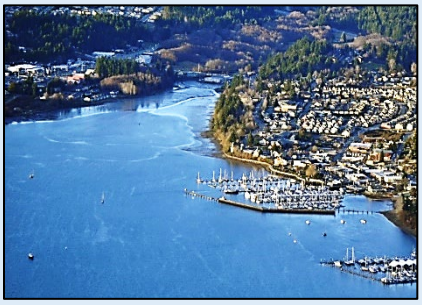
CITY OF POULSBO

STORMWATER MANAGEMENT ACTION PLAN





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ABBREVIATIONS AND ACROYNMS

ac	acre(s)
BMP	best management practice
CFP	Capital Facilities Plan
City	City of Poulsbo
Ecology	Washington State Department of Ecology
ESA	Endangered Species Act
FC	Fecal coliform
ft	foot/feet
GIS	geographic information system
ID	identifier
KPHD	Kitsap Public Health District
LID	low-impact development
LWD	large woody debris
mi	mile(s)
MS4	municipal separate storm sewer system
NA	not available
ND	no data
NPDES	National Pollutant Discharge Elimination System
Permit	Western Washington Phase II Municipal Stormwater Permit
PTIP	Poulsbo TMDL Implementation Plan
PIC	pollution identification and correction
RWA	Receiving Water Assessment
SFDC	South Fork Dogfish Creek
SMAP	Stormwater Management Action Plan
SR	State Route
SWCP	Stormwater Comprehensive Plan
SWMP	Stormwater Management Plan
T&E	threatened and endangered
UGA	Urban Growth Area
USFWS	United States Fish and Wildlife Service
WDFW	Washington Department of Fish and Wildlife
WDOH	Washington Department of Health
WQ	water quality
WSDOT	Washington State Department of Transportation

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EXECUTIVE SUMMARY

This Stormwater Management Action Plan (SMAP) has been prepared by the City of Poulsbo (City) pursuant to section S5.C.1.d of the 2019 Western Washington Phase II Municipal Stormwater Permit (Permit).

Receiving Water Assessment and Basin Prioritization

The Liberty Bay watershed encompasses all of the Poulsbo City Limits and UGA. The Liberty Bay watershed is about 22,000 acres in size. There are nine primary streams in the Liberty Bay watershed, five of which are all or partly located in the City.

The receiving water assessment (RWA) describes the City's receiving waters, stormwater contributing areas, beneficial uses, and the potential impacts of land use activities on those receiving waters. The RWA was used to guide basin prioritization and to identify the receiving waters that are most likely to benefit from stormwater management planning. The RWA and basin prioritization is summarized in Table 1.

Table 1. Basin Prioritization Summary.

Basin	Priority Rank
South Fork Dogfish Creek	1
Central Poulsbo	2
West Poulsbo	3
Poulsbo Creek	4
Bjorgen Creek	5
West Fork Dogfish Creek	6
Johnson Creek	7
Lemolo Creek	8
Barrantes Creek	9
East Fork Dogfish Creek	10

Priority Basin Characterization

The South Fork Dogfish Creek (SFDC) basin was determined to be the top priority basin in the City based on the combined receiving water assessment and stormwater management planning analysis. The SFDC scored slightly higher than the Central Poulsbo basin and significantly higher than the other seven basins in the City. The top ranking of the SFDC was influenced by both high

scores for the receiving water assessment and beneficial uses, as well as high score for stormwater management potential. Freshwater quality, land use, salmonid fish habitat, high capacity road miles and untreated total impervious area were all significant factors in SFDC priority ranking.

Stormwater Management Action Plan

The SMAP for the SFDC basin addresses existing land management programs, facilities, operation and maintenance, public education and outreach, operation and maintenance (O&M) and potential capital facility retrofits. Land use management, routine O&M, public education and enforcement activities are addressed under the City's existing stormwater program and no changes to these program elements are proposed.

Proposed SMAP actions included targeted enhanced maintenance to improve performance at older existing treatment facilities, and development of new system retrofits to treat runoff in high priority sub-basins. Approximately 15 existing facilities were identified that would benefit from O&M enhancements, five (5) of which are owned by the City. O&M enhancements would generally consist of bioswale retrofit conversions to bioretention swales, and potential detention pond naturalization to enhance treatment, infiltration and habitat value where these ponds are located within or adjacent to a stream or wetland buffer. These proposed O&M enhancements would be implemented over time based on an annual estimated $20,000 budget allocation.

A total of nine (9) potential stormwater facility retrofit projects were identified based on water quality analysis and typically propose vault type treatment units due to lack of suitable soil for infiltration and limited right of way for facility construction. These potential capital project costs are estimated at approximately $5.2M as shown in Table 2.

Implementation Schedule and Budget

The Permit requires both a short term and long term implementation schedule and budget for the SMAP. Potential short term actions would occur over the six year period 2022-2028 and would consist of a combination of enhanced maintenance activities and capital project development. The estimated costs for these short term actions is approximately $2,800,000 with $775,000 in funding from the City and $1,875,000 from grants.

Table 2. Preliminary Capital Project Summary.

Project	Area Treated	Approx. Acre PGIS Treated	Est. Cost [2]
Liberty Road Vault	Private parking lots, commercial development, public roads	13.00	$1,123,850
Poulsbo Village North Vault	Private parking lots, commercial development	8.00	$640,929
Iverson Street Pond Retrofit	Public road, public facilities, public parking lot	2.45	$251,856
Iverson Street Vault	Public road, public facility, commercial development, parking lots	4.75	$236,115
Lincoln Road-8th Street Vault	Public road	0.50	$119,250
7th Avenue Vault	Public road, private bldgs and parking lots	1.50	$139,920
SR305 Swale Retrofit	Private parking lots, public roads	48.00	$1,770,230
Bond Road Vault	Private parking lots, public roads	8.00	$807,820
Poulsbo Gardens retrofit	Residential development, public roads	6.00	$139,920
	TOTALS	**92.20**	**$5,229,890**

Potential long term actions would occur over the 2028-2041 period and would consist of a combination of enhanced maintenance activities and capital project development. The estimated costs for these actions is approximately $3,200,000, with $775,000 in funding from the City and $2,325,000 from grants.

The City relies on state and in some cases federal grant funds to pay for approximately 75 percent of capital project costs including both design and construction elements. Because the City relies on grants to fund capital projects, the City's financial ability to fund capital projects is uncertain. A financial assessment that includes strategies for funding capital projects is included in the City's 2016 Comprehensive Stormwater Management Plan, which is planned for update in the 2022-23 period.

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1 INTRODUCTION

This Stormwater Management Action Plan (SMAP) has been prepared by the City of Poulsbo (City) pursuant to requirements of the 2019 Western Washington Phase II Municipal Stormwater Permit (Permit). The 2019 Permit expanded requirements in Section S5, Special Conditions for Stormwater Management Program for Cities, Towns, and Counties, to include provisions requiring comprehensive stormwater planning. This SMAP meets requirements of condition S5.C.1.d of the Permit.

1.1 Background

The municipal separate storm sewer system (MS4) permits issued by the Washington State Department of Ecology (Ecology) require local jurisdictions to implement a wide range of programmatic stormwater management actions to protect beneficial uses of receiving waters. The Permit requirements are generally based on technical assessments that show that significant increases in riparian restoration, stormwater detention and infiltration, and water quality treatment are needed to improve receiving water conditions (Ecology 2019). Because of these findings, the 2019 Permit was expanded to include additional planning requirements to focus on prioritizing a sub-watershed basin where stormwater management programs and capital projects, if implemented, could have measurable effects on water quality. This prioritization process and action plan is to be documented within an SMAP.

The City has prepared several stormwater plans that informed this SMAP. These include the 2016 Poulsbo TMDL Implementation Plan (PTIP) and the 2016 City of Poulsbo Stormwater Comprehensive Plan (SWCP). Each of these plans included targeted projects to improve water quality, habitat and address flooding. The 2019 Permit requires stormwater comprehensive planning to "inform and assist in the development of policies and strategies as water quality management tools to protect aquatic resources." The projects identified in the 2016 plans that are also located in the priority basin were considered for inclusion in this SMAP.

This SMAP was prepared in accordance with Ecology's SMAP Guidance (Ecology 2019), which guides Permittees on selecting the highest-priority drainage basin for implementing management action plans for improving water quality conditions in receiving waters.

1.2 SMAP Goals and Objectives

The 2019 Permit requires local jurisdictions to prioritize spending and direct strategic investments or effort to those basins and catchment areas where improvement can be most readily achieved and the benefits can be seen on a fairly near-term timeline. This Permit

requirement essentially serves as the objective for the SMAP, which focuses addressing impacts and helps to answer the following questions:

- How can existing stormwater problems be most strategically addressed?
- How can water quality goals be accomplished while still meeting future population and density targets?

Permittees are to use local information related to receiving water and contributing area to prioritize a basin for planning and provide a tailored set of strategies or actions to protect or improve water quality for the prioritized basin.

1.3 SMAP Approach

The approach used to prepare this SMAP focuses on identifying the priority basin using the following generalized two-step process:

1. Conduct a Watershed Inventory and Receiving Water Assessment (RWA) that determines the influence and relative contribution of the City's jurisdictional area on the receiving water. For Phase II permittees like the City, the urbanized areas and designated Urban Growth Areas (UGAs) are required to be included in this step. The outcome of the RWA is a list of stormwater basins to be prioritized in Step 2.
2. Basins identified in Step 1 were prioritized based on the water quality conditions in the respective receiving waters. Receiving waters conditions were assessed by identifying the beneficial uses and existing water quality conditions. The highest priority was given to basins with the following characteristics:
    - Higher levels and variety of beneficial uses;
    - Moderate to high levels of impairment;
    - Where the City has potential to exert a greater influence on land management decisions and project implementation decisions; and
    - Where site-specific or regional management efforts can be effectively focused.

2 RECEIVING WATER ASSESSMENT (RWA)

The goal of the receiving water assessment (RWA) is to describe the City of Poulsbo receiving waters, stormwater contributing areas, beneficial uses, and the potential impacts of land use activities on those receiving waters. The RWA guides basin prioritization and is used to identify the receiving waters that are most likely to benefit from stormwater management planning.

The general scope of the RWA and associated prioritization process follows that recommended in SMAP guidance (Ecology 2019), as follows:

- Delineate all of the basins and receiving waters in the City's jurisdiction for watersheds that have areas of approximately one square mile or greater;
- Perform a relatively rapid assessment of existing information about beneficial uses and associated water quality, habitat and land use conditions in each watershed;
- Assess the relative current and potential future influence of the City's stormwater system on each receiving waters; and
- Evaluate and summarize the information to identify the basins/receiving waters that are to be advanced to a more detailed prioritization analysis.

In general, the RWA consists of identification of the parameters and data sources used to assess water quality, water flow and aquatic life habitat conditions in freshwater and marine areas.

2.1 Study Area

The study area consists of the City of Poulsbo and associated UGA (Figure 1). The City of Poulsbo is located in Kitsap County and encompasses approximately 5.36 square miles and supports a population of about 12,000 (2022).

2.2 Watershed Inventory

The watershed inventory provides a description of relative conditions of receiving waters and runoff contributing areas. The Liberty Bay watershed encompasses all of the Poulsbo City Limits and UGA. The Liberty Bay watershed is about 22,000 acres in size. There are nine primary streams in the Liberty Bay watershed, five of which are all or partly located in the City (Figure 2).

The initial step in the watershed inventory was to delineate watershed areas and basins in the City's jurisdiction (Figures 2 and 3). Within the City and associated UGA, a total of 10 basins were identified for more detailed RWA assessment (Table 3). As shown in Table 3, all nine basins in the City were advanced to the receiving water and prioritization process.

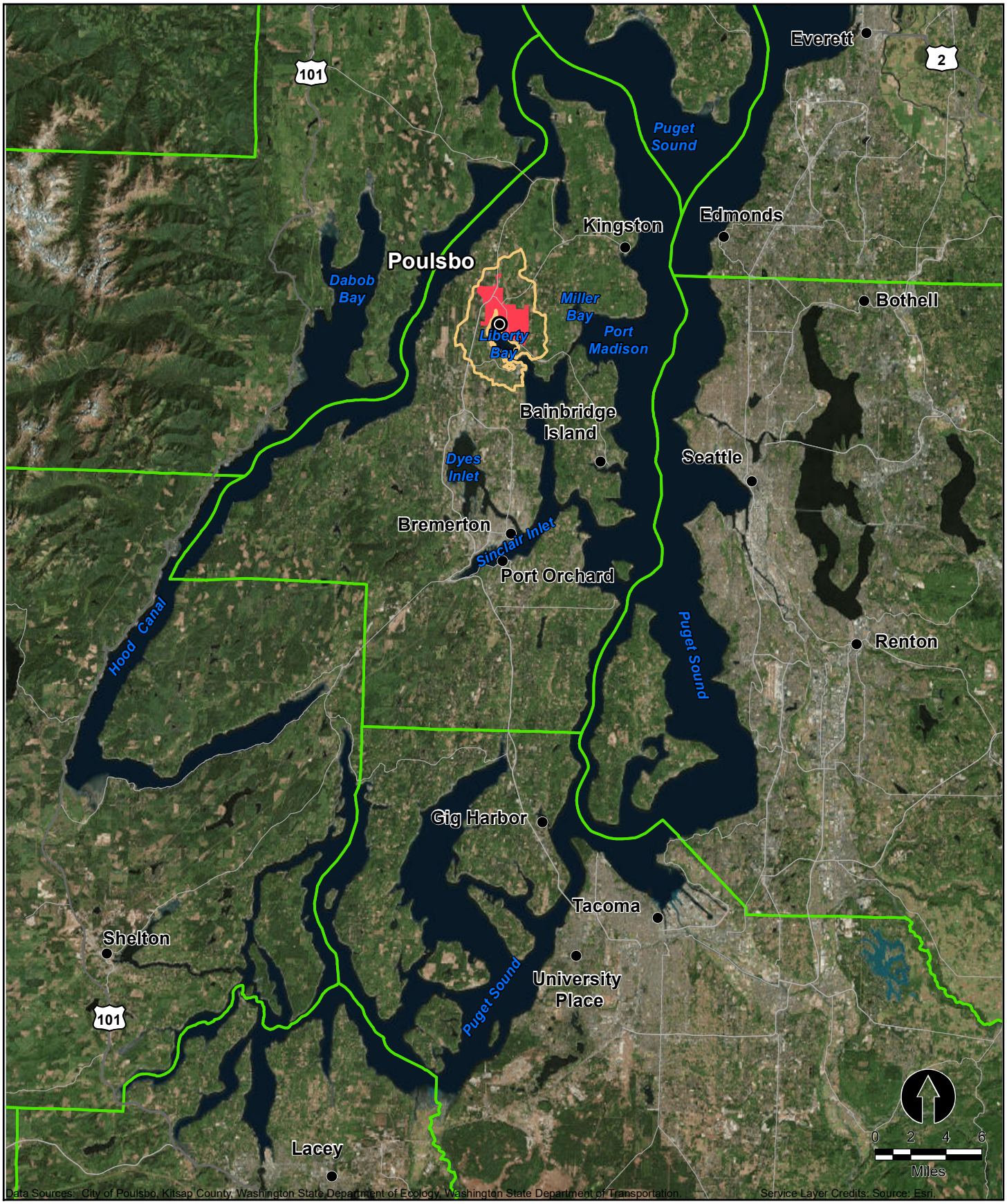
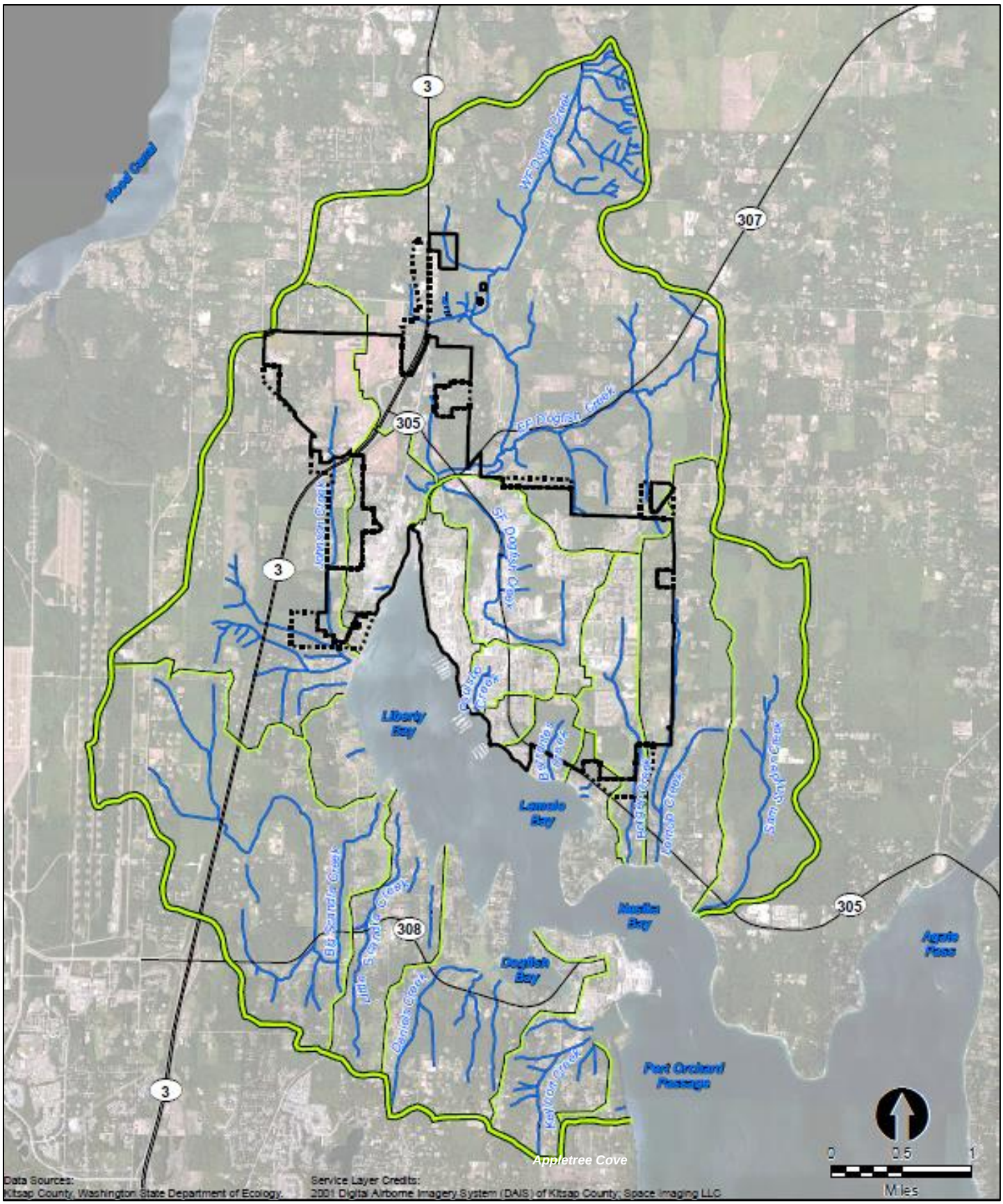


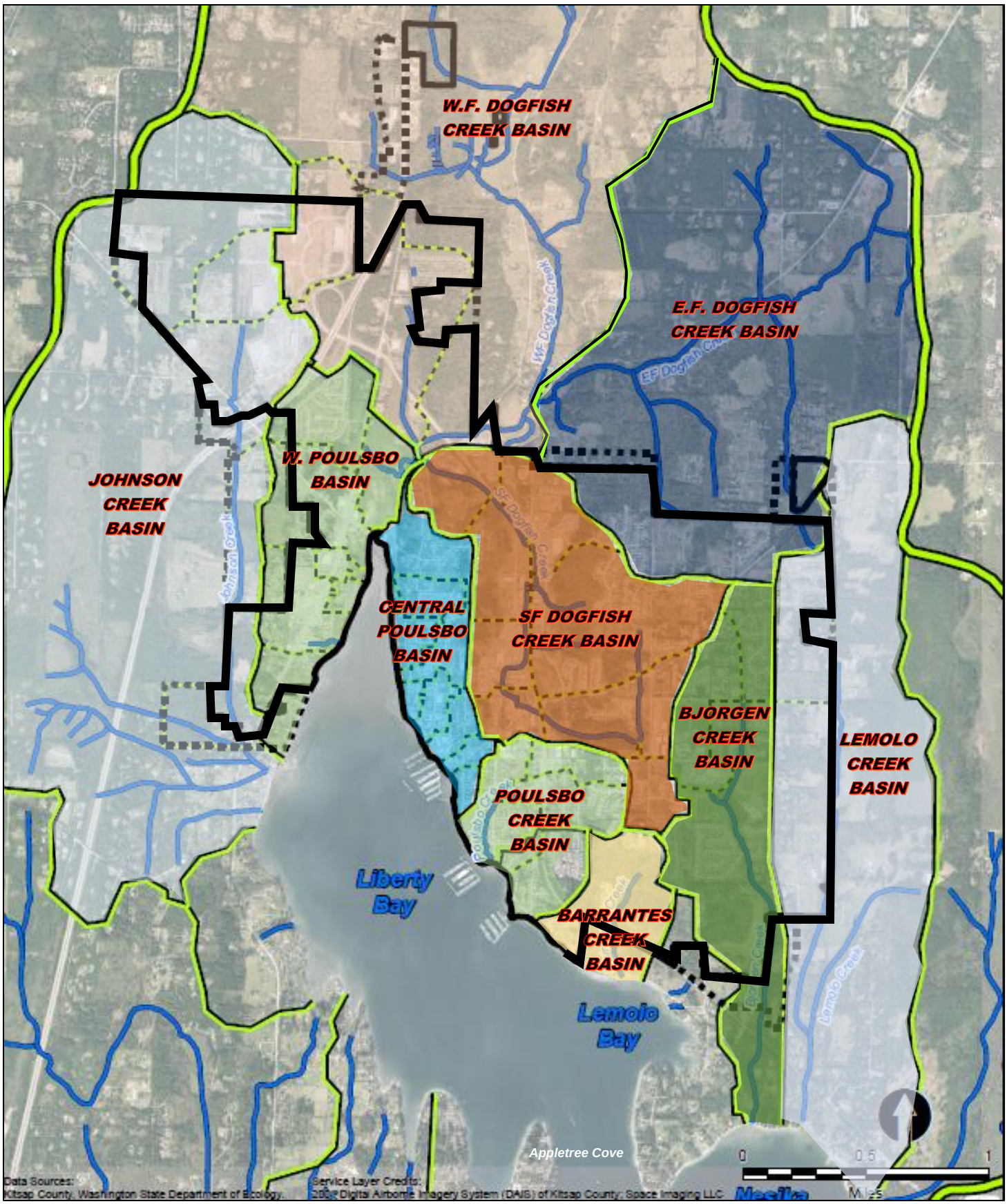
Figure 1.
City Location and Regional Context
Stormwater Management Action Plan
City of Poulsbo



CITY OF POULSBO
VIKING CITY

- Liberty Bay Watershed
- Basin Boundary
- Streams
- City of Poulsbo
- Urban Growth Area
- Highway

FIGURE 2. Liberty Bay Watershed
Stormwater Management Action Plan
City of Poulsbo



Liberty Bay Watershed
Basin Boundary
Sub-Basin Boundary
Streams
City of Poulsbo
Urban Growth Area

FIGURE 3. Poulsbo Basins

Stormwater Management Action Plan

City of Poulsbo

Table 3. Watershed Inventory and Summary of Basins and Receiving Waters in Study Area.

Basin	Total Basin Size (Ac) [1]	Basin Acres in City and UGA [1]	% Basin in City	Stormwater Management Influence [2]	Included in Prioritization Process?	Primary Watershed	Marine Receiving Water
South Fork Dogfish Cr.	647	647	100%	High	Yes	Dogfish Cr.	Liberty Bay
East Fork Dogfish Cr.	2,600	717	28%	Low	Yes	Dogfish Cr.	Liberty Bay
West Fork Dogfish Cr.	1,370	497	36%	Moderate	Yes	Dogfish Cr.	Liberty Bay
Johnson Creek	2,100	615	29%	Low	Yes	Johnson Creek	Liberty Bay
Poulsbo Creek	211	211	100%	Moderate	Yes	Poulsbo Creek	Liberty Bay
Barrantes Creek	220	110	50%	Low	Yes	Liberty Bay	Liberty Bay
Bjorgen Creek	510	424	83%	Moderate	Yes	Bjorgen Creek	Nesika Bay
Lemolo Creek	1,100	244	22%	Low	Yes	Lemolo Creek	Nesika Bay
Central Poulsbo	202	202	100%	High	Yes	Liberty Bay	Liberty Bay
West Poulsbo	343	343	100%	High	Yes	Liberty Bay	Liberty Bay
Totals	**9,303**	**4,010**	**43%**	-	-	-	-

Notes:

[1] Source: Poulsbo TMDL Plan 2016.

[2] Derived from Table 7 -Stormwater Management Potential as follows; High = SWMP Score 4-6; Moderate = SWMP Score 2-3; Low = SWMP Score 0-1.

2.3 Assessment of Receiving Water Conditions

The RWA compiled and reviewed a variety of available information to describe conditions within each basin. This information and the associate data variables were identified based on a combination of designated beneficial uses and available data sets, consistent with both NPDES permit guidance (Ecology 2019) and guidance from *Building Cities in the Rain* (Commerce 2016). Table 4 summarizes data sets used in the RWA relative to beneficial uses.

Table 4. Summary of Data Sets and Beneficial Uses for RWA.

Data Category	Beneficial Use	Data Sets Used in RWA
WATER QUALITY	Aquatic Life	Ecology 303(d) List
	Shellfish Harvesting - Recreational	Kitsap Health Dist.(KHD) and Wash. Dept of Health (WDOH)
	Shellfish Harvesting - Commercial	KHD and WDOH marine ambient monitoring data
	Primary Contact Recreation	KHD and WDOH ambient monitoring data
HYDROLOGY	Aquatic Life	
HABITAT	Aquatic Habitat	Ecology Watershed Characterization
	Salmonid Habitat	WDFW Salmonscape GIS
	T&E Listed ESA Species	Puget Sound Benthos B-IBI Dataset
	Forage Fish Spawning	Ecology Watershed Characterization
	Forage Fish Spawning	WDFW Forage Fish Spawning GIS
	ESA Critical Habitat	NOAA and USFWS Critical Habitat
SHELLFISH AND FINFISH CONSUMPTION	Shellfish Harvesting - Recreational	WDOH Commercial Shellfish and Beach Closure GIS
	Shellfish Harvesting - Commercial	WDOH Commercial Shellfish and Beach Closure GIS
	Finfish Harvesting - Recreational	WDOH Commercial Shellfish and Beach Closure GIS
LAND USE	Water Quality, Water Flow and Habitat	City of Poulsbo Zoning
		High ADT Road miles, Poulsbo Transportation Plan
		City of Poulsbo Parks Plan
		Land Cover and Impervious Surfaces
STORMWATER INFRASTRUCTURE	Water Quality, Water Flow and Habitat	City of Poulsbo GIS
		KHD Stormwater Monitoring Data

As shown in Table 4, data used in the RWA consisted of a combination of national, state and local data sets. Data from the City of Poulsbo Liberty Bay TMDL Implementation Plan (PTIP) (Seaslaska 2016), which utilized a variety of local, state and national data sets, was used extensively in the RWA. Ambient and project specific water quality collected by the Kitsap Public Health District

(KPHD) and Washington State Department of Health (WDOH) over the past 10 years was a primary data source for the water quality analysis. Ecology's *Puget Sound Watershed Characterization* data was also used to assess a variety of beneficial uses.

2.4 Beneficial Use Assessment

The beneficial use assessment identified key uses and status of water quality and habitat conditions to support those uses in each basin. This consisted of evaluation of beneficial uses as described in Table 4 for each basin using a relative prioritization scoring for each variable, with a score higher priority associated with a higher assigned point value, generally applied as shown in Table 5.

Basin scoring and criteria is provided in Appendix A and is described in detail in Chapter 3.

Table 5. General scoring criteria.

Score	Beneficial Use Rating	Description
4-5	Excellent:	Beneficial use not impaired. For example, a basin where all stream and marine ambient water quality monitoring data meets applicable standards would have a score of 5.
3-4	Good:	Beneficial use impaired in part, or in limited areas. For example, a basin where 90 percent of stream and marine ambient water quality monitoring data meets applicable standards would be rated "Good".
2-3	Fair:	Beneficial use is impaired, but still complies with portion of standard or criteria. For example, water quality monitoring data that meets Part 1 but not Part 2 of the fecal coliform standard or has a portion of the receiving water in "conditional" shellfish harvest status, would be rated "Fair".
0-2	Poor:	Beneficial use is significantly impaired. Examples would be basins where multiple ambient water quality monitoring stations do not water quality standards.

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3 BASIN PRIORITIZATION

Prioritization is based on the degree of impairment to beneficial uses, and the extent to which receiving water would benefit from implementation of stormwater retrofits, land development management actions and other stormwater management activities. As generally shown in Table 5, each basin was assigned a score for each criterion, with a higher priority score associated with a higher assigned point value. Scoring was divided into four classifications: Jurisdiction, Land Use, Water Quality, Hydrology and Habitat. Explanations for scoring of the ranking criteria are provided in section 3.1 below. Summary basin receiving water prioritization scores are shown in Table 7. Detailed scoring and ranking data are provided in Appendix A.

The highest-priority basin was selected by summing point values from each criterion. From this process, the South Fork Dogfish Creek (SFDC) basin was selected as the priority basin (see Chapter 4 for additional detail).

3.1 Prioritization and Ranking Criteria

Beneficial uses are generally codified uses that provide for the public's enjoyment of specific property or natural resources. Impairment criteria are metrics used to assess the condition of beneficial uses. Described below are the impairment criteria used for the RWA.

3.1.1 Jurisdiction

Percentage of a basin area inside the city UGA boundary was derived from the PTIP, which is calculated from GIS data provided by the City and Kitsap County. The City is not able to implement management strategies outside city boundaries, so a higher priority was assigned to basins with a higher percentage of area inside the City boundary.

3.1.2 Land Use

Zoning

Percentage of zoning classification for each basin was calculated from City zoning classifications. Priority scoring was based on percent of basin zoned for high intensity uses (commercial, industrial, high density residential) that have greater potential to contribute to decreased water quality.

Table 6. Receiving Water Prioritization Summary.

Basin	Rank	Sum	Land Use				Water Quality				Hydrology	Fish Habitat
			Jurisdiction	TIA	Zoning	Roads	Shellfish	Recreation	Marine WQ	FW WQ		
South Fork Dogfish Cr.	**1**	39	5	5	5	5	1	2	3	6	2	5
Central Poulsbo	**2**	38	5	5	4	4	1	4	3	6	1	5
West Poulsbo	**3**	36	5	5	5	3	1	2	3	6	1	5
Poulsbo Creek	**4**	30	5	4	3	3	1	3	3	7	1	0
Bjorgen Creek	**5**	29	4	4	1	4	2	0	3	8	1	2
West Fork Dogfish Creek	**6**	27	2	3	5	5	1	2	3	4	2	0
Johnson Creek	**7**	25	2	4	4	3	3	0	3	1	1	4
Lemolo Creek	**8**	24	1	5	1	2	2	0	3	5	1	4
Barrantes Creek	**9**	20	2	2	1	1	4	0	3	5	1	1
East Fork Dogfish Creek	**9**	20	1	4	1	1	1	0	3	2	2	5

High Average Daily Traffic (ADT) Road Miles

Miles of arterial and collector roads were calculated for each basin based on City road classification in the City of Poulsbo Transportation Plan (2016). High ADT roads are known to be significant stormwater pollutant sources. Basins with a higher number of miles of arterial and collector roads were a assigned a higher priority score.

Impervious Surfaces

Percent total impervious area (TIA) for each of the basins was calculated from land cover GIS data obtained from the PTIP. Higher scores were assigned to basins with higher levels of TIA.

3.1.3 Water Quality

Shellfish Harvesting

Shellfish harvesting prioritization scoring was based on WDOH harvesting area classification and the basis for the classification. Areas that had no restricted or prohibited harvesting because of pollution were assigned a higher priority than areas with a conditional classification.

Recreation

Parks, swimming beaches and areas of direct contact recreation (paddle boards, kayaks, etc.) were calculated based on number of parks and historical recreational uses. A higher prioritization was assigned to basins with a higher number of waterfront parks that support direct contact recreation.

Marine Water Quality

Marine water quality was analyzed for compliance with the fecal coliform (FC) standard as obtained from the PTIP. A higher score was assigned to basins that did not meet water quality standards.

Stream/Fresh Water Quality

Similar to marine water quality, stream water quality was analyzed for compliance with the FC standard. Data on compliance were obtained from the PTIP. A higher score was assigned to basins/streams that did not meet water quality standards.

3.1.4 Hydrology

Hydrology data was derived from the Ecology Watershed Characterization tool (Ecology 2021). The tool rates the level of importance maintaining overall water flow processes with ranks of

Low, Moderate, Moderate High, and High. A higher score was assigned to basins with streams that were rated High.

3.1.5 Fish Habitat

Fish habitat analysis was based on the number of salmonid species, the number of listed salmonid species present per basin and the relative quality of freshwater and marine habitat. Data for this criterion were obtained from the WDFW Salmonscape tool (2021), and the Stream Habitat and Fish Summary module within the Ecology 2019 Watershed Characterization tool (Ecology 2021). Higher score were given to basins with the relative highest number of salmonid species with the relative highest number of listed salmonid species, and the highest habitat value.

3.2 Stormwater Management Potential and Basin Prioritization Summary

Stormwater management potential prioritization is based on the degree of impairment to beneficial uses, and the extent to which receiving water may benefit from implementation of stormwater retrofits, land development management actions, more intensive maintenance, education and other SWMP activities. Stormwater management potential prioritization criteria are summarized below and presented in Table 7.

Table 7. Stormwater management potential and basin prioritization summary.

							TIA and % Currently Not Treated			
Basin	Rank	Total Sum	RWA Sum	SWMP Score[1]	Total Area	Exist. TIA	Acre	% Not Treated	TIA Index[2]	TIA Score
South Fork Dogfish Cr.	1	45	39	6	647	211	143	68%	97	6
Central Poulsbo	2	44	38	6	202	86	76	88%	67	6
West Poulsbo	3	41	36	5	349	123	85	69%	59	5
Poulsbo Creek	4	32	30	3	145	76	41	54%	22	2
Bjorgen Creek	5	32	29	3	424	91	59	65%	38	3
West Fork Dogfish Cr.	6	30	27	3	545	81	49	60%	30	3
Johnson Creek	7	25	25	0	615	151	21	14%	3	0
Lemolo Creek	8	22	22	0	244	99	9	9%	1	0
Barrantes Creek	9	20	20	0	176	32	11	34%	4	0
East Fork Dogfish Cr.	10	20	20	0	220	50	4	8%	0	0

TIA data source: PTIP 2016.

[1] SWMP Score = Stormwater Management Potential Summary = TIA Score

[2] TIA Index = (% untreated)*(acres untreated).

Index	Score	Index	Score	Index	Score	Index	Score
>60	6	49-40	4	29-20	2	9-0	0
50-59	5	39-30	3	19-10	1		

3.2.1 Untreated Impervious Areas

Untreated impervious areas were derived from the PTIP for each basin. A TIA index was calculated for each basin using acres of untreated TIA and percent untreated TIA to derive a weighted score. Basins with higher TIA index values were assigned a higher score.

3.3 Basin Prioritization Summary

The scoring summary from the receiving water assessment (Table 6) was added to stormwater management potential sum (as shown in Table 7) to provide a relative basin prioritization summary. Table 8 summarizes final basin prioritization ranking.

Table 8. Basin Prioritization Summary

Basin	Priority Rank	Total Score	RWA Score[1]	SWMP Score[2]
South Fork Dogfish Creek	1	45	39	6
Central Poulsbo	2	44	38	6
West Poulsbo	3	41	36	5
Poulsbo Creek	4	32	30	2
Bjorgen Creek	5	32	29	3
West Fork Dogfish Creek	6	30	27	3
Johnson Creek	7	25	25	0
Lemolo Creek	8	22	24	0
Barrantes Creek	9	20	20	0
East Fork Dogfish Creek	10	20	20	0

[1] See Table 6 for details.
[2] See Table 7 for details.

The South Fork Dogfish Creek (SFDC) basin is the top priority basin in the City based on the combined receiving water assessment and stormwater management planning analysis. As shown in Tables 7 and 8, the SFDC scored slightly higher than the Central Poulsbo and significantly higher than the other seven basins in the City. The top ranking of the SFDC was influenced slightly more by receiving water assessment criteria than stormwater management potential, although it should be note that there is significant overlap in RWA and stormwater management potential criteria (road miles, zoning and existing TIA). Basin size, freshwater quality, land use and fish habitat were all significant factors in SFDC priority ranking.

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4 PRIORITY BASIN CHARACTERIZATION

The SFDC basin is approximately 647-acres in size and is the largest sub-basin located entirely within the City. The SFDC basin has a relatively high percentage of commercial, industrial and high density residential development compared to other sub-basins in the City. The SFDC has the highest amount of total impervious area (211 acres) and the highest ADT road miles (3.35) in the City. Water quality and land use conditions in the SFDC basin are described in the following sections.

4.1 SFDC Water Quality Conditions

Water quality has been monitored in the SFDC by the KPHD on a relatively consistent basis since 1996. Over the past 25 years, water quality at the mouth of the SFDC as measured by Fecal coliform (FC) bacteria has generally shown a decreasing trend (Figure 4). Monitoring locations are shown in Figure 5.

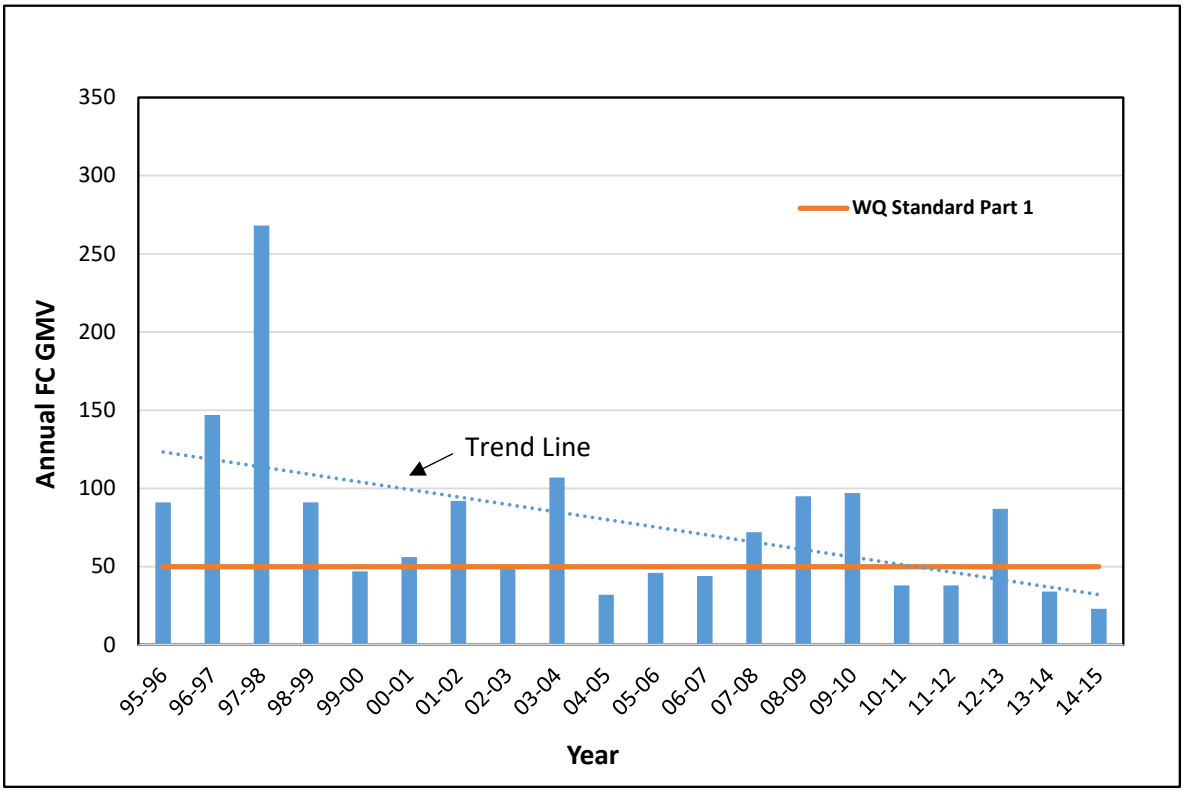

Figure 4. South Fork Dogfish Creek Fecal Coliform Trend, 1996-2015. Source: PTIP 2016.

SFDC stream monitoring conducted since 2017 has typically consisted of two wet weather and one dry weather sampling events. Results from FC monitoring during wet weather events for the 2017-2020 period routinely exceed the 50 FC/100 ml water quality standard as shown in Table 9.

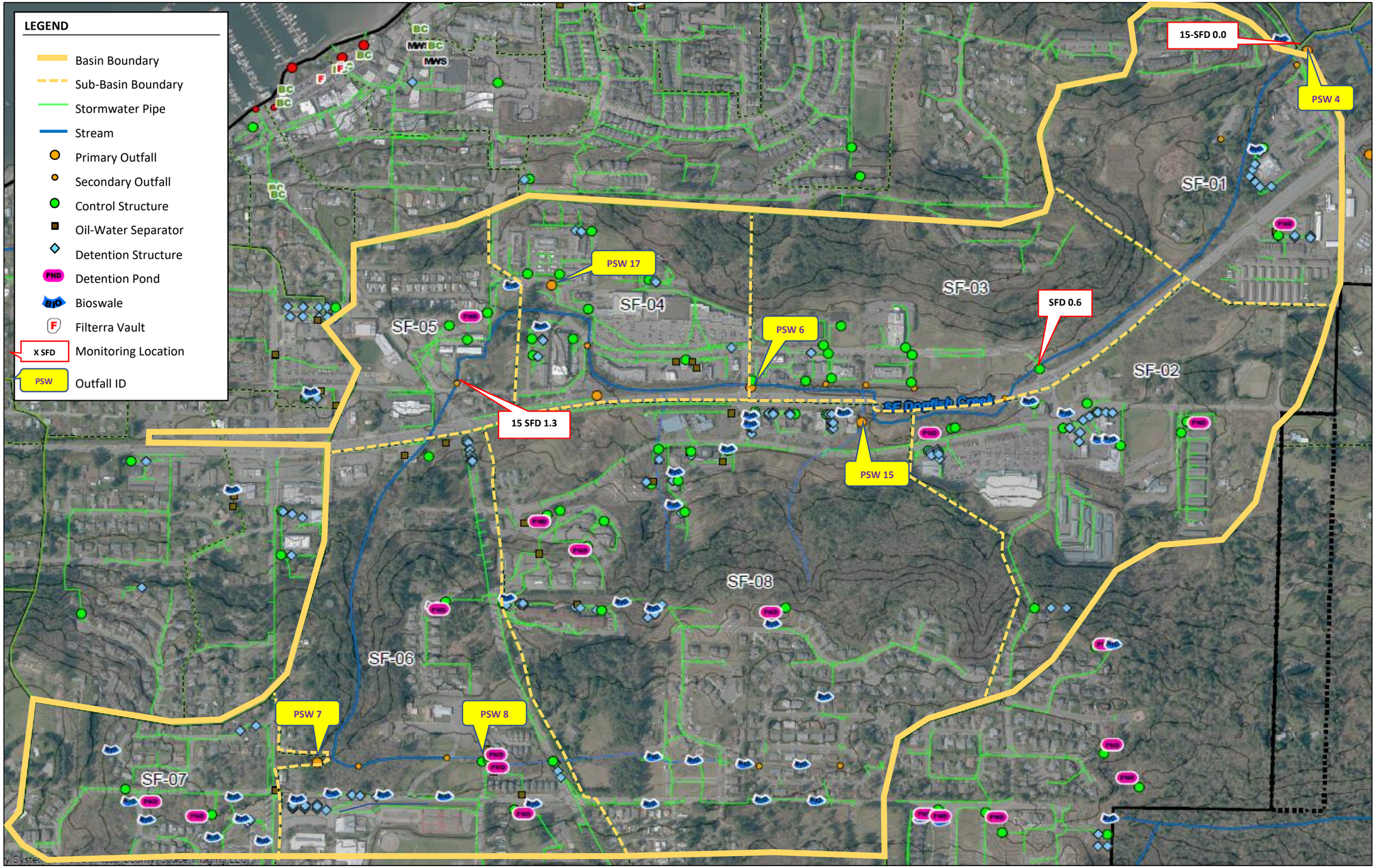

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FIGURE 5. EXISTING CONDITONS
South Fork Dogfish Creek Priority Basin
Stormwater Management Action Plan
City of Poulsbo

Table 9. SFDC water quality monitoring summary, 2017 – 2020.

Stream Station	2017		2018		2019		2020	
	FC GMV[1]	Meet Std?	FC GMV[1]	Meet Std?	FC GMV[1]	Meet Std?	FC GMV[1]	Meet Std?
SFDC 0.0	621	No	503	No	30	Yes [2]	92	No
SFDC 0.6	470	No	407	No	70	No [2]	305	No
SFDC 1.3	232	No	186	No	50	No[2]	669	No

[1] Geometric mean value.
[2] Only one sample collected this period.

The SFDC is the single highest FC loading source to Liberty Bay in the City. The location of high ADT SR305 through the center of the SFDC basin likely contributes relatively high toxics loading; however, no water quality data has been collected to confirm this assumption.

Refer to section 4.3 for additional description of stream and stormwater quality in the SFDC and prioritization of potential management actions.

4.2 Habitat Conditions

The SFDC has historically supported runs of chum and coho salmon, as well as steelhead and cutthroat trout. The lower mainstem of SFDC is contained within a relatively flat flood plain. Instream habitat conditions are typically moderately to highly degraded throughout the stream corridor. Riparian vegetation is fragmented, with isolated stands of mature trees (fir, cedar, alder and maple) located intermittently through the steam corridor.

In-stream and riparian habitat in the SFDC has been degraded by historical development that includes commercial and residential development and public roads. This development has confined the natural floodplain, eliminating most floodplain function. Development has resulted in excessive peak flows, with stream channel scoured to hardpan in the upper reach, and extensive deposition of fine sediment in the lower gradient reach downstream. This has narrowed the natural floodplain in the upstream reach, and artificially widened the floodplain downstream. The channel scour has resulted in decreased floodplain connectivity. Sediment deposition has filled pools, created a wider, braided channel, and contributed to increased flooding in the lower basin (ICF International 2010).

Insufficient stormwater treatment has been identified as a significant contributing factor to degraded habitat conditions in the basin. It is estimated that the existing level of detention provided in the basin is only about eight percent of the detention storage volume that is recommended under current standards, while existing water quality treatment conditions provide treatment for only five percent of the area that would be required under current standards (ICF International 2010).

In summary, fish and wildlife habitat conditions within the basin have been degraded as a consequence of urbanization and development. Impacts noted throughout the basin include reduced riparian zone widths, reduced diversity of native plants, increased channel and bank erosion, restricted channel migration, disconnected floodplains and wetlands, and loss of adjacent wetlands and off-channel rearing habitat for juvenile salmonids.

Additionally, an undersized culvert at 8th Avenue restricts fish passage during high flow conditions. This culvert replacement is subject to receipt of grant funding that the City is actively pursuing.

4.3 Stormwater Impacts and Target Treatment Locations

Water quality data collected by the City and KPHD over the prior 3 year period (2018-2020) was evaluated to identify potential target stormwater locations. Both stream segment targets and specific outfall target locations were evaluated as described below.

4.3.1 Target Stream Segment

As shown in Table 10, the middle segment of SFDC between the SR305-7th Avenue intersection and 8th Avenue was identified as the stream segment that would likely most benefit from targeted City stormwater management actions.

The middle segment contributing area is approximately 78-acres and is located between the SR305-Lincoln Road intersection, and the 7th Avenue-SR305 intersection (sub-basins SF-04 and SF-05; see Figure 5). This area includes the Poulsbo Public Works Complex, the Poulsbo Library, and the Poulsbo Village commercial zone. This segment has elevated FC concentrations, concentrated urban commercial development, and high proportion of untreated impervious surfaces. Stream habitat is degraded by barrier culverts, channel erosion, and channel aggradation. This stream segment and associated contributing area is the highest priority for action based on the sub-basin assessment.

4.3.2 Target Outfalls

Specific outfalls were evaluated using wet weather monitoring data from the 2015-2020 period. Results are shown in Table 11 and show that outfalls PSW-6, PSW-15 and PSW-17 ranked as the highest priority for action. Outfall locations are shown in Figure 5.

Potential management actions to address target locations are provided in Chapter 5.

Table 10. SFDC stream water quality segment summary.

Monitoring Location	Basin Area	2020 FC GMV (wet)[1]	2019 FC GMV (wet)[1]	2018 FC GMV (wet)[1]	3 Year Avg. FC GMV	Cont. Basin Area (Ac)	FC Loading Index[2]	High ADT Roads (Miles)[3]	AVG. ADT[4]	Toxics Loading Index[5]	Total FC & Toxics Index[6]	***Summary Pollutant Loading Rank***
SFDC 0.0	Lower Segment[7]	92	150	1,110	248	106.60	264	1.29	30,000	388	652	***2***
SFDC 0.6	Middle Segment[7]	305	10	276	94	282.31	266	5.04	10,000	504	770	***1***
SFDC 1.3	Upper segment[7]	669	50	234	198	258.24	513	0.95	5,000	47	560	***3***

[1] Geometric mean value (GMV) of wet weather storm sampling.

[2] Calculated as avg. GMV * contributing basin acres / 100.

[3] Primary arterials (x2), arterials and major collectors only per Poulsbo Transportation Plan 2016.

[4] Typical ADT from Poulsbo Transportation Plan Updated 2016

[5] Toxic load index = high ADT road miles x ADT/100

[6] Total index = FC Load Index + Toxic Load Index.

[7] Lower Segment: mouth to Forest Rock Hills. Middle segment: Forest Rock Hills to 8th Ave. Upper Segment: 8th Avenue to headwaters.

Table 11. SFDC basin outfall water quality segment summary.

Location	Basin Area	Outfall ID	2020 FC GMV (wet)[1]	2019 FC GMV (wet)[1]	2018 FC GMV (wet)[1]	2015 FC GMV (wet)[1]	3 Year Avg. FC GMV	Cond. (uS)	Cont. Basin Area (Ac)	FC Loading Index[2]	FC Loading Rank	High ADT Roads (Miles)[3]	Zoning Index[4]	Toxics Loading Rank	Segment Loading Rank[5]	Summary Ranking Score[6]	***Summary Pollutant Loading Rank***
SR305 /Bond Rd Outfall	Lower Segment[7]	PSW 4	ND	ND	ND	250	250	195.55	28.0	70	6	1.29	5	1	2	9	***4***
Liberty Road (Poulsbo Village)	Middle Segment[7]	PSW 6	1,838	ND	668	756	1,108	60.9	34.0	377	2	0.37	5	2	1	5	***1***
SR305 and North Lincoln	Middle Segment[7]	PSW 15	424	ND	359	268	391	95.65	36.0	141	3	0.40	4	4	1	8	***3***
7th Ave ditch at Centennial Park	Middle Segment[7]	PSW 17	883	ND	595	323	725	25.4	19.0	138	3	0.42	5	3	1	7	***2***
South Caldart at Hostmark	Upper Segment[7]	PSW 7	ND	ND	ND	305	305	49.7	33.0	101	4	0.39	3	5	3	12	***6***
SFDC at Mesford	Upper Segment[7]	PSW 8	ND	ND	ND	669	669	72.65	126.0	843	1	0.37	3	6	3	10	***5***

ND = No data.

[1] Geometric mean value (GMV) of wet weather storm sampling.

[2] Calculated as 3 year avg. GMV * contributing basin acres / 100.

[3] Primary arterials (x2), arterials and major collectors only per Poulsbo Transportation Plan 2016.

[4] Zoning Index	Score
Commercial Fully Developed	5
Commercial <100%, >50% Developed	4
Residential Fully Developed	4
Residential <100%, >50% Developed	3

[5] From summary pollutant loading rank column, Table 10.

[6] FC Loading Rank + Toxic Loading Rank + Segment Rank. Lowest score = highest rank.

[7] Lower Segment: mouth to Forest Rock Hills. Middle segment: Forest Rock Hills to 8th Ave. Upper Segment: 8th Avenue to headwaters.

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5 STORMWATER MANAGEMENT ACTION PLAN

The SMAP addresses existing land management programs, facilities, operation and maintenance, public education and outreach, operation and maintenance (O&M) and potential capital facility retrofits within the priority SFDC basin. Each of these elements is addressed in detail below.

5.1 Enhanced Stormwater Management Actions

Enhanced stormwater management actions related to Permit section 5 are described below.

5.1.1 Land Management and Development Strategies for Water Quality Management

Land management and development in the SFDC basin is governed under the City Comprehensive Plan and municipal code. The Comprehensive Plan includes goals and policies for existing and future land development, as well as water quality and habitat enhancement and protection. In general, no significant changes to the Comprehensive Plan or code are anticipated to be necessary or warranted to implement the SMAP.

5.1.2 Public Education and Outreach

Public education and outreach in the SFDC basin will be developed and implemented in accordance with the City's existing stormwater management program. Since 2008, the City and other West Sound jurisdictions have partnered with Kitsap County (as the lead agency) through an Inter-Local Agreement (ILA) to pool resources for the development, implementation, and funding of stormwater education and outreach through the West Sound Stormwater Outreach Group (WSSOG). This program includes:

- Pet waste education
- Natural yard care program
- Storm drain stenciling
- School curriculum
- Participation in the Puget Sound STormwater Outreach for Regional Municipalities coalition (STORM). STORM is a partnership of over 80 Puget Sound area cities and counties that have worked together since 2008 to address polluted stormwater runoff through the broad-reaching Puget Sound Starts Here (PSSH) media campaign.

5.1.3 IDDE

Illicit Discharge Detection and Elimination (IDDE) within the SFDC basin will be implemented in accordance with the City's existing IDDE program. This program consists of dry weather storm outfall sampling to detect potential non-storm drain discharges. Dry season monitoring is typically conducted by the KPHD at the locations shown in Figure 3 a minimum of once per year. If/when elevated pollutant levels are encountered, upstream source control tracking is initiated.

5.1.4 Source Control Program

The City has developed a source control program, as required by permit section S5.C.8. 162 publicly and privately owned sites that conduct activities that generate potential stormwater pollutants were identified. Source control inspections will be prioritized by pollution risk, illicit discharge history, and for sites that conduct activities that may generate fecal coliform pollution to support the SMAP and TMDL for Liberty Bay.

5.2 Enhanced Operation and Maintenance

Existing City owned and maintained stormwater flow control (detention) and water quality facilities in the SFDC basin were assessed for opportunity to enhance performance through modified O&M and/or low-cost retrofit. In general, the majority of existing detention and treatment facilities in the SFDC were constructed in the 1980-2000 period before adoption of current design standards. These facilities are therefore typically undersized for both treatment and detention relative to existing standards.

Existing facilities that would benefit from O&M enhancements are listed in Table 12. Potential facility enhancement locations are shown on Figure 6. As shown in Table 12, existing facility enhancements would generally consist of bioswale retrofit conversions to bioretention swales, and potential detention pond naturalization to enhance treatment, infiltration and habitat value where these ponds are located within or adjacent to a stream or wetland buffer.

The proposed O&M enhancements would be implemented over time based on an annual estimated $20,000 allocation as shown in Table 12. Facilities owned by the City and identified with a priority action of ***High*** would typically be implemented first. Implementation would generally consist of a facility engineering assessment, followed by development of a retrofit plan and then construction.

Table 12. Enhanced operation and maintenance projects.

Location	Map ID	Basin Area	Owner	Facility Type	Tmt. Area (Ac)	Condition	Enhanced Maintenance Action	Est. Cost	***Priority Action Rank***
Bond Road & 1st Avenue	1	Lower Segment [1]	Liberty Ridge Apts.	Bioswale	1.2	Not functional. Saturated with minimal vegetation	Retrofit bioretention swale with underdrain. Re-plant with water tolerant spp.	0 [2]	***Moderate***
Bond Road Medical	2	Lower Segment	Pacific Medical	Bioswale	1.9	Low function. Saturated and channelized. Little vegetation.	Retrofit bioretention swale with underdrain. Re-plant with water tolerant spp.	0 [2]	***Moderate***
SR305 Swale at Bond Intersection	3	Lower Segment	WSDOT	Bioswale	2.0	Not functional. Saturated and channelized. Little vegetation. Undersized.	Retrofit bioretention swale with underdrain.	0 [2]	***High***
SR305 Swale at S. side driveway	4	Lower Segment	WSDOT	Bioswale	2.4	Low function. Saturated and channelized. Little vegetation. Undersized.	Retrofit bioretention swale with underdrain.	0 [2]	***High***
Forest Rock Lane and Little Valley Lane	5	Middle Segment [1]	**City**	Bioswale	0.8	Not functional. Garbage, debris and overgrown.	Retrofit bioretention swale with underdrain.	$20,000	***High***
Forest Rock Lane at Taco Time	6	Middle Segment	Nelson Poulsbo LLC	Bioswale	0.7	Not functional. Saturated, channelized, overgrown	Retrofit bioretention swale with underdrain. Re-plant with water tolerant spp.	0 [2]	***Moderate***
SR305 at 7th Avenue	7	Middle Segment	WSDOT	Bioswale	6.5	Low function. Saturated and channelized. Little vegetation. Undersized.	Retrofit bioretention swale with underdrain	0 [2]	***High***
O'Rielly Auto	8	Middle Segment	Wyman Trust	Bioswale	0.6	Not functional. Saturated, overgrown and channelized.	Retrofit bioretention swale with underdrain. Re-plant with water tolerant spp.	0 [2]	***Low***
SR305 at 8th Avenue	9	Middle Segment	WSDOT	Bioswale	4.9	Low function. Saturated and channelized. Little vegetation. Undersized.	Retrofit bioretention swale with underdrain	0 [2]	***High***
Caldart Avenue - Austurbruin Park	10	Upper segment [1]	**City**	Bioswale	0.7	Low function. Saturated and channelized. Vehicle damage due to lack of curb/parking.	Retrofit flow dispersion, planting, vehicle barrier. Re-plant with water tolerant spp.	$5,000	***Low***
Caldart Avenue - Curt Rudolf Rd	11	Upper segment	**City**	Bioswale and Detention Pond	2.3	Low function. Minimal flow. Undersized.	Retrofit/naturalize pond to enhance treatment and appearance.	$10,000	***Low***
Caldart Avenue, N. end Asterbruin	12	Upper segment	**City**	Bioswale and Detention Pond	6.3	Low function. Minimal flow. Undersized.	Retrofit/naturalize pond to enhance treatment and appearance.	$20,000	***Moderate***
Lincoln Road	13	Upper segment	OHI Asset Mgmt.	Bioswale	3.0	Not functional. Swale saturated and overgrown. Outfall not functional.	Retrofit bioretention swale with underdrain. Re-plant with water tolerant spp.	0 [2]	***Low***
12th Ave. NE (Caldart Hts.)	14	Upper segment	**City**	Bioswale and Detention Vault	12.1	Bioswale not functional. Channelized, no vegetation, erosion. Outfall erosion and channel incision.	Swale: Vegetation removal, flow dispersion, replanting, outfall dispersion. Outfall: evaluate outlet structure, armor outlet.	$25,000	***High***
NE Watland Street	15	Upper segment	Caldart Hts HOA	Bioswale	2.6	Bioswales non-functional and co-located in SFDC channel.	In-stream and riparian plantings to improve filtration and detention	0 [2]	***Moderate***
				TOTALS	**48.0**			**$80,000**	

[1] Lower Segment: mouth to Forest Rock Hills. Middle segment: Forest Rock Hills to 8th Ave. Upper Segment: 8th Avenue to headwaters.

[2] Private facility. Maintenance by owner.

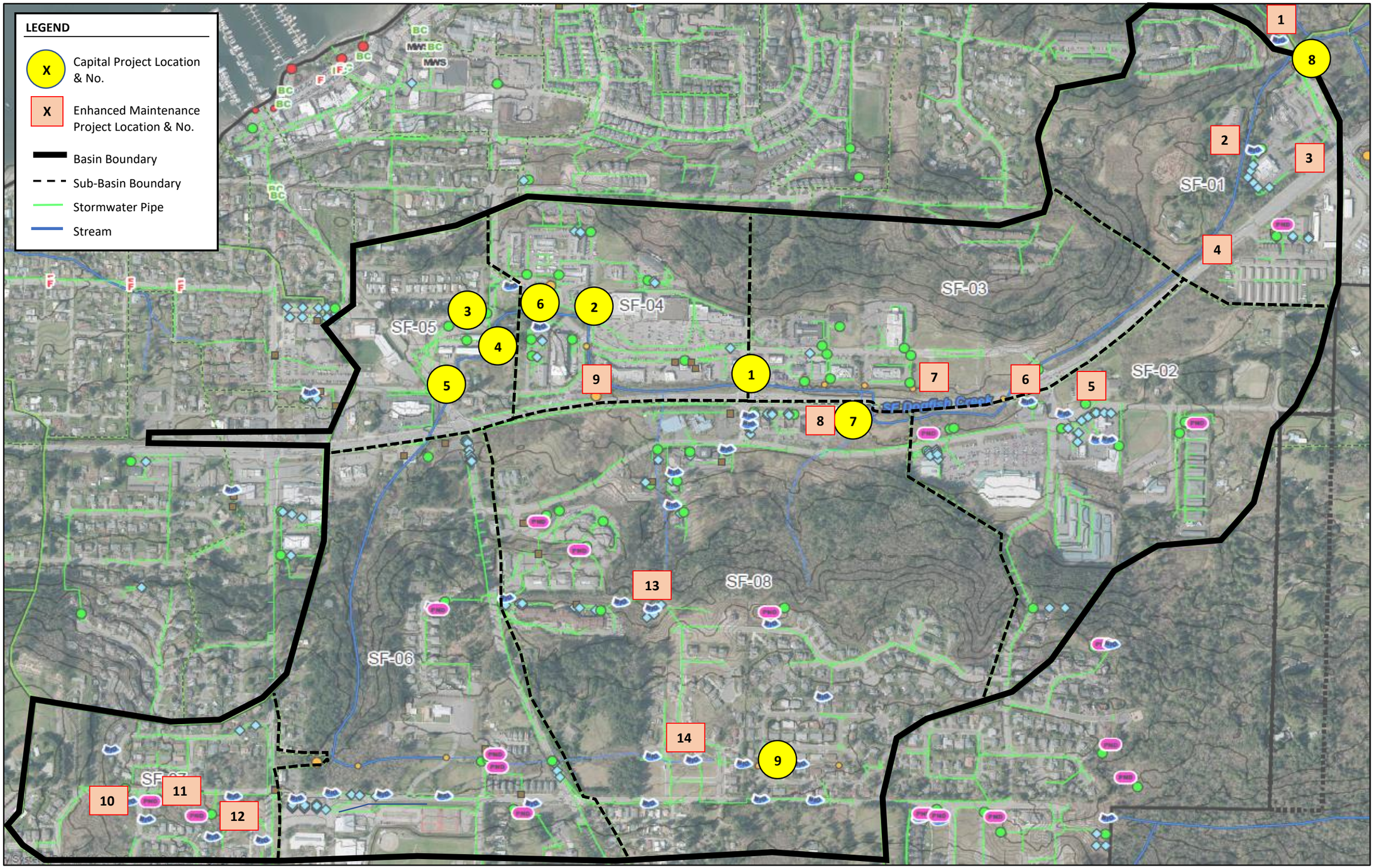

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FIGURE 6. PROPOSED PROJECTS

South Fork Dogfish Creek Priority Basin

Stormwater Management Action Plan

City of Poulsbo

5.3 Stormwater Facility Retrofits

Potential stormwater facility retrofit projects were identified based on the water quality analysis shown in Tables 8 and 9, and specific features of the City's stormwater system. In general, proposed BMP retrofits propose vault type treatment units due to lack of suitable soil for infiltration and limited right of way for facility construction. Potential retrofit locations are shown on Figure 6 and are summarized in Table 13. More detailed project descriptions are provided in Appendix B. The South Fork Dogfish Creek Stormwater Retrofit Design Project was conducted through an Ecology grant. The pond retrofit design converts existing grass swales to bioretention facilities and a Modular Wetland Treatment Vaults. The pond retrofit also increases detention volume to help stream flows. This project would greatly increase water quality treatment for a significant portion of south fork dogfish creek as currently the only water quality treatment facility is an oil/water separator. This project, when constructed, would provide enhanced water quality treatment to 28.8 acres of the SFDC basin and 0.56 acre-ft of increased detention volume. The projected construction cost is estimated at $2.2 million dollars and subject to grant funding. See Appendix C for the close out report to ecology for the grant design.

Table 13. Proposed Capital Project Summary

Priority [1]	Map ID	Project	Area Treated	Approx. Acre PGIS Treated	Est. Cost [2]	Cost/Acre
1	1	Liberty Road Vault	Private parking lots, commercial bldgs, public roads	13.00	$1,123,850	$86,450
1	2	Poulsbo Village North Vault	Private parking lots, commercial bldgs	8.00	$640,929	$80,116
2	3	Iverson Street Pond Retrofit	Public road, public bldgs, public parking lot	2.45	$251,856	$102,798
2	4	Iverson Street Vault	Public road, public facility, private bldgs. and parking lots	4.75	$236,115	$49,708
2	5	Lincoln Road-8th Street Vault	Public road	0.50	$119,250	$238,500
2	6	7th Avenue Vault	Public road, private bldgs and parking lots	1.50	$139,920	$93,280
Subtotal projects in contributory basin of current Ecology grant design project				*30.20*	*$2,511,920*	*$108,475*
3	7	SR305 Swale Retrofit	Private parking lots, public roads	48.00	$1,770,230	$36,880
4	8	Bond Road Vault	Private parking lots, public roads	8.00	$807,820	$100,978
5	9	Poulsbo Gardens retrofit	Residential development, public roads	6.00	$139,920	$23,320
			TOTALS	**92.20**	**$5,229,890**	**$56,723**

[1] Based on sub-basin and outfall water quality assessment.

[2] Refer to individual projects estimates in Appendix B for additional detail.

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6 IMPLEMENTATION SCHEDULE AND BUDGET

The Permit requires both a proposed short term and long term implementation schedule and budget for the SMAP, as follows:

- Short-term actions (*i.e.*, actions to be accomplished within six years), and
- Long-term actions (*i.e.*, actions to be accomplished within seven to 20 years).

6.1 Short Term Actions

Potential short term actions would occur over the six year period 2022-2028 and are summarized in Table 14. Short term actions would consist of a combination of enhanced maintenance activities and capital project development. The estimated costs for these short term actions is approximately $2,800,000 with $775,000 in funding from the City and $1,875,000 from grants.

6.2 Long Term Actions

Potential long term actions would occur over the 2028-2041 period and are summarized in Table 14. These actions would consist of a combination of enhanced maintenance activities and capital project development. The estimated costs for these actions is approximately $3,200,000, with $775,000 in funding from the City and $2,325,000 from grants.

6.3 Financial Plan

The City relies on state and in some cases federal grant funds to pay for approximately 75 percent of capital project costs including both design and construction elements. The City's Surface Water Utility collects rates from City property owners, and general facility charges from new development. These revenues are used to fund the City's stormwater activities including O&M, program administration, NPDES compliance requirements and match for capital projects.

Because the City relies on grants to fund capital projects, the City's financial ability to fund the projects shown in Table 14 is uncertain. A financial assessment that includes strategies for funding capital projects is included in the City's 2016 Comprehensive Stormwater Management Plan, which is planned for update in the 2022-23 period.

Table 14. SFDC Stormwater Management Action Plan Preliminary Budget and Implementation Schedule.

Year		OPERATION, MAINTENANCE AND ADMIN. COSTS					CAPITAL IMPROVEMENTS				TOTALS
								Funding Source			
		Enhanced Maintenance	Source Control	Ed. & Outreach	Monitoring	Total	Project Cost	Grant	City	Notes/Comments	
SHORT TERM											
1	2022	$20,000			$2,000	$22,000				Grant app. 2021 for const. 2023	$22,000
2	2023	$20,000			$2,000	$22,000					$22,000
3	2024	$20,000			$2,000	$22,000	$1,400,000	$1,050,000	$350,000	Construction	$1,422,000
4	2025	$20,000			$2,000	$22,000				Grant app. 2025 for const. 2028	$22,000
5	2026	$5,000			$2,000	$7,000					$7,000
6	2027	$5,000			$2,000	$7,000	$150,000		$150,000	City design	$157,000
7	2028	$5,000			$2,000	$7,000	$1,100,000	$825,000	$275,000	Construction	$1,107,000
Subtotal Short Term		*$95,000*	*$0* [1]	*$0* [1]	*$14,000*	*$109,000*	*$2,650,000*	*$1,875,000*	*$775,000*		*$2,759,000*
LONG TERM											
8	2029	$5,000			$2,000	$7,000	$400,000	$300,000	$100,000	Design grant app. 2028	$407,000
9	2030	$5,000			$2,000	$7,000					$7,000
10	2031	$5,000			$2,000	$7,000				Grant app. 2031 for const. 2033	$7,000
11	2032	$5,000			$2,000	$7,000					$7,000
12	2033	$5,000			$2,000	$7,000	$1,000,000	$750,000	$250,000	Construction	$1,007,000
13	2034	$5,000			$2,000	$7,000					$7,000
14	2035	$5,000			$2,000	$7,000				Grant app. 2035 for const.2037	$7,000
15	2036	$5,000			$2,000	$7,000					$7,000
16	2037	$5,000			$2,000	$7,000	$1,700,000	$1,275,000	$425,000		$1,707,000
17	2038	$5,000			$2,000	$7,000					$7,000
18	2039	$5,000			$2,000	$7,000					$7,000
19	2040	$5,000			$2,000	$7,000					$7,000
20	2041	$5,000			$2,000	$7,000					$7,000
Subtotal Long Term		*$65,000*	*$0* [1]	*$0* [1]	*$26,000*	*$91,000*	*$3,100,000*	*$2,325,000*	*$775,000*		*$3,191,000*
TOTAL 20 YEAR		**$160,000**			**$40,000**	**$200,000**	**$5,750,000**				**$5,950,000**

[1] Cost included as part of normal operations budget. No additional budget allocation proposed.

6.4 Future Assessment and Feedback Processes

The Permit requires a process and schedule to provide future assessment and feedback to improve the planning process and implementation of procedures and projects. This process will consist of the following measures:

- Annual review of implementation progress as part of the City's annual Stormwater Management Report prepared pursuant to NPDES requirements, and
- Continuation of annual stream, outfall and marine water monitoring results conducted by the City, KPHD and WDOH (as part of commercial shellfish bed certification).

6.4.1 Monitoring and Coordination

Current monitoring programs have provided valuable information to support Permit compliance, progress assessment and prioritization of budget resources. Within the SFDC basin, additional targeted wet weather monitoring would provide important information to validate capital project prioritization, identify source control needs and ensure that water quality gains from City actions are sustained over time. Specific monitoring recommendations include:

- Additional wet weather monitoring locations in the SFDC headwaters north of Lincoln Road to assess performance of existing treatment facilities;
- Coordination with Kitsap County Public Works to add an aquatic benthic macroinvertebrates monitoring station to the middle or lower segment of SFDC;
- Coordination with the Suquamish tribe on escapement surveys to assess whether stormwater conditions in SFDC may be potentially contributing to pre-spawn salmon mortality; and
- Coordination with the Washington State Department of Transportation (WSDOT) to optimize maintenance and performance of the SR305 stormwater system.

6.4.2 Adaptive Management

Adaptive management is the systematic use of information to improve operations, especially in the face of uncertainty. The adaptive management process can be applied at any scale, from budget processes to individual projects to overall stormwater management programs. This systematic process identifies uncertainties, monitors results, and informs actions. A formalized program that clearly articulates the uncertainties and monitors results reduces the risk of errors and allows programs to move forward in the face of uncertainty.

The SMAP is comprised of program activities and individual projects that have been identified through prior data collection and system evaluations regarding flooding, water quality, and

habitat. These programmatic activities and projects are typically reviewed annually as part of capital project planning and budgeting. Data collection also occurs annually as part of routine monitoring, and as part of special time-limited projects. Combining annual programmatic planning with annual data review provides an opportunity to apply the adaptive management approach. More detailed program analysis, financial assessment and capital project planning occurs on a 6 to 7-year cycle as part comprehensive planning and provides an additional opportunity for adaptive management measures.

Emerging issues related to climate change, sea level rise and impact of stormwater on threatened and endangered salmonids indicate that more frequent data and programmatic analysis may be warranted to ensure capital and O&M investments reflect both City priorities and existing conditions. A formal adaptive management process that focuses on targeted data collection (both qualitative and quantitative) can ensure that management actions maximize benefit for lowest cost for both O&M and capital program elements.

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APPENDIX A

Receiving Water Assessment Tables

Table 1. Summary of Basins and Receiving Waters.

Basin	Total Basin Size (Ac)	Basin Acres in City and UGA	% Basin in City	Primary Streams	Receiving Water
South Fork Dogfish Creek	647	647	100%	South Fork Dogfish Creek	Dogfish Creek
East Fork Dogfish Creek	2,600	717	28%	East Fork Dogfish Creek	Dogfish Creek
West Fork Dogfish Creek	1,370	497	36%	West Fork Dogfish Creek	Dogfish Creek
Johnson Creek	2,100	615	29%	Johnson Creek	Liberty Bay
Poulsbo Creek	211	211	100%	Poulsbo Creek	Liberty Bay
Barrantes Creek	220	110	50%	Barrantes Creek	Liberty Bay
Bjorgen Creek	510	424	83%	Bjorgen Creek	Nesika Bay
Lemolo Creek	1,100	244	22%	Lemolo Creek	Nesika Bay
Central Poulsbo	202	202	100%	None	Liberty Bay
West Poulsbo	343	343	100%	None	Liberty Bay
Total	9,303	4,010	43%		

Source: Poulsbo TMDL Plan 2016.

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Table 2. Receiving Water Prioritization Summary.

Basin	Rank	Sum	Land Use				Water Quality				Hydrology	Fish Habitat
			Jurisdiction	TIA	Zoning	Roads	Shellfish	Recreation	Marine WQ	FW WQ		
South Fork Dogfish Creek	**1**	39	5	5	5	5	1	2	3	6	2	5
Central Poulsbo	**2**	38	5	5	4	4	1	4	3	6	1	5
West Poulsbo	**3**	36	5	5	5	3	1	2	3	6	1	5
Poulsbo Creek	**4**	30	5	4	3	3	1	3	3	7	1	0
Bjorgen Creek	**5**	29	4	4	1	4	2	0	3	8	1	2
West Fork Dogfish Creek	**6**	27	2	3	5	5	1	2	3	4	2	0
Johnson Creek	**7**	25	2	4	4	3	3	0	3	1	1	4
Lemolo Creek	**8**	24	1	5	1	2	2	0	3	5	1	4
Barrantes Creek	**9**	20	2	2	1	1	4	0	3	5	1	1
East Fork Dogfish Creek	**9**	20	1	4	1	1	1	0	3	2	2	5

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Table 3. Jurisdiction, land use, roads and total impervious area (TIA).

Basin	Total Basin Size (Ac)	Basin Acres in City and UGA	% Basin in City and UGA	Jurisdiction Score [1]	Zoning Classification				Road Miles	Road Score [3]	Existing TIA		
					Commercial Industrial %	High Den. Residential %	Sum	Score [2]			Acres	%	Score [4]
South Fork Dogfish Creek	647	647	100%	5	60%	25%	85%	5	3.35	5	211	33%	5
East Fork Dogfish Creek	2,600	717	28%	1	0%	0%	0%	1	0.3	1	188	26%	4
West Fork Dogfish Creek	1,370	497	36%	2	60%	20%	80%	5	3.34	5	81	16%	3
Johnson Creek	2,100	615	29%	2	50%	15%	65%	4	1.52	3	151	25%	4
Poulsbo Creek	211	211	100%	5	15%	15%	30%	3	1.5	3	76	36%	4
Barrantes Creek	220	110	50%	2	0%	0%	0%	1	0.2	1	11	10%	2
Bjorgen Creek	510	424	83%	4	0%	0%	0%	1	2.67	4	91	22%	4
Lemolo Creek	1,100	244	22%	1	0%	0%	0%	1	0.6	2	99	41%	5
Central Poulsbo	202	202	100%	5	30%	50%	80%	4	2.78	4	79	39%	5
West Poulsbo	343	343	100%	5	50%	35%	85%	5	1.99	3	119	35%	5

[1] Jurisdiction

% in City	Score
100	5
75-100	4
50-75	3
25-50	2
0-25	1

Data Source: Poulsbo Zoning Map 2021.

[2] Zoning

Sum	Score
100-80	5
60-80	4
40-60	3
20-40	2
0-20	1

Data Source: Poulsbo Zoning Map 2021.

[3] Roads = arterials and collectors only

Miles	Score
>3	5
2.0-3.0	4
1.0-2.0	3
0.5-1	2
0. - 0.5	1

Data Source: KC GIS.

[4] Impervious Areas

% TIA	Score
0-5	1
5-10	2
10-20	3
20-30	4
30-40	5

Data Source: Poulsbo TMDL Plan 2016.

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Table 4. Shellfish harvest and recreation.

Basin	Shellfish Harvest Classification/Score	Recreation					Notes
		No. of Parks [2]	Contact Recreation [3]	Miles of Marine Park Shoreline [4]	Recreation Sum	Recreation Score	
South Fork Dogfish Creek	1	1	1	0.1	2.1	2	Centennial Park
East Fork Dogfish Creek	1	0	0	0	0	0	None
West Fork Dogfish Creek	1	1	0	1	2	2	Fish Park
Johnson Creek	3	0	0	0	0	0	None
Poulsbo Creek	1	2	1	0.2	3.2	3	Lions Park, Oyster Plant Park
Barrantes Creek	4	0	0	0	0	0	None
Bjorgen Creek	2	0	0	0	0	0	None
Lemolo Creek	2	0	0	0	0	0	None
Central Poulsbo	1	3	1	0.5	4.5	4	Anderson, Legion, Port
West Poulsbo	1	2	0	0.3	2.3	2	West Poulsbo WF Park, Nelson Park

Notes:

Shellfish Classification	Score
Approved	4
Conditional	3
Unclassified	2
Prohibited	1
Closed Due to Pollution	0

Data Source: WDOH

[2] Combined city and Port waterfront parks and designated public open space.

[3] Based on historical use.

[4] Estimated from aerial mapping.

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Table 5. Marine Water Quality

Basin	Long Term Trend [1]	Current WQ Status [2]	Total Score
South Fork Dogfish Creek	1	2	3
East Fork Dogfish Creek	1	2	3
West Fork Dogfish Creek	1	2	3
Johnson Creek	1	2	3
Poulsbo Creek	1	2	3
Barrantes Creek	1	2	3
Bjorgen Creek	1	2	3
Lemolo Creek	1	2	3
Central Poulsbo	1	2	3
West Poulsbo	1	2	3

ND = No Data.

Notes:

[1] Long term trend. All data from KCHD 2018, 2019; WDOH 2019.

Score	Trend Criteria
0	Improving
1	Stable
2	Declining

[2] Compliance with FC standard. All data from KCHD 2018; WDOH 2019.

Score	Criteria
2	All stations meet FC standard
1	Met Part 1of Standard
3	Failed Both Parts of Standard

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Table 6. Stream Water Quality

Basin	Long Term Trend [1]	Current WQ Status [2]	FC Load [3]	TMDL Reduction [4]	Total Score
South Fork Dogfish Creek [1]	0	1	5	0	6
East Fork Dogfish Creek [1, 3a]	0	1	1	0	2
West Fork Dogfish Creek [1, 3a]	0	1	2	1	4
Johnson Creek [1a]	0	0	1	0	1
Poulsbo Creek [1]	1	2	1	3	7
Barrantes Creek [1, 3a]	0	2	1	2	5
Bjorgen Creek [1]	1	2	2	3	8
Lemolo Creek [1]	1	1	1	2	5
Central Poulsbo [1a, 3a]	1	0	2	3	6
West Poulsbo [1a, 3a]	1	0	2	3	6

[1] Long term FC trend. All data from KCHD 2019. [1a] Estimated at City limits from Poulsbo TMDL 2016.

Score	Trend Criteria
0	Improving
1	Stable
2	Declining

[2] Compliance with FC standard. All data from KCHD 2018.

Score	Criteria
0	Meets both parts FC standard
1	Met Part 1of Standard
2	Failed Both Parts of Standard

[3] Poulsbo TMDL Plan.

Score	Criteria
5	> 100 bcfu/day
4	75-100 bcfu/day
3	50-75 bcfu/day
2	25-50 bcfu/day
1	5-25 bcfu/day
0	< 5 bcfu/day

3a Estimated from Poulsbo TMDL data.

[4] TMDL reduction calculated as follows:

	GMV 2018 [1]	GMV 2020 [2]	TMDL Target Value	% Reduction Needed [5]	Score [6]
SFDC	26	-	31	0%	0
EFDC	25	-	28	0%	0
WFDC	25	-	22	12%	1
JC	14	-	15	0%	0
PC	103	-	27	74%	3
BarC	55	-	26	53%	2
Bjorgen	74	-	13	82%	3
Lemolo	31	-	11	65%	2
CP	ND	238	30	87%	3
WP	ND	139	44	68%	3

[1] KCHD 2018.

[2] 2020 outfall data.

[3] Based on outfall OF-3703

[4] Based on outfall OF-3707

[5] Reduction needed to meet TMDL target value.

[6] Score based on:

% Reduction Needed	Score
1	0
1-33	1
33-66	2
66-100	3

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Table 7. Hydrology

Basin	Hydrology Rating [1,2]
South Fork Dogfish Creek	2
East Fork Dogfish Creek	2
West Fork Dogfish Creek	2
Johnson Creek	1
Poulsbo Creek	1
Barrantes Creek	1
Bjorgen Creek	1
Lemolo Creek	1
Central Poulsbo	1
West Poulsbo	1

Notes:

[1] All data WDOE Watershed Characterization 2021. Combines Delivery, Surface Storage, Recharge, and Discharge components to compare relative importance of analysis units in maintaining overall water flow processes in a non-degraded setting.

[2] Water Flow Importance Rating from WDOE Watershed Characterization:

Rating	Score
High	5
Moderate High	3
Moderate	2
Low	1

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Table 8. Fish presence and habitat summary.

Basin	Stream	No. Salmonid Species [1]	No. ESA Listed Salmonid Species [2]	Freshwater Habitat Index [3]	Stream Habitat Present (miles) [4]	Shoreline Habitat Index [5]	Sum	Score [6]
South Fork Dogfish Creek	South Fork Dogfish Creek	4	1	1	2.25	0	8.25	5
East Fork Dogfish Creek	East Fork Dogfish Creek	5	2	2	0.25	0	9.25	5
West Fork Dogfish Creek	West Fork Dogfish Creek	0	0	0	0	0	0	0
Johnson Creek	Johnson Creek	3	1	1.8	1.1	1	7.9	4
Poulsbo Creek	Poulsbo Creek	0	0	0	0	0	0	0
Barrantes Creek	Barrantes Creek	0	0	0.00	0	1	1	1
Bjorgen Creek	Bjorgen Creek	2	0	1	0.95	0	3.95	2
Lemolo Creek	Lemolo Creek	3	1	1	1.1	0	6.1	4
Central Poulsbo	None	5	2	0	0	1	8	5
West Poulsbo	None	5	2	0	0	1	8	5

Notes:

[1] Chinook, steelhead, fall chum, coho, resident trout. Source: WDFW Salmonscape and Poulbso TMDL Plan.

[2] Stream and shoreline habitat only. Chinook and steelhead.

[3] Sum of all quantity and quality of habitats for all salmonids present or potentially present. Includes downstream salmonid habitats (the quality and quality of salmonid habitat downstream of the assessment unit) and hydrogeomorphic features (all extant wetlands and undeveloped floodplains in the assessment unit).

All data from WDOE Watershed Characterization 2021. Rating scale:

WDOE Rating	Score
Low (1-6 index)	0
Moderate (7-13)	1
High (13-18 index)	2

[4] Total stream miles that support fish species.

[5] Total shoreline miles that support fish species, forage fish spawning habitat.

[6] Score criteria:

Sum	Score
=>8	5
6-8	4
4-6	3
2'-4	2
1-2	1
0	0

Table 9. Summary of beneficial uses and data sets used in RWA.

Data Category	Beneficial Use	Data Sets Used in RWA
WATER QUALITY	Aquatic Life	Ecology 303(d) List
	Shellfish Harvesting - Recreational	Kitsap Health District (KHD) PIC data
	Shellfish Harvesting - Commercial	WDOH Classification Maps
	Primary Contact Recreation	KHD ambient monitoring data
	TMDL	Ecology 2013
WATER FLOW	Aquatic Life	Ecology Watershed Characterization
HABITAT	Salmonid Habitat	WDFW Salmonscape
	Forage Fish Spawning	Ecology Watershed Characterization
	Salmonid Habitat	Poulsbo TMDL Plan
	Forage Fish Spawning	WDFW Forage Fish Spawning GIS
	ESA Critical Habitat	NOAA and USFWS Critical Habitat
SHELLFISH AND FINFISH CONSUMPTION	Shellfish Harvesting - Recreational	WDOH Commercial Shellfish and Beach Closure GIS
	Shellfish Harvesting - Commercial	WDOH Commercial Shellfish and Beach Closure GIS
	Finfish Harvesting - Recreational	WDOH Commercial Shellfish and Beach Closure GIS
LAND USE	Water Quality, Water Flow and Habitat	City of Poulsbo Zoning
		High ADT Road miles, Poulsbo Transportation Plan
		City of Poulsbo Parks Plan
		Land Cover and Impervious Surfaces
STORMWATER INFRASTRUCTURE	Water Quality, Water Flow and Habitat	City of Poulsbo GIS
		City of Poulsbo Stormwater Monitoring Data

APPENDIX B
Capital Project Descriptions

SOUTH FORK DOGFISH CREEK STORMWATER RETROFIT
City of Poulsbo
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Table 1. Preliminary Capital Project Summary

Priority [1]	Map ID	Project	Area Treated	Approx. Acre PGIS Treated	Est. Cost [2]	Cost/Acre
1	1	Liberty Road Vault	Private parking lots, commercial bldgs, public roads	13.00	$1,123,850	$86,450
1	2	Poulsbo Village North Vault	Private parking lots, commercial bldgs	8.00	$640,929	$80,116
2	3	Iverson Street Pond Retrofit	Public road, public bldgs, public parking lot	2.45	$251,856	$102,798
2	4	Iverson Street Vault	Public road, public facility, private bldsg and parking lots	4.75	$236,115	$49,708
2	5	Lincoln Road-8th Street Vault	Public road	0.50	$119,250	$238,500
2	6	7th Avenue Vault	Public road, private bldgs and parking lots	1.50	$139,920	$93,280
			Subtotal projects within contributory basin of current Ecology grant design project	*30.20*	*$2,511,920*	*$108,475*
3	7	SR305 Swale Retrofit	Private parking lots, public roads	48.00	$1,770,230	$36,880
4	8	Bond Road Vault	Private parking lots, public roads	8.00	$807,820	$100,978
5	9	Poulsbo Gardens retrofit	Residential development, public roads	6.00	$139,920	$23,320
			TOTALS	**92.20**	**$5,229,890**	**$56,723**

[1] Based on sub-basin and outfall water quality assessment.

[2] Refer to individual projects estimates for additional detail.

SOUTH FORK DOGFISH CREEK STORMWATER RETROFIT
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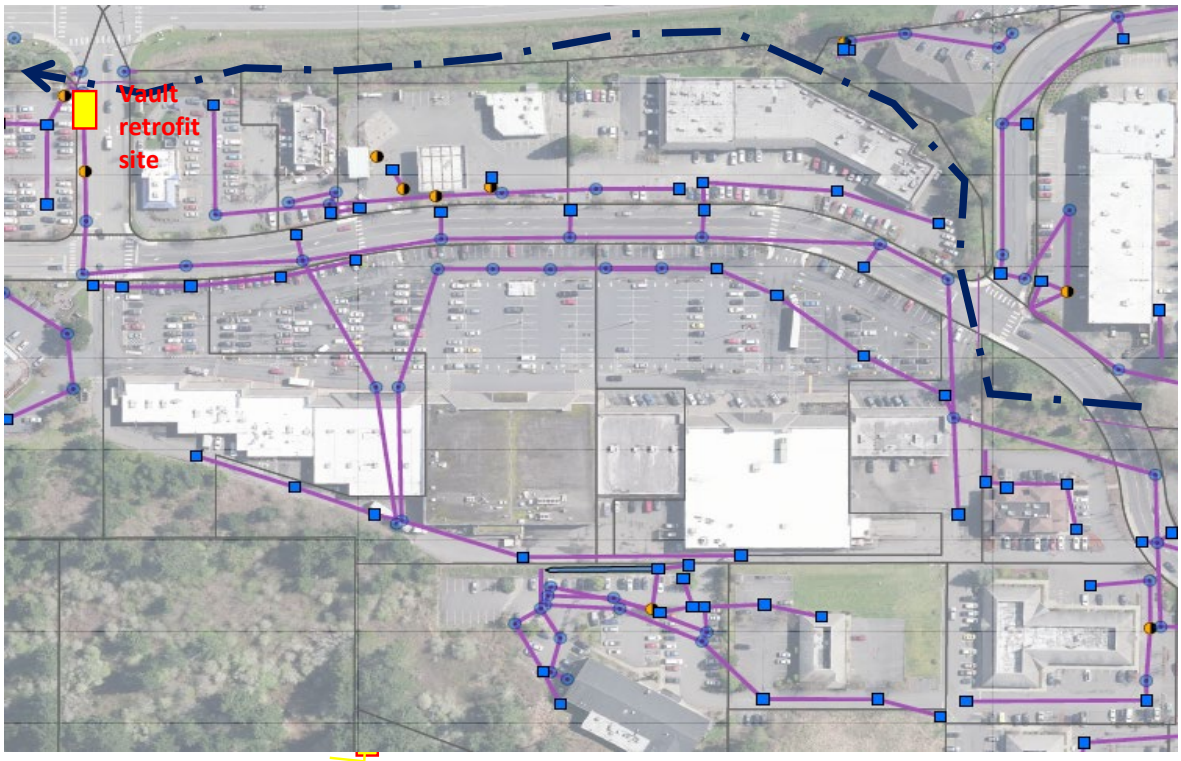
Liberty Road Treatment Vault

Description: Retrofit treatment vault into existing conveyance. Treats 13 acres PGIS.

Item	Description	Unit	Unit Cost	Quantity	Total
1	Mobilization	LS	$60,000.00	1	$60,000
2	TESC and Site Prep	LS	$20,000.00	1	$20,000
3	Excavation	LS	$20,000.00	1	$20,000
4	8' x 16' vaults	LS	$75,000.00	3	$225,000
5	12" PVC storm pipe	LF	$50.00	100	$5,000
6	Catch basin Type 2	EA	$5,000.00	2	$10,000
7	Flow Splitter	EA	$15,000.00	1	$15,000
8	Utility Relocation Allowance	LS	$50,000.00	1	$50,000
9	Pretreatment vault	LS	$70,000.00	2	$140,000
10	Street and sidewalk restoration	LS	$50,000.00	1	$50,000
11	Traffic Control	LS	$20,000.00	3	$60,000
12	Clean Up and Restoration	LS	$10,000.00	1	$10,000
13	*Subtotal*				*$665,000*
14	Design and Permits	20%			$133,000
15	Tax	9%			$59,850
16	Contingency	30%			$199,500
17	CM	10%			$66,500
18	TOTAL CONSTRUCTION COST				$1,123,850



SOUTH FORK DOGFISH CREEK STORMWATER RETROFIT
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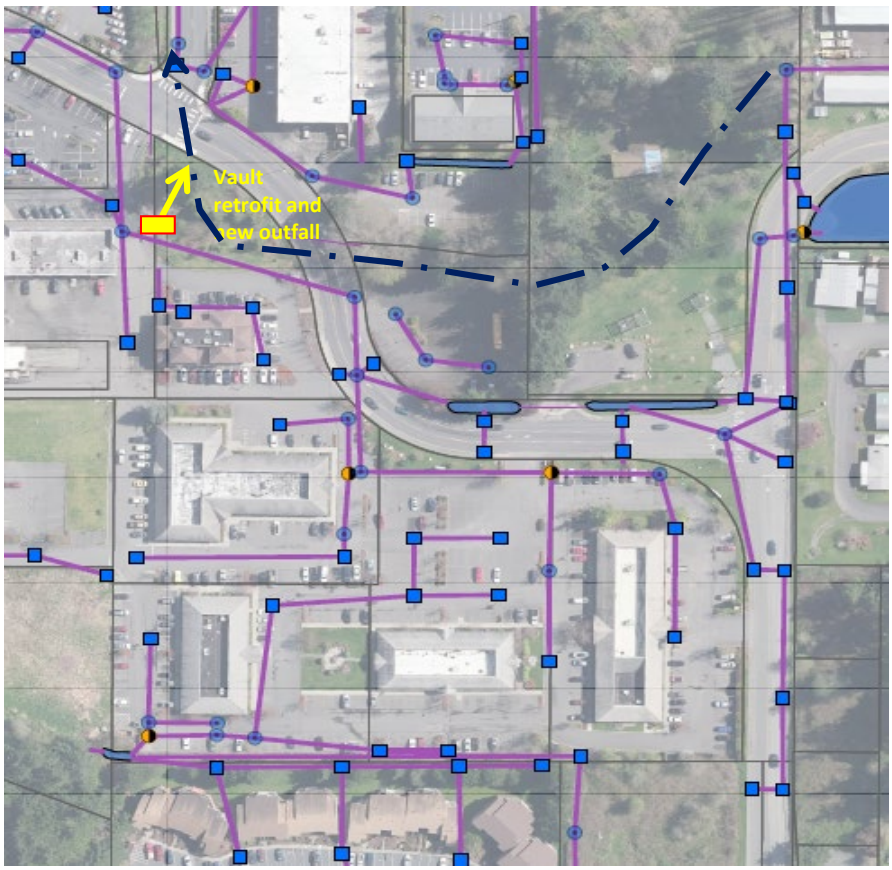
Poulsbo Village-North Vault Retrofit

Description: Retrofit vault into existing conveyance. Treat 8.0 acres PGIS. Construct new outfall to SFDC to alleviate surcharging and flooding.

Item	Description	Unit	Unit Cost	Quantity	Total
1	Mobilization	LS	$36,600.00	1	$36,600
2	TESC and Site Prep	LS	$2,000.00	1	$2,000
3	8' x 16' Vault	LS	$75,000.00	2	$150,000
4	12" PVC storm pipe	LF	$50.00	50	$2,500
5	Utility Relocation Allowance	LS	$50,000.00	1	$50,000
6	Catch Basin Type 2	EA	$5,000.00	1	$5,000
7	Flow Splitter	EA	$15,000.00	2	$30,000
8	18" Outfall	LS	$50,000.00	1	$50,000
9	Mitigation	LS	$25,000.00	1	$25,000
10	Roadway Repair	LS	$25,000.00	1	$25,000
11	Traffic control	LS	$2,000.00	1	$2,000
12	Easements	LS	$10,000.00	2	$20,000
13	Clean Up and Restoration	LS	$5,000.00	1	$5,000
14	*Subtotal*				*$403,100*
15	Bid Documents	10%			$40,310
16	Tax	9%			$36,279
17	Contingency	30%			$120,930
18	CM	10%			$40,310
19	TOTAL CONSTRUCTION COST				$640,929



SOUTH FORK DOGFISH CREEK STORMWATER RETROFIT
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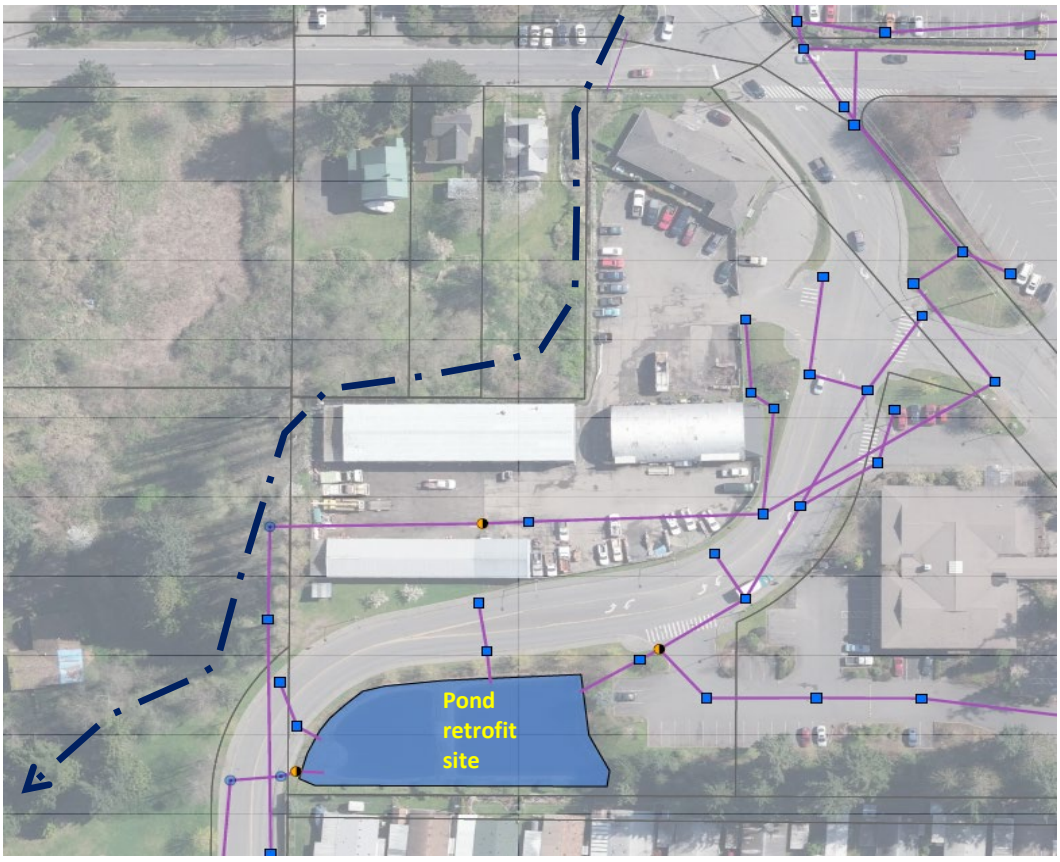
IVERSON STREET POND RETROFIT

Description: Retrofit existing detention pond to provide optimal combination of water quality treatment and flow control. Install low cost, low maintenance landscaping to improve appearance and habitat value. Treats approx. 4 acres PGIS.

Item	Description	Unit	Unit Cost	Quantity	Total
1	Mobilization	LS	$14,400.00	1	$14,400
2	TESC and Site Prep	LS	$10,000.00	1	$10,000
3	Excavation to increase pond vol.	CY	$30.00	200	$6,000
4	Rockery Wall to Increase Pond Vol.	SF	$60.00	1,000	$60,000
5	Topsoil/compost amendment	TON	$40.00	500	$20,000
6	Embankment placement and compaction	CY	$10.00	200	$2,000
7	Planting	LS	$20,000.00	1	$20,000
8	Outlet control structure retrofit	LS	$10,000.00	1	$10,000
9	Split rail fence adjacent to Iverson	LF	$20.00	300	$6,000
10	Traffic Control	LS	$5,000.00	1	$5,000
11	Clean Up and Restoration	LS	$5,000.00	1	$5,000
12	*Subtotal*				*$158,400*
13	Bid Documents	10%			$15,840
14	Tax	9%			$14,256
15	Contingency	30%			$47,520
16	CM	10%			$15,840
17	TOTAL CONSTRUCTION COST				$251,856



SOUTH FORK DOGFISH CREEK STORMWATER RETROFIT
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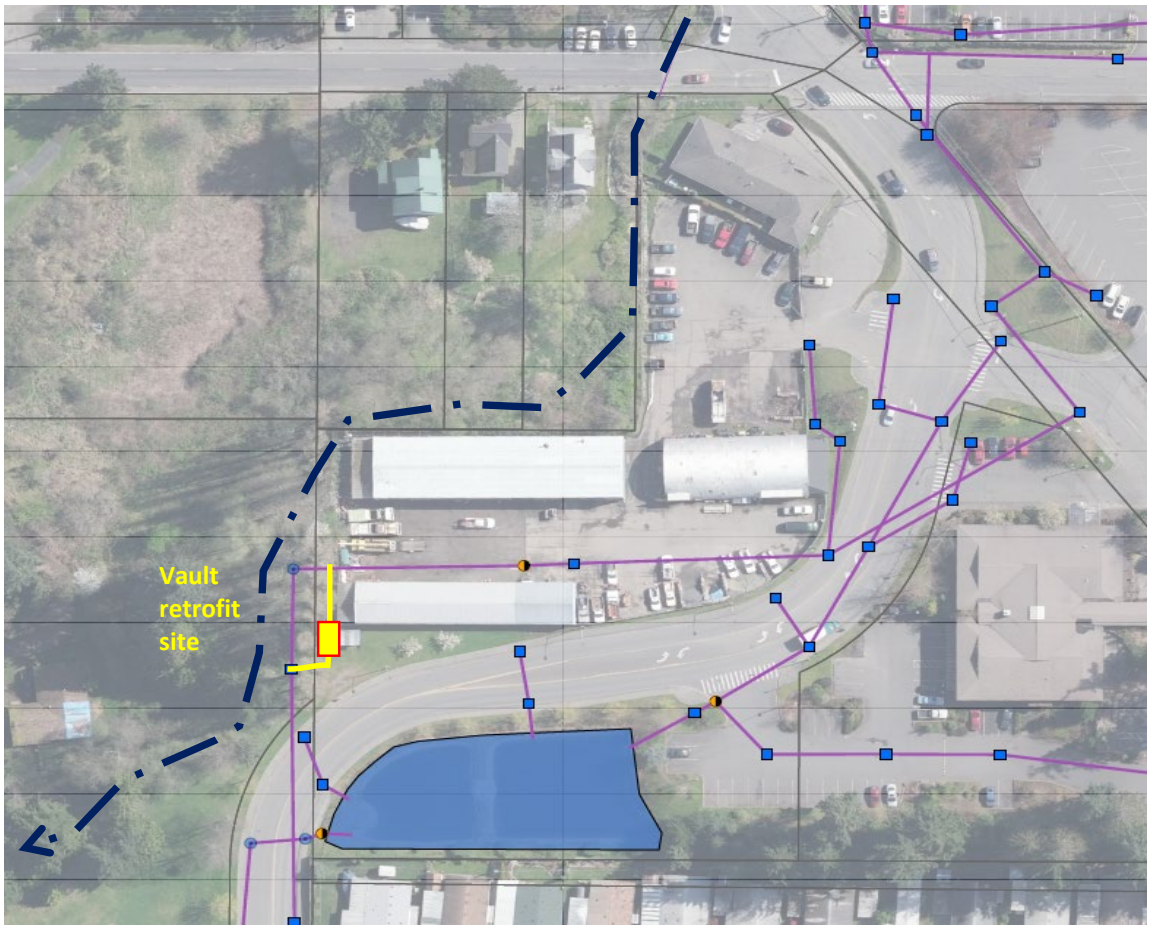
IVERSON STREET VAULT RETROFIT

Description: Retrofit treatment vault into existing conveyance. Remove storm structure from stream buffer. Treats approximately 4.75 acres PGIS.

Item	Description	Unit	Unit Cost	Quantity	Total
1	Mobilization	LS	$13,500.00	1	$13,500
2	TESC and Site Prep	LS	$10,000.00	1	$10,000
3	Remove existing structure	LS	$5,000.00	1	$5,000
4	8' x 16' Vault	LS	$100,000.00	1	$100,000
5	12" PVC storm pipe	LF	$50.00	100	$5,000
6	Catch basin Type 2	EA	$5,000.00	2	$10,000
7	Clean Up and Restoration	LS	$5,000.00	1	$5,000
8	*Subtotal*				*$148,500*
9	Bid Documents	10%			$14,850
10	Tax	9%			$13,365
11	Contingency	30%			$44,550
12	CM	10%			$14,850
13	TOTAL CONSTRUCTION COST				$236,115



SOUTH FORK DOGFISH CREEK STORMWATER RETROFIT
City of Poulsbo
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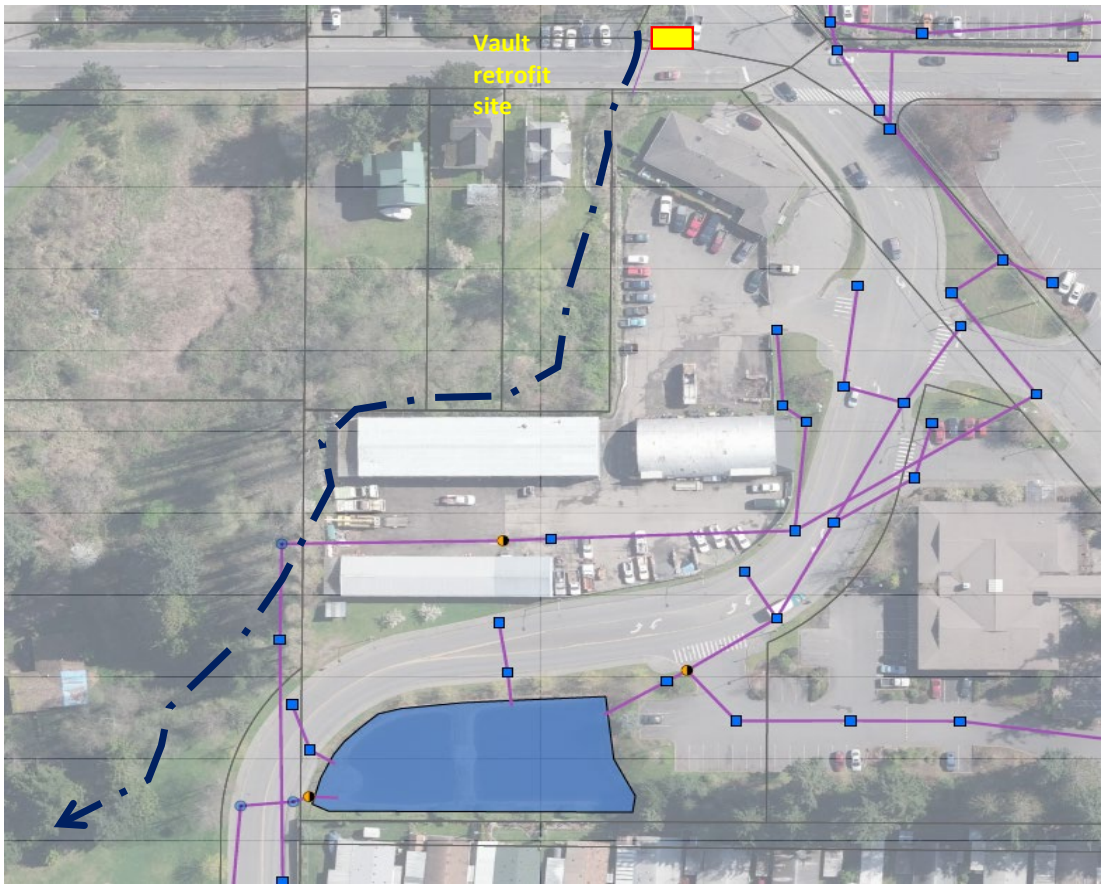
LINCOLN ROAD-8th AVENUE VAULT RETROFIT

Description: Retrofit treatment vault into existing conveyance with curb inlet. New outfall to stream. Treats 0.5 acres PGIS.

Item	Description	Unit	Unit Cost	Quantity	Total
1	Mobilization	LS	$6,800.00	1	$6,800
2	TESC and Site Prep	LS	$6,200.00	1	$6,200
3	Excavation	LS	$2,000.00	1	$2,000
4	4' x 4' BioPod vault	LS	$25,000.00	1	$25,000
5	12" PVC storm pipe	LF	$50.00	50	$2,500
6	Curb and gutter	LF	$50.00	50	$2,500
7	Catch basin Type 2	EA	$5,000.00	1	$5,000
8	Outfall	LS	$10,000.00	1	$10,000
9	Traffic control	LS	$10,000.00	1	$10,000
10	Clean Up and Restoration	LS	$5,000.00	1	$5,000
11	*Subtotal*				*$75,000*
12	Final Design and Permits	10%			$7,500
13	Tax	9%			$6,750
14	Contingency	30%			$22,500
15	CM	10%			$7,500
16	TOTAL CONSTRUCTION COST				$119,250

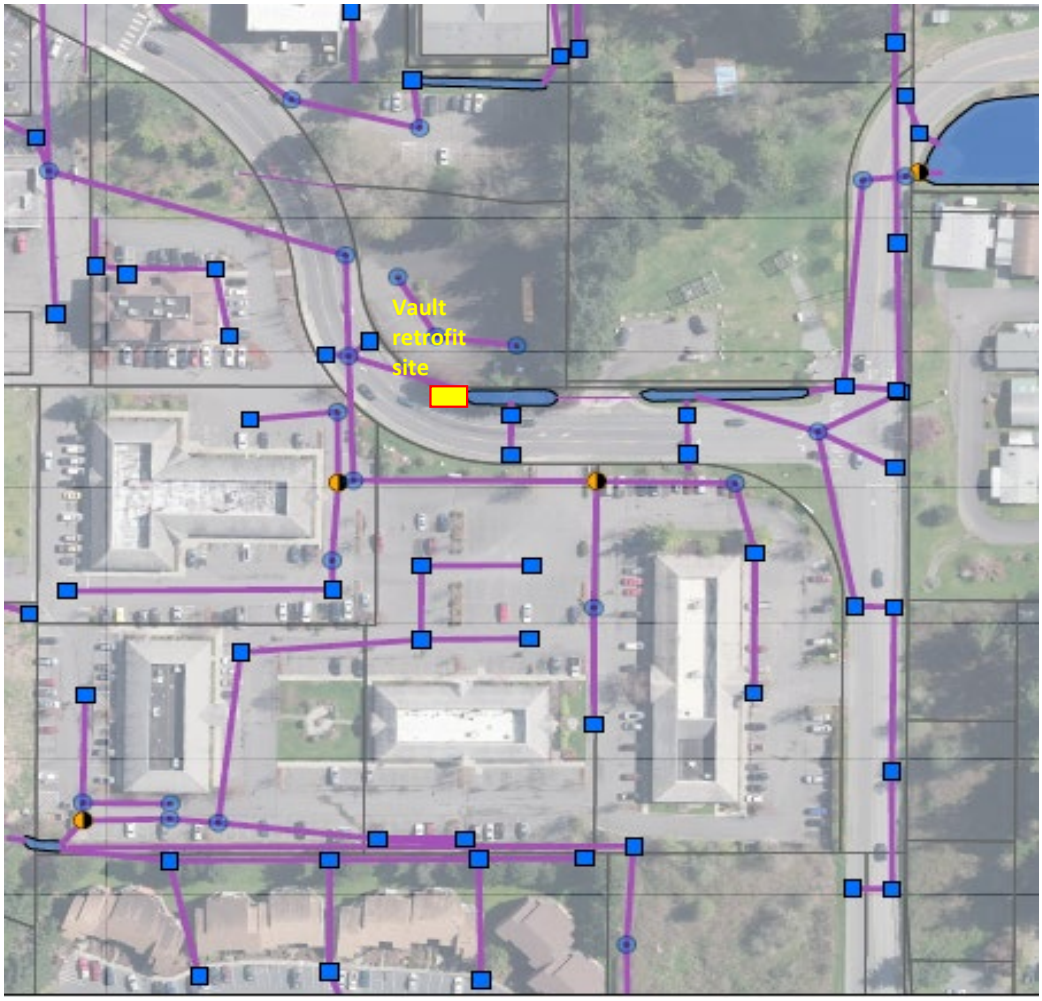


SOUTH FORK DOGFISH CREEK STORMWATER RETROFIT
City of Poulsbo
03-02-21 v2

7th Avenue Vault Retrofit

Description: Retrofit existing ditch to provide water quality treatment. Treats approx. 1.5 acres.

Item	Description	Unit	Unit Cost	Quantity	Total
1	Mobilization	LS	$8,000.00	1	$8,000
2	TESC and Site Prep	LS	$10,000.00	1	$10,000
3	6' x 8' BioPod vault	LS	$40,000.00	1	$40,000
4	12" PVC storm pipe	LF	$50.00	50	$2,500
5	Curb and gutter	LF	$50.00	50	$2,500
6	Catch basin Type 2	EA	$5,000.00	2	$10,000
7	Traffic control	LS	$10,000.00	1	$10,000
8	Clean Up and Restoration	LS	$5,000.00	1	$5,000
9	*Subtotal*				*$88,000*
10	Design and Permits	10%			$8,800
11	Tax	9%			$7,920
12	Contingency	30%			$26,400
13	CM	10%			$8,800
14	TOTAL CONSTRUCTION COST				$139,920

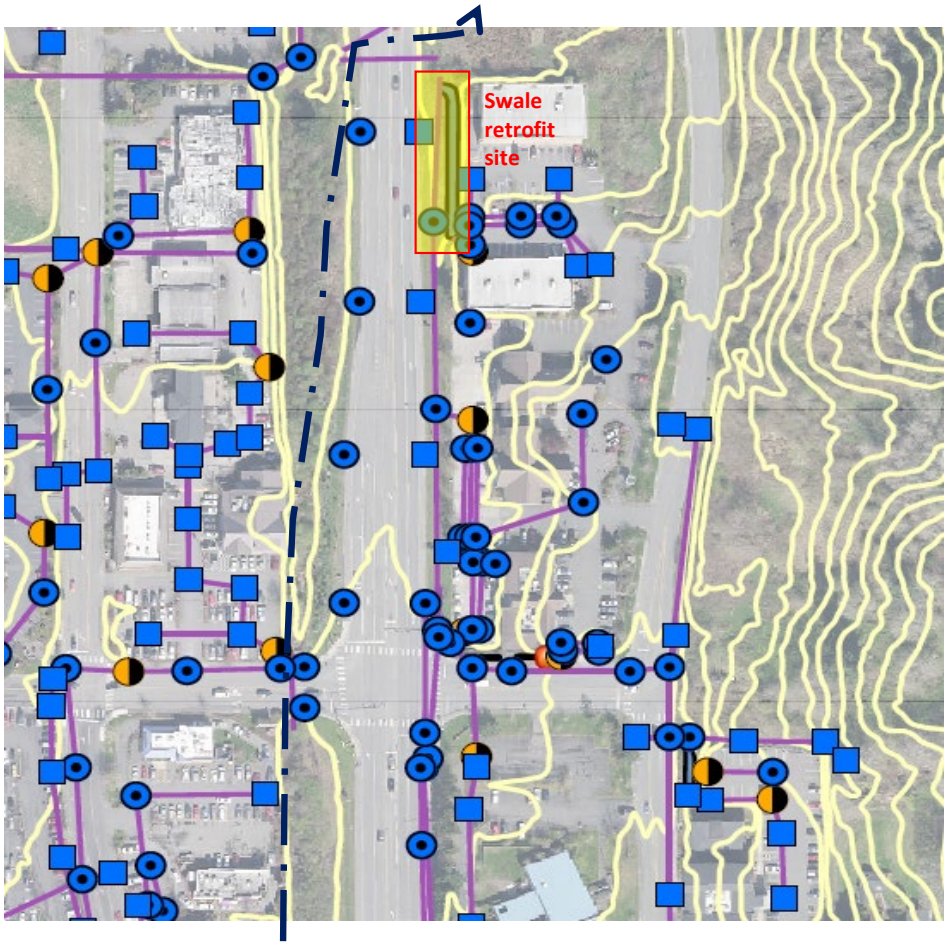


SOUTH FORK DOGFISH CREEK STORMWATER RETROFIT
City of Poulsbo
03-02-21 v2

SR305 SWALE RETROFIT AT 10TH AVENUE

Description: Retrofit existing swale with high capacity filter media and underdrain or treatment wetland. Treats approximately 48 acres PGIS.

Item	Description	Unit	Unit Cost	Quantity	Total
1		LS	$77,000.00	1	$77,000
2	TESC and Site Prep	LS	$20,000.00	1	$20,000
3	Treatment Vault	SF	$250.00	2,000	$500,000
4	Pretreatment vault	Ea	$75,000.00	1	$75,000
5	12" PVC storm pipe	LF	$50.00	100	$5,000
6	Catch basin Type 2	EA	$5,000.00	2	$10,000
7	Flow splitter	EA	$15,000.00	1	$15,000
8	Outfall Improvements	LS	$25,000.00	1	$25,000
9	Mitigation	LS	$50,000.00	1	$50,000
10	Utility Relocation Allowance	LS	$50,000.00	1	$50,000
11	Traffic Control	LS	$10,000.00	1	$10,000
12	Clean Up and Restoration	LS	$10,000.00	1	$10,000
13	*Subtotal*				*$847,000*
14	Design and Permits	20%			$169,400
15	Tax	9%			$245,630
16	Contingency	50%			$423,500
17	CM	10%			$84,700
18	TOTAL CONSTRUCTION COST				$1,770,230

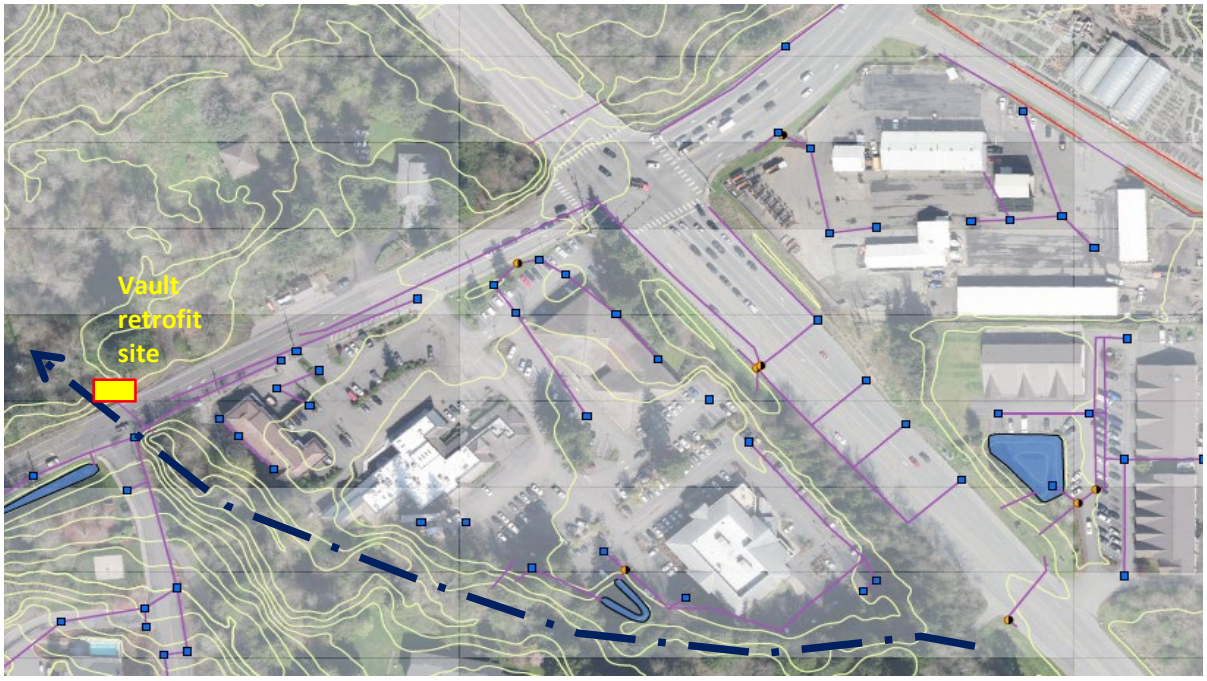


SOUTH FORK DOGFISH CREEK STORMWATER RETROFIT
City of Poulsbo
03-02-21 v2

Bond Road-1st Avenue Treatment Vault

Description: Retrofit vault into existing conveyance system. Treats approximately 11 acres PGIS.

Item	Description	Unit	Unit Cost	Quantity	Total
1	Mobilization	LS	$43,000.00	1	$43,000
2	TESC and Site Prep	LS	$10,000.00	1	$10,000
3	Excavation and embankment	LS	$10,000.00	1	$10,000
4	8' x 16' vaults	LS	$75,000.00	3	$225,000
5	12" PVC storm pipe	LF	$50.00	100	$5,000
6	Catch basin Type 2	EA	$5,000.00	2	$10,000
7	Flow Splitter	EA	$15,000.00	1	$15,000
8	Utility Relocation Allowance	LS	$50,000.00	1	$50,000
9	Pretreatment vault	LS	$40,000.00	1	$40,000
10	Outfall retrofit	LS	$20,000.00	1	$20,000
11	Buffer mitigation/enhancement	LS	$20,000.00	1	$20,000
12	Traffic Control	LS	$20,000.00	1	$20,000
13	Clean Up and Restoration	LS	$10,000.00	1	$10,000
14	*Subtotal*				*$478,000*
15	Design and Permits	20%			$95,600
16	Tax	9%			$43,020
17	Contingency	30%			$143,400
18	CM	10%			$47,800
19	TOTAL CONSTRUCTION COST				$807,820

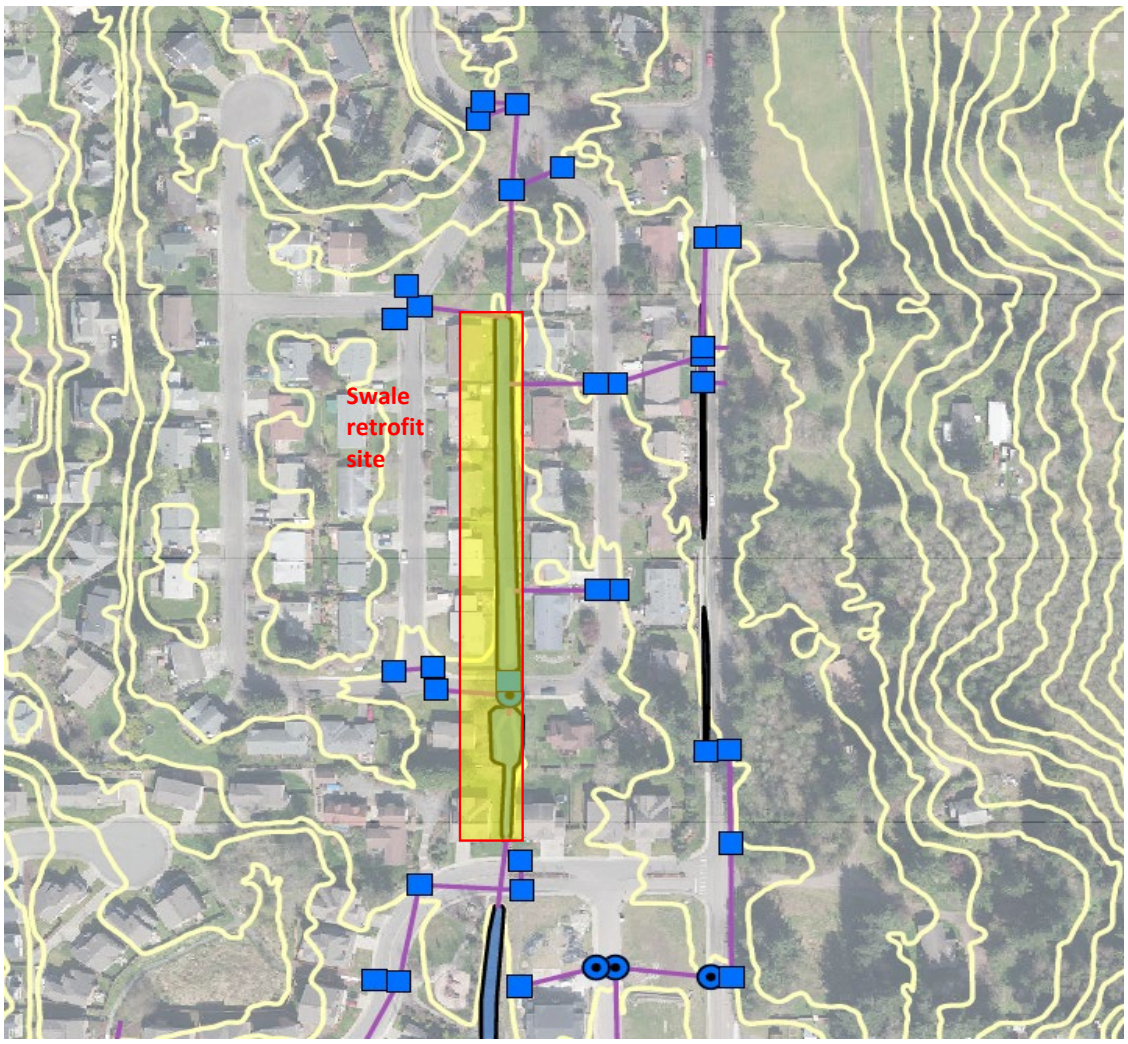


SOUTH FORK DOGFISH CREEK STORMWATER RETROFIT
City of Poulsbo
03-02-21 v2

POULSBO GARDENS SWALE RETROFIT

Description: Retrofit existing swale with flow dispersion and vegetation to enhance biofiltration. Treats approx. 6 acres PGIS in headwaters of SF Dogfish Creek.

Item	Description	Unit	Unit Cost	Quantity	Total
1	Mobilization	LS	$8,000.00	1	$8,000
2	TESC and Site Prep	LS	$10,000.00	1	$10,000
3	Channel excavation	LS	$15,000.00	1	$15,000
4	Flow dispersion structures	EA	$2,000.00	10	$20,000
5	Topsoil/compost enhancement	LS	$5,000.00	1	$5,000
6	Planting	LS	$20,000.00	1	$20,000
7	Clean Up and Restoration	LS	$10,000.00	1	$10,000
8	*Subtotal*				*$88,000*
9	Design and Permits	10%			$8,800
10	Tax	9%			$16,720
11	Contingency	20%			$17,600
12	CM	10%			$8,800
13	TOTAL CONSTRUCTION COST				$139,920



APPENDIX C

SFDC Design Grant Close Out Report

South Fork Dogfish Creek Stormwater Retrofit Design Project
City of Poulsbo
WQC-2018-PoulPW-00158

July 2018 – February 2022

Final Total Project Cost: $227,697.01

Ecology Funded Water Quality Improvement Cost: $227,697.01

Additional Water Quality Improvement Cost: $0.00

Other Project Cost: $0.00

Context and Project Description

This project will improve water quality in the South Fork of Dogfish Creek through design of a pond retrofit, designs to convert existing grass swales to bioretention facilities, and design of Modular Wetland Treatment Vaults at South Fork Dogfish Creek in the City of Poulsbo. Theproject will treat 28.8 acres to enhanced water quality standards within the South Fork Dogfish Creek basin. Additionally, the pond is proposed to be retrofitted to increase detention volume which will greatly help stream flows.

The existing project basins provide minimal water quality treatment and a significant portion of South Fork Dogfish Creek lacks detention and water quality facilities. The only significant flow control is the existing detention pond and the only existing water quality treatment facility is an oil/water separator. The existing storm system was not designed to current standards and needs to be updated to increase hydraulic capacity.

As this is a design only project, the next step will be to identify construction funding, advertise the project, and construct the water quality improvement.

The photo above shows an example of a large Modular Wetland vault being filled with treatment media. Cleaning and replacement of the media is important to maintaining a functional stormwater system.

Dogfish Creek portion adjacent to 7th Ave. The black arrow indicates the location of one of the proposed treatment vaults.

Project Accomplishments

In order to improve water quality, the City of Poulsbo produced a design package identifying:

Facilities Designed:

- Retrofitting the existing stormwater pond to improve detention volume.
- Retrofitting the two existing grass swales into bioretention swales.
- Five Modular Wetland Treatment Vaults
- Total basin area of 28.8 Acres, Treated PGIS 20.8 Acres

These designed retrofits provide enhanced water quality treatment.

The design package was completed under budget by consultant Perteet with assistance from City of Poulsbo staff.

Water Quality and Environmental Outcomes

Evaluating water quality benefits from retrofit projects can be challenging. Often, the existing built environment does not have enough undeveloped land left to build BMPs that would be sufficient to effectively manage all the stormwater generated by the drainage basin. In the retrofit program, Ecology encourages local communities to build the largest facility that will fit in the available space and then uses a calculation developed with stakeholder input to evaluate the amount of treatment and flow control provided in retrofit projects on a common basis for reporting purposes. Ecology calls this area the runoff treatment or flow control equivalent area.

Using this equivalent area, we can estimate the amount of solids removal per year that the constructed project could achieve, using a given amount of pollutant removal and the annual runoff. We can also estimate the area that has runoff similar to pre-developed conditions created through the retrofit project.

The following table lists the equivalent area values for this project:

	Runoff Treatment		Flow Control
Actual Basin Area (ac)	Equivalent Area (ac)	Solids removed per year (lbs.)	Equivalent Area (ac)
28.8	N/A	N/A	N/A

The proposed design project will provide enhanced treatment for 28.8 acres within the basin with no treatment currently. Additionally, the pond modifications will provide 0.56 acre-ft of increased detention volume, thereby providing better flow control into South Fork Dogfish Creek.

Lessons Learned

For this project, the original assumptions for basin area were slightly higher than actual based on the topography within the built environment. Overall the City was able to nearly meet the original design intent, however it is a lesson learned that actual topography can vary from what would be expected based on visual grades, slopes, etc.

The Next Step for Continued Success

The next step for this project is to identify construction funding, advertise, and construct the project. Based on the work completed in the design portion, the project construction cost is estimated at approximately $2.2mil and is partially programmed into the City Storm CIP for future construction. Due to the overall project cost, it is likely the City would choose to phase the project. This will allow flexibility when pursuing construction funding and grant opportunities.

Recipient Contact Information

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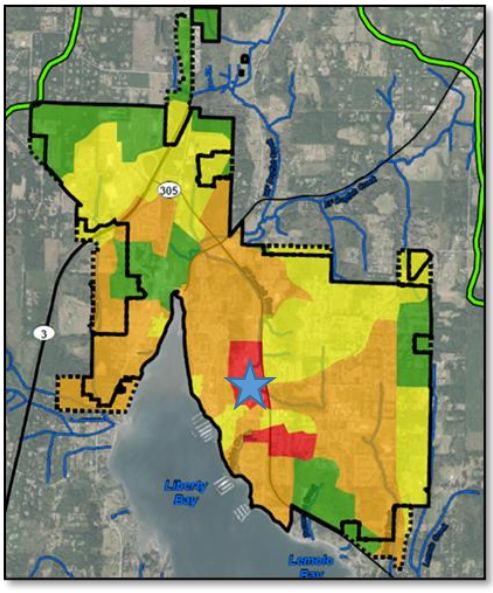
Project web page found:
www.CityofPoulsbo.com



The Map to the left shows the general water quality treatment available in each basin. Red indicates no treatment, yellow and orange indicate minor treatment facilities in the basin and the green indicates treatment is available. The star shows the project location in relation to the general basin. This project will treat about half of the area with no treatment present.