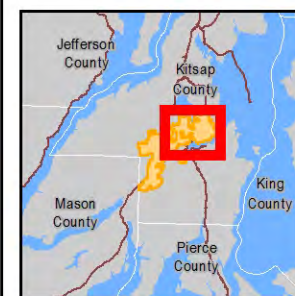
INFILTRATION POTENTIAL

- VERY LOW
- LOW
- MODERATE
- HIGH
- DRAINAGE FOCUS AREAS
SEE TEXT
- STEEP SLOPE / GEOLOGIC HAZARD AREA
- COASTAL ZONE ATLAS HAZARD AREA
- USGS QUADRANGLE BOUNDARY

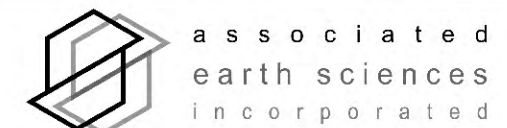
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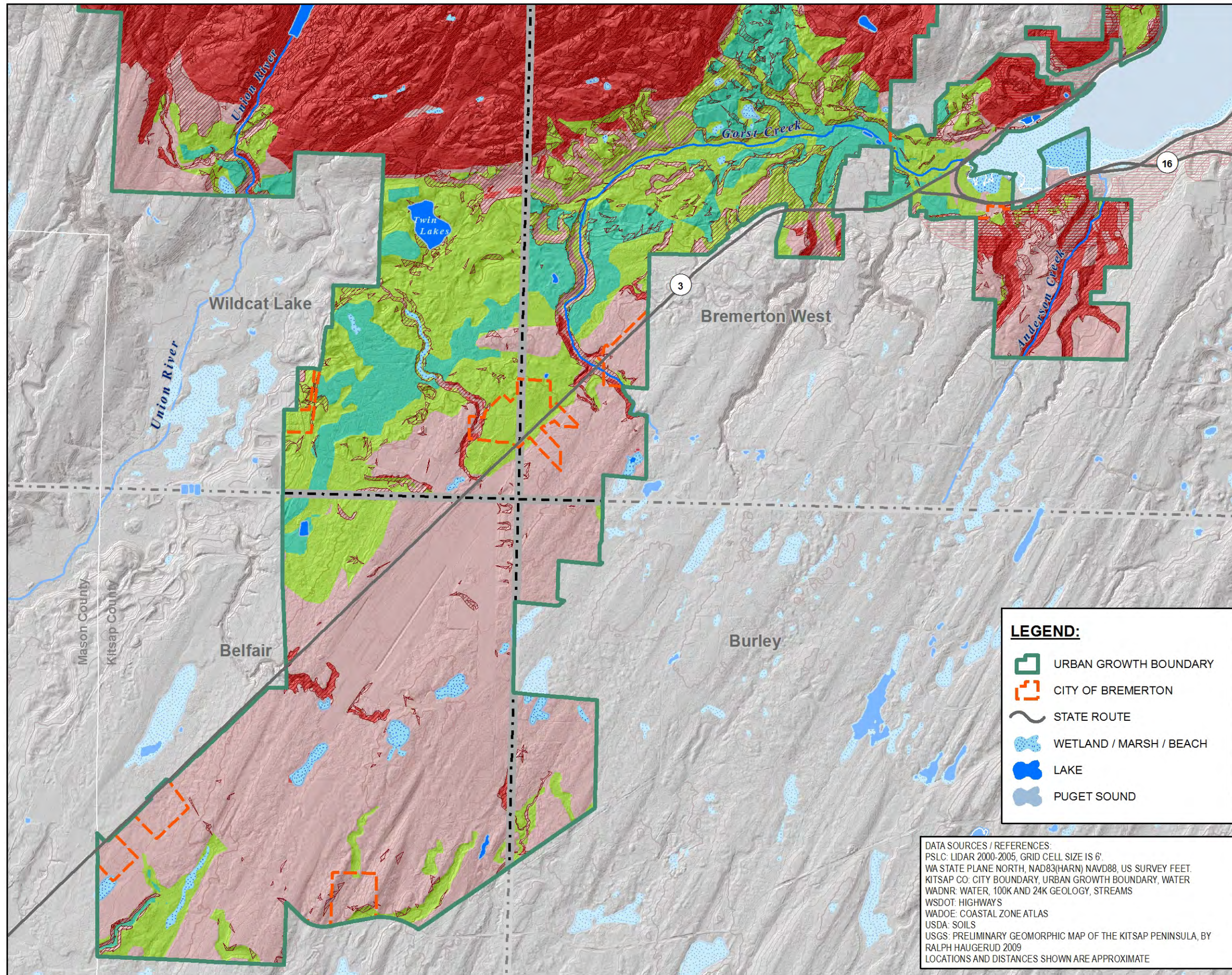
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**SHALLOW INFILTRATION
 POTENTIAL
 CITY OF BREMERTON
 INFILTRATION ASSESSMENT
 BREMERTON, WASHINGTON**



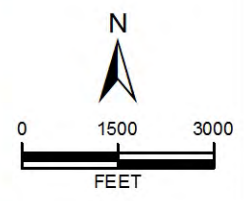
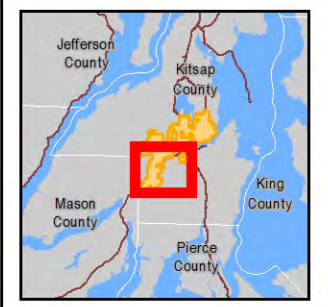
LEGEND:

- INFILTRATION POTENTIAL**
- VERY LOW
 - LOW
 - MODERATE
 - HIGH
 - DRAINAGE FOCUS AREAS
SEE TEXT
 - STEEP SLOPE / GEOLOGIC HAZARD AREA
 - COASTAL ZONE ATLAS HAZARD AREA
 - USGS QUADRANGLE BOUNDARY

LEGEND:

- URBAN GROWTH BOUNDARY
- CITY OF BREMERTON
- STATE ROUTE
- WETLAND / MARSH / BEACH
- LAKE
- PUGET SOUND

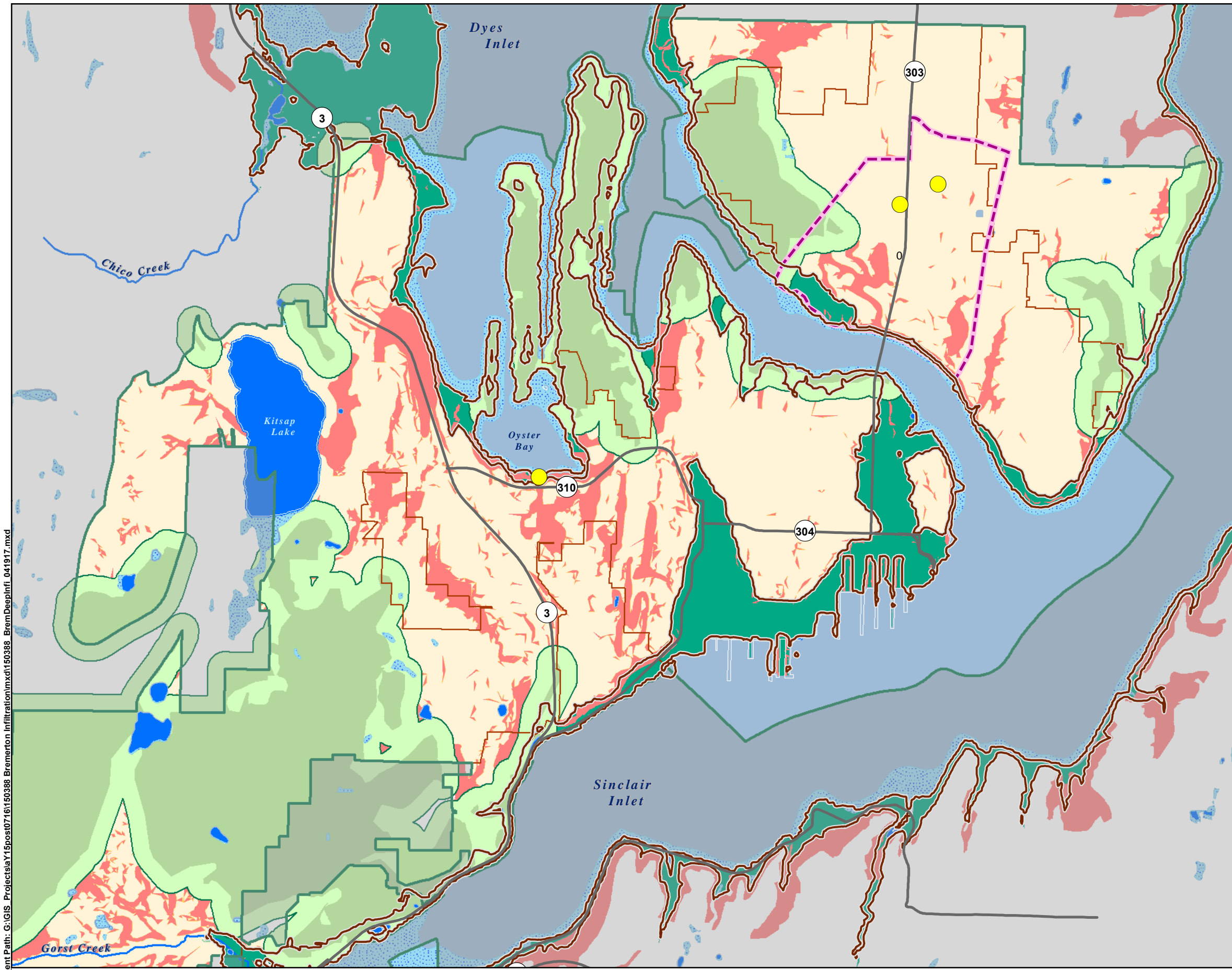
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 WA STATE PLANE NORTH, NAD83(HARN) NAVD88, US SURVEY FEET.
 KITSAP CO: CITY BOUNDARY, URBAN GROWTH BOUNDARY, WATER
 WADNR: WATER, 100K AND 24K GEOLOGY, STREAMS
 WSDOT: HIGHWAYS
 WADOE: COASTAL ZONE ATLAS
 USDA: SOILS
 USGS: PRELIMINARY GEOMORPHIC MAP OF THE KITSAP PENINSULA, BY
 RALPH HAUGERUD 2009
 LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE



BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION



**SHALLOW INFILTRATION
 POTENTIAL
 CITY OF BREMERTON
 INFILTRATION ASSESSMENT
 BREMERTON, WASHINGTON**

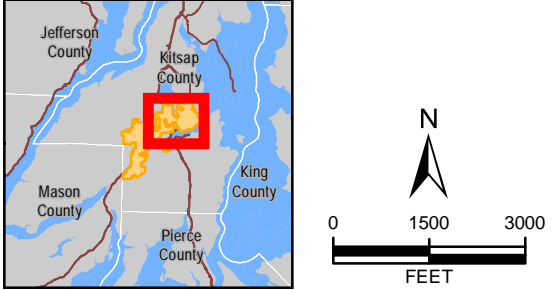


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LEGEND:

- DRAINAGE FOCUS AREAS
SEE TEXT
- FOCUS AREA
- MODERATE DEEP POTENTIAL
- BEDROCK AND PRE VASHON
- BUFFER 500 FT
- GEOLOGICAL HAZARD AREA
- URBAN GROWTH BOUNDARY
- CITY OF BREMERTON
- 50 FOOT CONTOUR
- WETLAND / MARSH / BEACH
- LAKE
- PUGET SOUND
- AREA LESS THAN 50 FT MSL

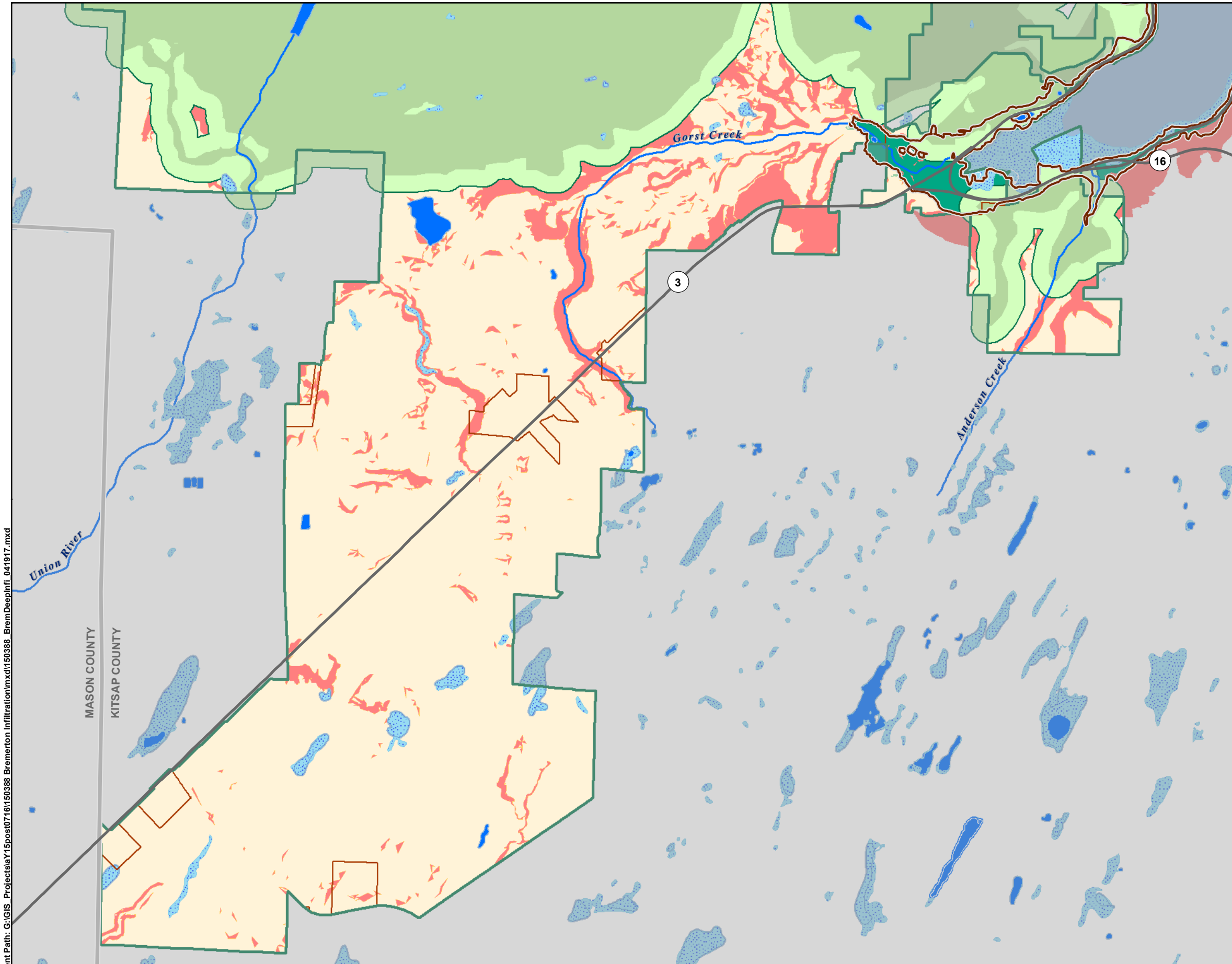
DATA SOURCES / REFERENCES:
 PSLC: LIDAR 2000-2005, GRID CELL SIZE IS 6'.
 WA STATE PLANE NORTH, NAD83(HARN) NAVD88, US SURVEY FEET.
 KITSAP CO: CITY BOUNDARY, URBAN GROWTH BOUNDARY, WATER
 WADNR: WATER, 100K AND 24K GEOLOGY, STREAMS
 WSDOT: HIGHWAYS
 WADOE: COASTAL ZONE ATLAS
 USDA: SOILS
 USGS: PRELIMINARY GEOMORPHIC MAP OF THE KITSAP PENINSULA, BY RALPH HAUGERUD 2009
 LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE



BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION



DEEP INFILTRATION POTENTIAL
 CITY OF BREMERTON
 INFILTRATION ASSESSMENT
 BREMERTON, WASHINGTON

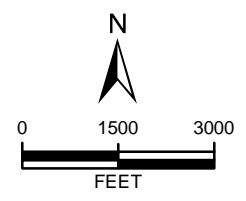
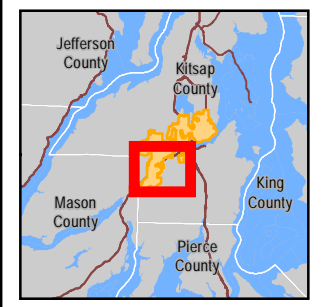


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LEGEND:

-  DRAINAGE FOCUS AREAS
SEE TEXT
-  FOCUS AREA
-  MODERATE DEEP POTENTIAL
-  BEDROCK AND PRE VASHON
-  BUFFER 500 FT
-  GEOLOGICAL HAZARD AREA
-  URBAN GROWTH BOUNDARY
-  CITY OF BREMERTON
-  50 FOOT CONTOUR
-  WETLAND / MARSH / BEACH
-  LAKE
-  PUGET SOUND
-  AREA LESS THAN 50 FT MSL

DATA SOURCES / REFERENCES:
 PSLC: LIDAR 2000-2005, GRID CELL SIZE IS 6'.
 WA STATE PLANE NORTH, NAD83(HARN) NAVD88, US SURVEY FEET.
 KITSAP CO: CITY BOUNDARY, URBAN GROWTH BOUNDARY, WATER
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 RALPH HAUGERUD 2009
 LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE



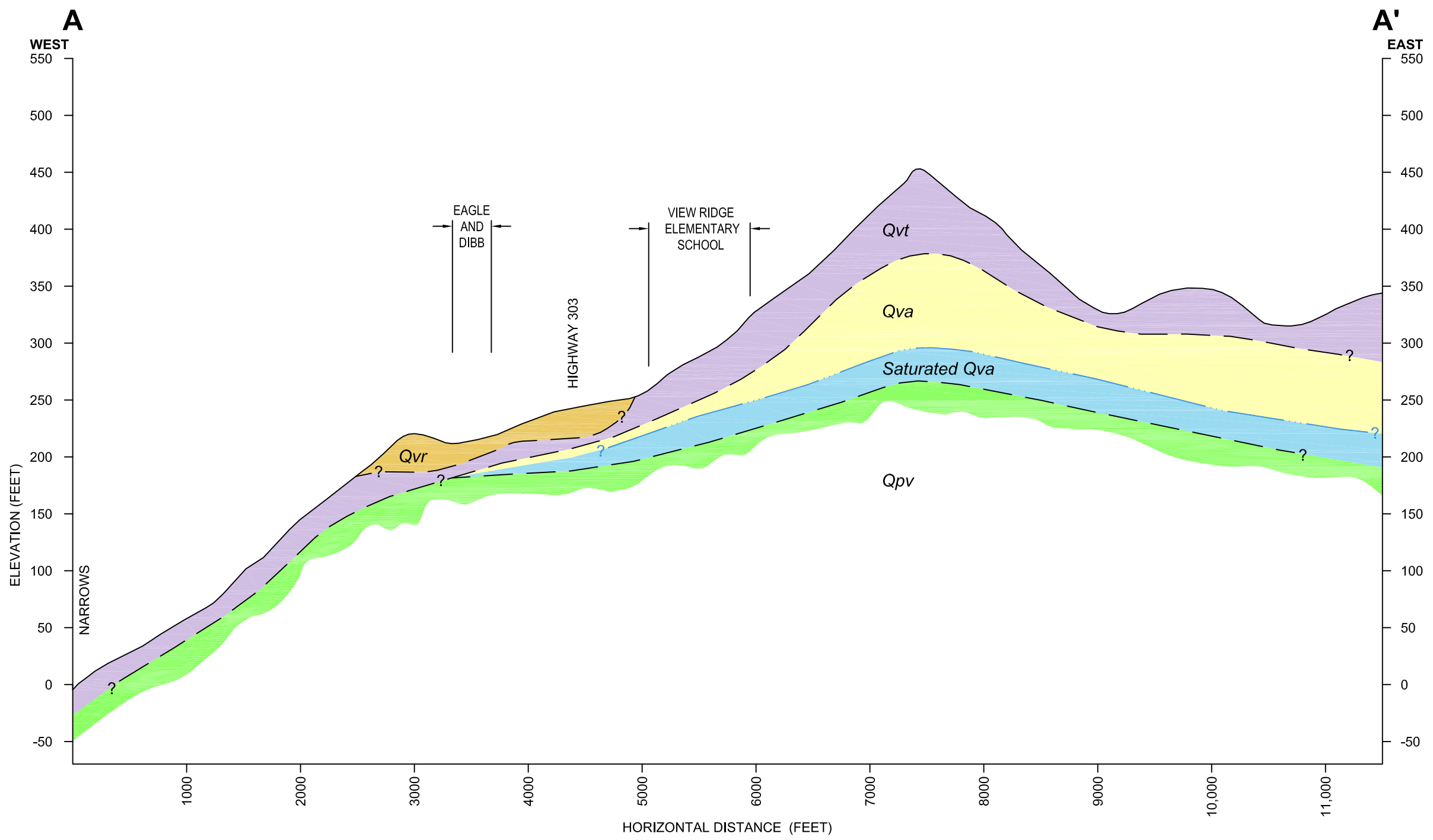
BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION



DEEP INFILTRATION POTENTIAL
 CITY OF BREMERTON
 INFILTRATION ASSESSMENT
 BREMERTON, WASHINGTON

PROJ NO. KH150388A	DATE: 4/17	FIGURE: 8B
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150388 Bremerton Infiltrate \ 150388 GeoSect.dwg LAYOUT: F9 Sect A-A



LEGEND:

- Qvr VASHON RECESSIONAL OUTWASH
- Qvt VASHON LODGEMENT TILL
- Qva VASHON ADVANCE OUTWASH
- Qpv PRE-VASHON DEPOSITS - UNDIFFERENTIATED

GEOLOGIC CONTACT
 REGIONAL GROUND WATER TABLE

VERTICAL EXAGGERATION = 10X

NOTE: LOCATION AND DISTANCES SHOWN ARE APPROXIMATE

NOTES:

1. THE SUBSURFACE CONDITIONS PRESENTED IN THIS GEOLOGIC CROSS-SECTION ARE BASED ON AN INTERPRETATION OF CONDITIONS FROM RELEVANT SITE INFORMATION DEVELOPED AND PROVIDED BY OTHERS. THE SUBSURFACE INTERPRETATIONS PRESENTED IN THIS GEOLOGIC CROSS-SECTION SHOULD NOT BE CONSTRUED AS A WARRANTY OF ACTUAL SUBSURFACE CONDITIONS AT THE SITE. OUR EXPERIENCE HAS SHOWN THAT SOIL AND GROUND WATER CONDITIONS CAN VARY SIGNIFICANTLY OVER SMALL DISTANCES.

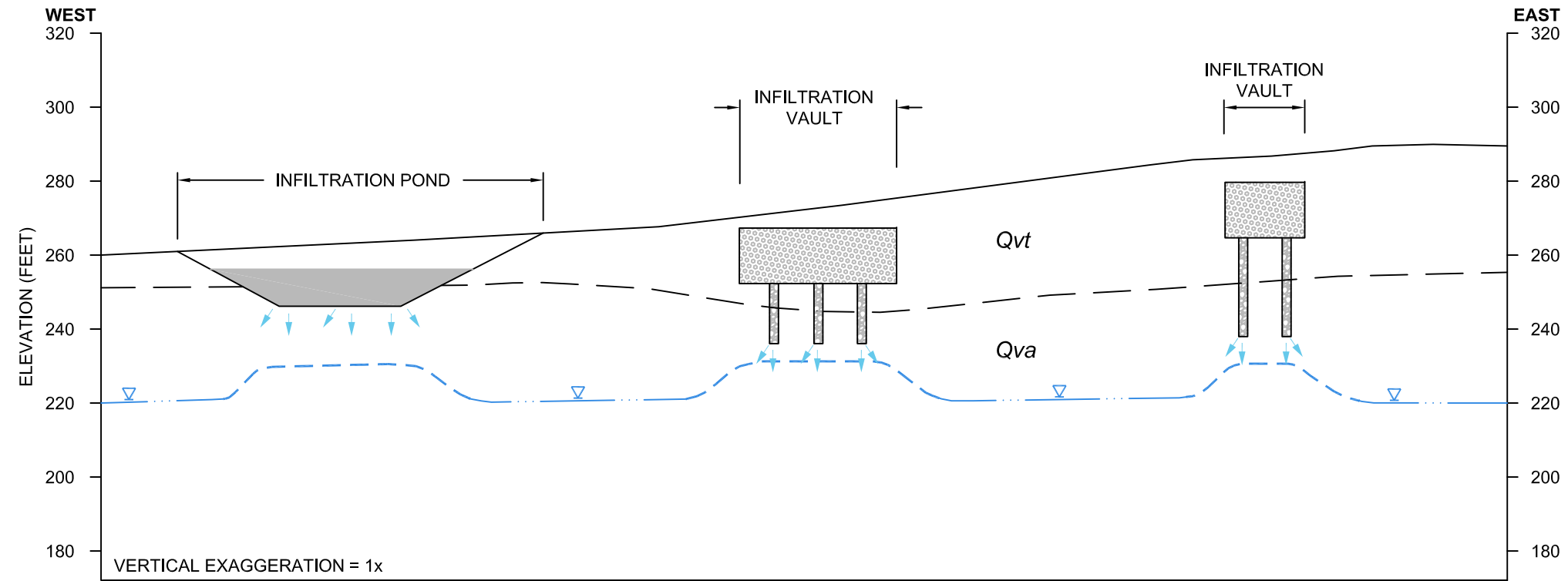
NOTE: BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION



**SCHEMATIC GEOLOGIC
CROSS-SECTION A - A'**
CITY OF BREMERTON INFILTRATION ASSESSMENT
BREMERTON, WASHINGTON

PROJ NO.	DATE:	FIGURE:
KH150388A	3/17	9

DETAIL 1 - VIEW RIDGE ELEMENTARY SCHOOL



LEGEND:

- Qvr VASHON RECESSONAL OUTWASH
- Qvt VASHON LODGEMENT TILL
- Qva VASHON ADVANCE OUTWASH
- Qpv PRE-VASHON DEPOSITS - UNDIFFERENTIATED
- GEOLOGIC CONTACT
- ▽ PERCHED GROUND WATER OR AQUIFER
- - - POTENTIAL GROUND WATER MOUND
- SAND FILTER MEDIA
- ▨ DRILLED DRAIN (UIC WELL) OR PIT DRAIN - PEA GRAVEL BACKFILLED
- ▩ INFILTRATION VAULT GRAVEL BACKFILLED

VERTICAL EXAGGERATION = 1X

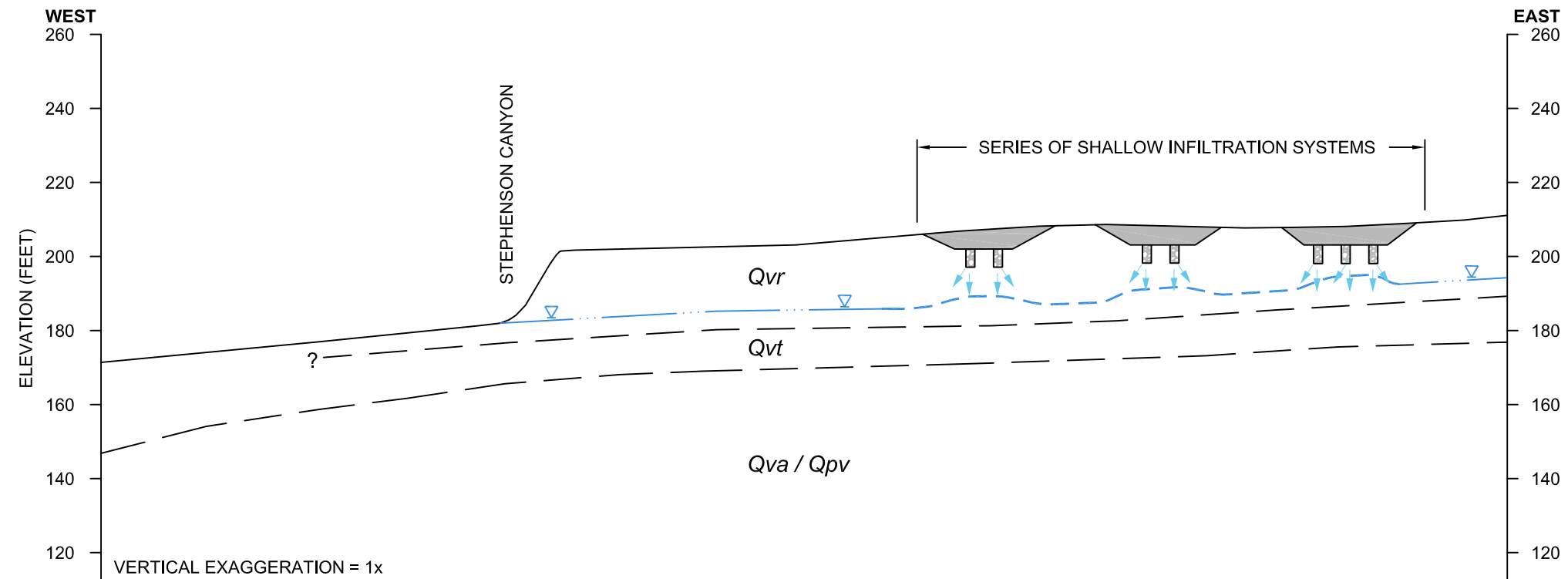
NOTE: LOCATION AND DISTANCES SHOWN ARE APPROXIMATE

NOTES:

1. THE SUBSURFACE CONDITIONS PRESENTED IN THIS GEOLOGIC CROSS-SECTION ARE BASED ON AN INTERPRETATION OF CONDITIONS FROM RELEVANT SITE INFORMATION DEVELOPED AND PROVIDED BY OTHERS. THE SUBSURFACE INTERPRETATIONS PRESENTED IN THIS GEOLOGIC CROSS-SECTION SHOULD NOT BE CONSTRUED AS A WARRANTY OF ACTUAL SUBSURFACE CONDITIONS AT THE SITE. OUR EXPERIENCE HAS SHOWN THAT SOIL AND GROUND WATER CONDITIONS CAN VARY SIGNIFICANTLY OVER SMALL DISTANCES.

2. THE SCHEMATIC INFILTRATION DETAILS ARE TO ILLUSTRATE CONCEPTUAL INFILTRATION STRATEGIES. NO SUBSURFACE EXPLORATION HAS BEEN COMPLETED AT THE SITE.

DETAIL 2 - EAGLE AND DIBB AREA



NOTE: BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION



**SCHEMATIC INFILTRATION
DETAILS 1 AND 2**
CITY OF BREMERTON INFILTRATION ASSESSMENT
BREMERTON, WASHINGTON

PROJ NO. KH150388A DATE: 3/17 FIGURE: 10

APPENDIX D: KITSAP COUNTY & CITY OF PORT ORCHARD MOU

MEMORANDUM OF
UNDERSTANDING BETWEEN
KITSAP COUNTY AND THE CITY OF
BREMERTON

PURPOSE AND PARTIES

This Memorandum of Understanding (MOU) is made and entered into by and between Kitsap County (County) and the City of Bremerton (City) to memorialize each parties' intent to cooperate with the other in order to comply with the coordination requirements of the 2019 Western Washington NPDES Phase II Municipal Stormwater Permit (Permit).

RECITALS

A. WHEREAS, both the County and the City are "Permittees" under the Permit and are required to develop and update maps containing the identified information contained in Section S5.C(4)(a) of the Permit relative to Municipal Separate Stormwater Sewer System (MS4) Mapping and Documentation;

B. WHEREAS, Section S5.C(4)(a)(vi) requires Permittees to map "connections between the Municipal Separate Storm Sewer System (MS4) owned or operated by the Permittee and other municipalities or public entities;"

C. WHEREAS, Section S5.C(4)(e) requires that Permittees "upon request, and to the extent appropriate... provide mapping information to federally-recognized Indian Tribes, municipalities, and other Permittees." This Section also does not preclude Permittees from recovering reasonable costs associated with fulfilling the mapping information request;

D. WHEREAS, Section S5.A(5)(a) requires Permittees to coordinate with each other in adjoining or shared areas, including for the control of pollutants between physically interconnected MS4s and carrying out activities in ways that do not conflict with the plans, policies and regulations of the other;

E. WHEREAS, mutual benefits will accrue to the parties when collaborating and sharing data required under the Permit; and

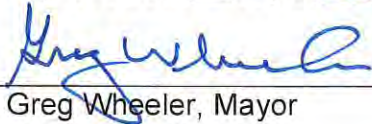
NOW THEREFORE, the County and City wish to cooperate in providing the mapping information as follows:

AGREEMENT

1. The departments of public works for each party shall collaborate and share data relating to stormwater connections across jurisdictional boundaries, as well as any other mapping information necessary under the Permit. This data will be shared at least once a year.
2. When necessary, at mutually agreeable times and locations, personnel from each department of public works shall meet to discuss the mapping information and any changes.
3. Each party shall bear their own costs associated with developing the mapping information and shall share such information without costs to the other party.
4. Each party shall hold the other harmless for any errors in mapping information, but shall work diligently and in good faith to provide accurate information.
5. Each party shall use best efforts to inform the other upon learning of a transfer of pollutants between their interconnected MS4s and shall work cooperatively towards any necessary resolution.
6. Each party agrees to use best efforts to coordinate stormwater management activities in shared water bodies or watersheds so as to not conflict with the other's plans, policies or regulations.
7. The point of contact for the County shall be the Stormwater Asset Program Manager and the point of contact for the City shall be the Stormwater Permit Coordinator.
8. This Memorandum of Understanding (MOU) will remain in force and effect until July 31, 2024, which is the expiration of the 2019 Permit, unless revoked or otherwise amended by the parties. The term of the MOU may be extended by agreement of the parties.

CITY OF BREMERTON

Approved this 30th day of March, 2021

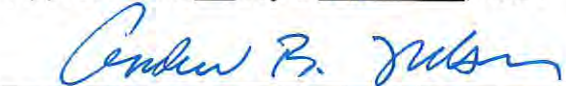


Greg Wheeler, Mayor

City of Bremerton

KITSAP COUNTY

Approved this 19 day of April, 2021



Andrew Nelson

Kitsap County Public Works Director
under Resolution 024-2015

Contract No. 076-22

**MEMORANDUM OF
UNDERSTANDING BETWEEN
THE CITY OF PORT ORCHARD AND THE
CITY OF BREMERTON**

PURPOSE AND PARTIES

This Memorandum of Understanding (MOU) is made and entered into by and between City of Port Orchard (Port Orchard) and the City of Bremerton (Bremerton) to memorialize each parties' intent to cooperate with the other in order to comply with the mapping requirements of the 2019 Western Washington NPDES Phase II Municipal Stormwater Permit (Permit).

RECITALS

A. WHEREAS, both Port Orchard and Bremerton are "Permittees" under the Permit and are required to develop and update maps containing the identified information contained in Section S5.C(4)(a) of the Permit relative to Municipal Separate Stormwater Sewer System (MS4) Mapping and Documentation;

B. WHEREAS, Section S5.C(4)(a)(vi) requires Permittees to map "connections between the Municipal Separate Storm Sewer System (MS4) owned or operated by the Permittee and other municipalities or public entities;"

C. WHEREAS, Section S5.C(4)(e) requires that Permittees "upon request, and to the extent appropriate... provide mapping information to federally-recognized Indian Tribes, municipalities, and other Permittees." This Section also does not preclude Permittees from recovering reasonable costs associated with fulfilling the mapping information request;

D. WHEREAS, Section S5A(5)(a) requires Permittees to coordinate with Permittees in adjoining or shared areas relative to Illicit Discharge Detection and Elimination;

E. WHEREAS, mutual benefits will accrue to the parties when collaborating and sharing data required under the Permit; and

NOW THEREFORE, both Cities wish to cooperate in providing the mapping information as follows:

AGREEMENT

1. The departments of public works for each party shall collaborate and share data relating to stormwater connections across jurisdictional boundaries, as well as any other mapping information necessary under the Permit. This data will be shared at least once a year.
2. When necessary, at mutually agreeable times and locations, personnel from each department of public works shall meet to discuss the mapping information and any changes.
3. Each party shall bear their own costs associated with developing the mapping information or producing the information to the other party, and shall share such

information without costs to the other party.

4. Each party acknowledges that the mapping information exchanged pursuant to this Agreement is not certified, survey-grade mapping information. Each party shall work diligently and in good faith to provide accurate information, and shall have no claim or right of indemnification against the other for the accuracy of the information provided.
5. To clarify roles and responsibilities, the jurisdiction where a discharge occurs will inform the other jurisdiction of any spills or illicit discharges into the neighboring jurisdiction.
6. Each party agrees stormwater management activities won't conflict with regional plans, policies or regulations.
7. The point of contact for Port Orchard shall be the Stormwater Program Manager and the point of contact for Bremerton shall be the Stormwater Permit Coordinator.
8. This Memorandum of Understanding (MOU) will remain in force and effect until July 31, 2024, which is the expiration of the 2019 Permit, unless revoked or otherwise amended by the parties. Either party may terminate this agreement by providing thirty (30) days written notice to the non-terminating party. The term of the MOU may be extended by agreement of the parties.

CITY OF BREMERTON

CITY OF PORT ORCHARD

Approved this ___ day of _____, 2022

Approved this 24th day of May, 2022

DocuSigned by:

Greg Wheeler

BAF46095E8E747B...

Greg Wheeler
Mayor
City of Bremerton

DocuSigned by:

Robert Putaansuu

F89E88B5D0E74EF

Robert Putaansuu
Mayor
City of Port Orchard

APPENDIX E: EXECUTIVE STORMWATER COORDINATION POLICY

CITY OF BREMERTON		Municipal NPDES Stormwater Permit Compliance Coordination for all City Departments
INDEX 2-30-14	EFFECTIVE DATE: July 1, 2015 REVIEW DATE: <i>11/18/2018</i> REVISED DATE:	APPROVED <i>Patty Lent</i>

Goal:

The City of Bremerton was issued a Western Washington Phase II Municipal Stormwater Permit (Permit) by the Washington State Department of Ecology (Ecology) in 2007. The Permit is a National Pollutant Discharge Elimination System (NPDES) federal permit that allows municipal separate stormwater sewer systems (MS4) to discharge to waters of the state. The Permit includes broad ranging requirements that impact many City departments.

The updated Permit, January 2014, (Section S5.A.5.b) requires a coordination mechanism among departments to eliminate barriers to compliance with the terms of the permit. This policy provides clarification of departmental roles and responsibilities to comply with the Permit. Permit updates may add further requirements which will be defined and distributed through the Stormwater Permit Coordination Group to the affected department.

Permits - Stormwater Program:

- 1) NPDES Phase II Municipal Stormwater Permit #WAR04-5507: City-wide permit regulates stormwater discharges from the City's MS4. A stormwater pollution prevention plan (SWPPP) is required for City facilities, buildings, treatment plants and parks properties. Development and implementation is based on the Permit requirements and *Good Housekeeping Practices (Center for Watershed Protection - Manual 9)*.
- 2) Industrial Stormwater General Permit (ISGP): Port of Bremerton (POB) operates under an ISGP issued and enforced by Ecology, #WAR-000901. The City works with the POB to provide education and support. The airport, industrial park and private roadways are covered by the POB's ISGP. Annual reports to Ecology are prepared by POB.
- 3) Conditional No-Exposure Exemption (CNE): Bremerton's Wastewater Treatment Plant (WWTP) has a CNE issued by Ecology. The WWTP maintains compliance with and requests renewal as needed.
- 4) Construction Stormwater General Permit: Issued and enforced by Ecology for construction projects that disturb > 1 acre of land. The City of Bremerton inspects and documents Temporary Erosion and Sediment Control (TESC) installation, condition and effectiveness to protect the City's stormwater system from pollutants. The project manager/contractor is responsible to

comply with this permit's requirements.

Note:

NPDES Waste Discharge Permit #WA-002928-9 is separate from the Stormwater Permit: WWTP permit regulates the operation of the WWTPs and combined sewer overflow outfalls. Compliance and reporting is managed by the Wastewater Utility Manager.

Policies:

- 1) The Permit is a broad ranging federal municipal stormwater permit requiring citywide compliance.
- 2) Lead Department: The Public Works and Utilities Department (PW&U) shall be the City's lead for coordinating compliance with the Permit. PW&U shall be responsible to identify compliance requirements and each Department is responsible to implement these requirements at facilities or for activities under their purview.
- 3) Departments responsible for any portion of the Permit shall work cooperatively with the Lead Department by understanding and fulfilling their responsibilities and responding to and providing accurate tracking and reporting information in a timely manner when requested.
- 4) Lead Department shall inform all City staff of the general hazards associated with illicit discharges and improper disposal of waste (Section S5.C.3.iv).
- 5) All municipal field staff and first responders, including Fire and Police, are responsible for reporting illicit discharges and spills to the City's Spill Hotline (360) 473-5920.
- 6) All departments are responsible for working with the NPDES Permit Coordinator to resolve instances of Permit noncompliance, including:
 - a. General terms and conditions of the Permit
 - b. Administrative, development, and implementation of Permit requirements
 - c. Reporting, tracking, and documentation of required activities
 - d. Identifying steps and a timeline for resolving issues of non-compliance, and submit as a Non-Compliance Notification to Ecology for failure to comply with permit terms and conditions. Required within 30 days of becoming aware of a non-compliance issue.
- 7) Compliance with Standards
 - a. All City operations with potential to impact stormwater shall follow applicable building and land management standards, including:
 - Site specific Stormwater Pollution Prevention Plan (SWPPP)
 - Stormwater Management Manual for Western Washington
 - Good Housekeeping Practices (Center for Watershed Protection - Manual 9)

- City of Bremerton Integrated Vegetation Management Plan
- 8) Stormwater development review, inspection, and stormwater and road maintenance activities shall use applicable manuals, policies, and guidelines listed below or as updated:
- Bremerton Municipal Code Chapter 15.04.020 – Adoption of Manuals
 - City of Bremerton Stormwater Maintenance Manual
 - Regional Road Maintenance ESA Program Guidelines
- 9) Departments are responsible for understanding, implementing and meeting Permit requirements including: training staff, implementing policies, keeping records, and providing accurate tracking and reporting data for the programs under their responsibility.
- 10) Fines and penalties for non-compliance: Ecology performs periodic Permit compliance audits. Fines can be issued for areas of non-compliance. When a fine is issued it will be paid for by the department in violation. Ecology and third parties, including citizens and environmental groups, can sue municipalities for not complying with permits. Penalties for non-compliance include fines of up to \$10,000/day/violation.

11) Departmental Responsibilities

It is the responsibility of the department director to assign duties and responsibilities to appropriate members of their staff and ensure they are being implemented correctly.

a. **Executive – Mayor**

The Mayor is responsible for certifying compliance with the terms of the Permit for the stormwater system the City owns or operates. The City is required to comply with all conditions of the Permit, including any appendices referenced therein. Certification of compliance with the Permit states:

“I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that Qualified Personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for willful violations.”

b. **Public Works and Utilities**

Stormwater Permit compliance requirements are included in the Permit itself, and Sections: S5.C.1 Public Education and Outreach, S5.C.2 Public Involvement, S5.C.3 Illicit Discharge Detection and Elimination (IDDE),

S5.C.5 Operations and Maintenance, and S5.C.4. Controlling Runoff from New Development, Redevelopment and Construction Sites.

The City's NPDES Stormwater Permit Coordinator reports to the Water Resources Manager who reports to the PW&U Director. The NPDES Permit Coordinator's duties include:

- Prepare and submit Stormwater Permit submittals to Ecology.
- Coordinate Stormwater Permit efforts for the City, including: collecting, tracking and reporting data provided by departments, preparing and submitting annual reports and updates to Ecology.
- Chair the Stormwater Permit Coordination Group (see section 12).
- Assist City departments to identify and understand responsibilities for their sections of the Permit.
- Assist in the development and update of programs or procedures necessary to meet Permit requirements.
- Provide training as necessary or requested.
- Work with departments to identify and resolve issues of non-compliance, drafting and submitting Non-Compliance notifications to Ecology.
- Assist with illicit discharge detection and elimination (IDDE) identification and reporting training for City field staff.
- Assist with code integration and code revisions as required by the Permit.
- Oversee and review the Stormwater Utility Budget.
- Provide point of contact for Department of Ecology regarding issues of the Permit.
- Coordinate with local, state and federal agencies, as needed, to comply with the permit and stormwater projects.

Public Works Facilities Division:

- Conduct monthly inspections and coordinate maintenance of all city-owned or operated stormwater facilities located on properties under their purview (excluding Parks Department properties).
- Develop, implement and maintain Stormwater Pollution Prevention Plans (SWPPP) for city owned Facilities (excluding Parks Department properties).

Engineering Division:

Is responsible for general compliance and implementation of requirements in Section S5.C4 of the Stormwater Permit entitled "Controlling Runoff from New Development, Redevelopment and Construction Sites". These

responsibilities include, but are not limited to:

- Review development submittals with adopted standards and policies.
- Track development projects under construction.
- Track and justify deviations (e.g. variances, exceptions etc.) from adopted stormwater development standards.
- Inspect and ensure stormwater treatment, BMPs, and facilities are constructed and installed as approved through development plan review process.
- Inspect, document, and enforce TESC and source control BMPs for capital and development construction projects in the City.
- Conduct ongoing biannual inspection of all permanent stormwater treatment and flow control BMPs/facilities and catch basins in new residential developments until the developments reach 90% buildout.
- Collect and distribute final as-built stormwater system drawings for new developments and redevelopments to designated GIS and Public Works staff.
- Ensure new developments and redevelopments submit stormwater system maintenance manuals and covenants for review, approval and recording prior to final approval and acceptance of the project.
- Ensure stormwater maintenance manuals are site or facility specific and in compliance with adopted guidance, manuals and standards.
- Distribute copies of recorded stormwater maintenance covenants, plats and maintenance obligations to appropriate supervisors and the Permit Coordinator.
- Update and maintain stormwater system GIS map with new and redeveloped stormwater facilities as projects are accepted and closed. Includes private and public systems as-built. (Operations and other field staff will provide mapping and data support through normal operations).
- Report all above and permit-required activities to the Permit Coordinator for the annual report or as requested.

c. Community Development

Responsible for general compliance and parts of Section S5.C4 of the Stormwater Permit entitled “Controlling Runoff from New Development, Redevelopment and Construction Sites”. These responsibilities include, but are not limited to:

- Report annexations.
- Update codes, policies, plans, programs, procedures, and standards as appropriate and applicable to the Planning Department to comply

with Permit requirements.

- Conduct development review in compliance with adopted standards and policies.
- Track development review.
- Update codes, policies, plans and standards, implemented by or under the purview of Community Development, with Engineering, necessary to meet requirements of the Permit.
- Report all above and permit required activities to the Permit Coordinator for the annual report or as requested.

d. Finance

- Track costs to implement Permit requirements by providing project numbers and accounting of expenditures to implement Permit requirements.
- Provide Geographic Information System (GIS) and database support that allows for mapping, documentation and tracking of activities performed by City departments and staff.
- Support GIS and database that enables City staff to update, modify and change map attributes in the field and enhances staff's ability to investigate IDDE issues.
- Support database development that provides the tools to document maintenance, construction site inspections, temporary erosion control and sediment issues, track correspondence and site work.

e. Parks and Recreation

- Develop, implement, and update Stormwater Pollution Prevention Plans (SWPPP) for stormwater facilities on Parks Department properties.
- Perform operation and maintenance activities following adopted building and land management standards (See section 6 of this policy).
- Inspect, maintain, and repair all stormwater systems, treatment and control BMPs/facilities; document as required by the Permit and site specific SWPPP.
- Provide stormwater system attributes and GIS mapping data for facilities under their purview.
- Provide maintenance and inspection reports to the Permit Coordinator for the annual report.

f. Police and Fire Departments

First responders can reduce the pollution potential of accidents, spills, and

fires. Although secondary to their primary mission, early assessment and dispatch request for cleanup efforts will reduce the impact of pollutants on the environment and stormwater system.

- When practical, implement spill containment and cleanup procedures.
- Call 911 to dispatch Public Works and Utilities for cleanup assistance, as needed.
- Notify Public Works and Utilities if pollutants enter the stormwater system or material needs to be cleaned up after an incident at (360) 473-5920 or 911 (CENCOM Dispatch).

Discharge from emergency firefighting activities is one of the very few non-stormwater flows authorized in the Permit. Notification that fire suppression materials entered the stormwater system to the Public Works and Utilities at (360) 473-5920 is necessary for cleanup and Permit reporting purposes.

However, foam or contaminated water from testing of pump equipment and foam suppression systems is not authorized to be disposed of in the stormwater system. The use of BMPs to disperse water and foam away from the stormwater system or ponds is required when training or testing equipment.

12) Stormwater Permit Coordination Group

A Stormwater Permit Coordination Group (SWPCG) will be created to effectively coordinate the broad ranging requirements of the Stormwater Permit. Affected departments include Community Development, Finance, Fire, Parks and Recreation, Police and Public Works and Utilities. A representative from each department shall be assigned to the coordination group. Additional departments may be added to support Permit requirements. A Stormwater Permit Coordination Group standard operating procedure will be developed.

