HERRERA

TECHNICAL MEMORANDUM

Date: March 21, 2022

To: Pat Johnson, City of Edmonds

From: Rebecca Dugopolski, Mindy Fohn, and Katie Wingrove, Herrera Environmental Consultants, Inc.

Subject: City of Edmonds Receiving Water Conditions and Stormwater Management Influence Assessment

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BACKGROUND

The purpose of this technical memorandum is to document the process used to prepare a receiving water conditions assessment for the City of Edmonds (City) to meet the requirements of S5.C.1.d.i of the Western Washington Phase II National Pollutant Discharge Elimination System Municipal Stormwater Permit (NPDES Phase II permit). The approach taken to complete this inventory generally follows Ecology's Stormwater Management Action Plan (SMAP) guidance (Ecology 2019) with modifications that reflect the specific needs of the City and the landscape.

The inventory was conducted in three general steps, which are described in detail in following sections:

- Basin Delineation and Receiving Water Identification
- Receiving Water Conditions Assessment (including an evaluation of water resource uses)
- Stormwater Management Influence Assessment

The full results from the receiving water conditions assessment are included as Appendix A, (Tables A-1, A-2, and A-3). Table A-4 includes the results of the overburdened communities (equity) inventory. Equity data will be utilized during the prioritization step of the SMAP development process.

The intent of this assessment is to provide a characterization of each of the City's basins using two sets of metrics; one aimed at evaluating receiving water conditions and the second at stormwater management influence. Using selected metrics from Appendix A, an initial screening was completed to identify basins that will be carried forward into the prioritization phase of SMAP planning.

Summary information is provided for each of the basins that were retained for the next phase of the planning. This technical memorandum along with the Excel workbook (Appendix A) and basin inventory matrix summary (Appendix B) will be submitted to Ecology with the City's annual report by March 31, 2022, as required by the NPDES Phase II permit.

During the next phase of this project, the selected basins will be further evaluated and prioritized. This will involve looking more closely at planned activities and expected changes in pollutant loads or flows, opportunities, management goals, and other information to support an informed decision.

Basin Delineation and Receiving Water Identification

The first step in the SMAP planning process was to delineate the City's basins and identify receiving waters so that the inventory data could be matched with the appropriate basin and receiving waters. The number of basins defined is dependent upon the scale used and needs to be appropriate for supporting the inventory and planning effort. Ecology's SMAP guidance (Ecology 2019) recommends a scale of 1 to 20 square miles. Seven of the nine basins identified meet this guidance, but two are less than 1 square mile.

Methods

The City provided two primary GIS datasets to develop the basin delineation (Table A-1 in Appendix A). The City's GIS data was supplemented by Washington Department of Natural Resources (DNR) stream mapping and urban growth area (UGA) boundaries. Table 1 summarizes the data sources used for basin delineations.

Table 1. Data Sources for the Basin Delineation.

Metric	Data Source	Method Notes
Watershed area	City GIS data: "Edmonds_Watersheds" feature class	See discussion following this table describing revised drainage basin boundaries
Receiving waters (list of streams)	City GIS data: "STORM_DITCH_CREEK" feature class, DNR stream mapping	Edmonds stream mapping is not continuous. It was used for identification and naming, but not for analysis
Receiving waters (list of lakes)	GIS: NHD layer	
City control	Washington Geospatial Open Data: Washington State City Urban Growth Areas (2019)	Intersected city boundary (and UGA) with all watersheds to calculate percent control

DNR: Department of Natural Resources
GIS: Geographic Information Systems
NHD: National Hydrography Dataset
UGA: urban growth area

To organize the City drainage basins for the SMAP evaluation process, the following minor revisions were made:

- Ecology's SMAP guidance indicates that delineation should cover the "total drainage area, including all contributing areas outside of your permit coverage area" (Ecology 2019). Minor adjustments were needed to expand the delineated boundaries to include areas outside the city:
    - The Hall-Ballinger Watershed was expanded beyond the city boundary to include King County's McAleer Creek topographic basin extents.

  - The Southwest Edmonds Watershed has no open channel inside city limits and did not have a corresponding drainage area mapped by King County, so the Puget Sound Watershed Characterization (PSWC) assessment unit boundary was used to delineate the boundary to its full extent.

- Ecology's SMAP guidance states that receiving waters should be identified with a total watershed between 1 to 20 square miles. The City's Surface and Stormwater Comprehensive Plan (Herrera 2010) identified 26 basins, with many of small size. Small basins were grouped together to create SMAP assessment watersheds of appropriate size, where possible. Some minor splits and adjustments were made to merge coastal areas into their adjacent watersheds; these were grouped, where possible, based on shoreline environment categories and mapped coastal features (such as eelgrass). The result is that multiple small streams are grouped into one watershed for analysis.

- Catchment delineation is a later step in the SMAP process intended for the priority basin. Ecology guidance indicates that catchments should be between 400 to 600 acres in size. Due to the small size of the City's watersheds, dividing into catchment areas required minimal effort and was completed for all watersheds for future use. Many of the original drainage areas already fit within the catchment size range. Where appropriate, watersheds were split into catchments along city boundaries or major roads with reference to topography.

Results

Watersheds were named based on hydrologic features of interest. Table 2 lists nine watersheds to be evaluated and prioritized through the SMAP process. Detailed information regarding each watershed is provided in Table A-1 in Appendix A.

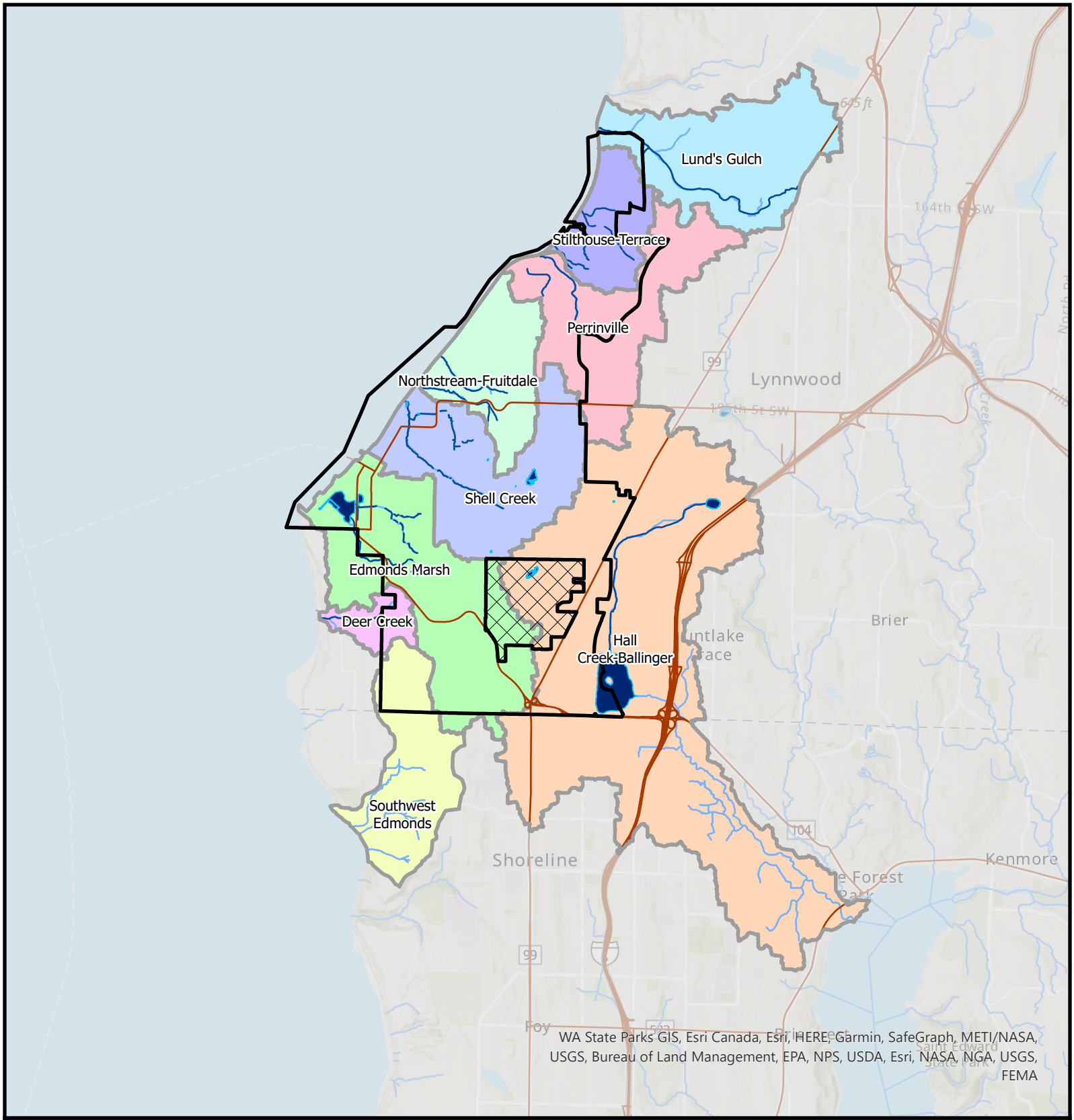
Table 2. City of Edmonds Watersheds for the SMAP Process.

Watershed Name	Area (square miles)	Percent of Total Basin Within City Limits (%)	Receiving Waters
Deer Creek	0.35	43%	Deer Creek Puget Sound
Halls Creek-Ballinger	8.10	16%	Hall Creek McAleer Creek Lake Ballinger Lake Washington Puget Sound
Lund's Gulch	2.11	4%	Lund's Gulch Creek Puget Sound
Northstream-Fruitdale	1.21	100%	Fruitdale Creek Northstream Creek Puget Sound

Table 2 (continued). City of Edmonds Watersheds for the SMAP Process.

Watershed Name	Area (square miles)	Percent of Total Basin Within City Limits (%)	Receiving Waters
Perrinville	2.01	42%	Perrinville Creek Puget Sound
Shell Creek	2.11	99%	Hindley Creek Shell Creek Puget Sound
Southwest Edmonds	1.46	21%	Unnamed Creek (outside City) Puget Sound
Stilthouse-Terrace	0.87	86%	Outfall Creek Stilthouse Creek Terrace Creek Puget Sound
Edmonds Marsh	2.89	77%	Shellabarger Creek Willow Creek Edmonds Marsh Puget Sound

Two watersheds in the City (Deer Creek and Stilthouse-Terrace) are smaller than the Ecology SMAP guidance recommended threshold of 1 square mile. All basins ultimately flow to Puget Sound, including Hall Creek – Ballinger, which flows to Lake Washington first, but then eventually to Puget Sound. Hall Creek-Ballinger is the largest drainage basin. This drainage basin includes the upper system of Hall Creek, Lake Ballinger at the mid-basin, and McAleer Creek at the lower basin. Northstream-Fruitdale, Shell Creek, Stilthouse Terrace, and Edmonds Marsh all have greater than 75 percent of their basin area within the city limits.



Legend

- Edmonds City Limits
- Edmonds Unincorporated UGA
- Watershed Boundary
- Waterbodies
- Streams
- Highway

Figure 1.
City of Edmonds Watersheds.

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0 0.63 1.25 2.5 Miles

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RECEIVING WATER CONDITIONS ASSESSMENT

The goal of the receiving water conditions assessment is to develop a high-level screening of the City's basins to provide a simple comparison of the existing condition of each water resource and the water resource uses they support. Information and attributes were scored to allow a quantitative comparison of the basins.

Methods

The first step of the receiving water conditions assessment was to develop a list of metrics and compile the data by basin. While a wide variety of metrics were developed, not all of them were used in the scoring due to suspected autocorrelation (i.e., degree of similarity) and to simplify and focus the assessment on the metrics that were most helpful. The metrics not used in the scoring are summarized in Table A-2 in Appendix A and may be useful during sub-catchment delineation and prioritization. Table 3 summarizes the metrics and data sources selected for the receiving water conditions assessment.

Table 3. Data Sources for the Receiving Water Conditions Assessment.

Metric Category	Metric(s)		Data Source(s)	Method Notes
Water Quality	Benthic index of biotic integrity (B-IBI)		• Puget Sound Benthos Database • Willow Creek Study (Shannon and Wilson 2019)	Web-based indicator database
	303(d) Listed Water	Dissolved Oxygen	Ecology WQA Database (2016 Assessment)	Web-based indicator database
		Temperature		
		Bacteria		
		Bioassessment		
		Phosphorus		
	Water Quality Conditions	pH	• Willow Creek Study (Shannon and Wilson 2019) • 2017 Stream Team Report (Edmonds Stream Team 2017) • 2020 Stream Team Report (Edmonds Stream Team 2020) • 2019-2020 Snohomish County Lakes Program Report	Literature review
		Dissolved Oxygen		
		Temperature		
		Bacteria		
		Phosphorus		
		Sediment Quality		
		Sediment/Erosion		
	Metals Export		Puget Sound Watershed Characterization, Metals Export Degradation	Web-based map review
Water Flow	Water Flow		Puget Sound Watershed Characterization, Water Flow: Overall Importance	Web-based map review
	Groundwater Protection		WSDOH Wellhead Protection Times of Travel Map	Web-based map review

Table 3 (continued). Data Sources for the Receiving Water Conditions Assessment.

Metric Category	Metric(s)	Data Source(s)	Method Notes
Nearshore Conditions	Nearshore Habitat	• Shore Zone Inventory (WDNR 2001) • King County Brightwater FEIS (2001) • City Shoreline Master Program	Web-based map review
	Nearshore Biological	• Shore Zone Inventory (WDNR 2001) • King County Brightwater FEIS (2001) • City Shoreline Master Program	Web-based map review
	Mapped Pocket Estuary	Puget Sound Nearshore Ecosystem Recovery Project	Web-based map review
Water Resource Uses	ESA Listed Salmon Units	• SWIFD Database • Salmon Scape	GIS analysis of web-based resoureces
	Salmonids and Resident Fish (Presence, Rearing, Spawning)	SWIFD Database	GIS analysis of web-based resoureces
	Fish Hatcheries	• Ecology Coastal Atlas • 2020 Stream Team Report (Edmonds Stream Team 2020) • SalmonScape	Literature and web-based map review
	Public Contact Recreation Condition	WSDOH Recreational Beach Classifications Map	Web-based map review
	Shellfish Harvesting	WSDOH Shellfish Growing Areas Map	Web-based map review
	Recent Fish Releases	2020 Stream Team Report (Edmonds Stream Team 2020)	Literature review
	Recent Observed Spawning	2020 Stream Team Report (Edmonds Stream Team 2020)	Literature review
	Water Supply	WSDOH Wellhead Protection Times of Travel Map	Web-based map review

ESA: Endangered Species Act
FEIS: Final Environmental Impact Statement
GIS: Geographic Information Systems
SWIFD: Statewide Washington Integrated Fish Distribution
WDNR: Washington Department of Natural Resources
WQA: Water Quality Assessment
WSDOH: Washington State Department of Health

The metrics selected from those listed in Table 3 to represent water resource condition include:

- Listed surface water quality impairments
- Water quality concerns from local studies

The metrics selected from those listed in Table 3 to represent water resource uses include:

- Public recreation – beaches
- Public recreation – boat launches
- Drinking water supply
- Wellhead protection areas
- Aquatic habitat–marine and freshwater nearshore
- Aquatic species–freshwater
- Aquatic species–forage fish
- Pocket estuary–juvenile fish habitat

Water resource condition scoring was based upon the concept that higher levels of water resource use and lower water quality receive higher scores. An assigned weight of "1" indicated "moderate importance." An assigned weight of "2" indicated "high importance." Water quality data without a Quality Assurance Project Plan (QAPP) were weighted at "1" and data with a QAPP was weighted "2."

Not all receiving waters are subject to environmental monitoring. Therefore, a bias for waters with environmental monitoring data is inherent. Receiving waters that support certain water resource uses (i.e., swimming, aquatic life, or water supply) tend to be monitored whereas, receiving waters with little to no water resource use are absent of data.

Table 4 provides a list of these metrics and a brief description of the scoring and weighting methods.

Table 4. Metrics Used to Complete the Receiving Water Conditions Assessment.

Metric	Scoring Method	Weighting Method
Water Resource Condition		
Listed Water Quality Impairments	Basins were scored based on the number of listed water quality parameters or in the receiving water downstream of the basin: ● **Score of 0:** No listings ● **Score of 1:** 1 to 2 parameters ● **Score of 2:** 3 to 4 parameters ● **Score of 3:** more than 4 parameters listed and/or Category 5 listing	Assigned weight = 2 High importance
Water Quality Concerns from Local Studies	These data are from studies with no documented QAPP therefore are weighted at 1. ● **Score of 0**: No concerns ● **Score of 1:** 1 to 2 parameters of concern ● **Score of 2:** 3 to 4 parameters of concern ● **Score of 3:** more than 4 parameters of concern	Assigned weight = 1 Moderate importance
Support of Water Resource Uses		
Public Recreation Beaches	● **Score of 0:** No public recreation access ● **Score of 1:** 1 point for each public access	Assigned weight = 1 Moderate importance
Public Recreation Boat Launches	● **Score of 0:** No public recreation access ● **Score of 1:** 1 point for each public access	Assigned weight = 1 Moderate importance
Drinking Water Supply or Wellhead Protection Area (10-year Time of Travel)	● **Score of 0:** 0% of basin area in 10-year time of travel for wellhead ● **Score of 1:** 0.5% to 15% of basin area in 10-year time of travel for wellhead ● **Score of 2:** 16% to 60% of basin area in 10-year time of travel for wellhead ● **Score of 3:** greater than 60% of basin area in 10-year time of travel for wellhead	Assigned weight = 1 Moderate importance
Aquatic Habitat–Marine and Freshwater Nearshore	● **Score of 0:** No eelgrass or kelp present ● **Score of 1:** Patchy eelgrass or kelp in nearshore area ● **Score of 2:** Moderate eelgrass or kelp in nearshore area ● **Score of 3:** Dense eelgrass or kelp in nearshore area	Assigned weight = 1 Moderate importance

Table 4 (continued). Metrics Used to Complete the Receiving Water Conditions Assessment.

Metric	Scoring Method	Weighting Method
Support of Water Resource Uses (continued)		
Aquatic Species–Freshwater	• **Score of 0:** No salmonid or coastal cutthroat trout listed as present • **Score of 1**: 2 species • **Score of 2:** 3 species • **Score of 3:** More than 3 species	Assigned weight = 1 Moderate importance
Aquatic Species–Forage Fish	• **Score of 0:** No forage fish spawning at nearshore area • **Score of 2**: Forage fish spawning present at nearshore area	Assigned weight = 1 Moderate importance
Pocket Estuary – Juvenile Fish Habitat	• **Score of 0:** No pocket estuary to support juvenile chinook and other species • **Score of 2:** Presence of pocket estuary to support juvenile chinook and other species	Assigned weight = 1 Moderate importance

QAPP: Quality Assurance Project Plan

Results

Table 5 provides the receiving water conditions assessment scores for each drainage basin along with the key rationale for the scoring and where it ranked in the list of nine drainage basins. Note that a high score indicates poor water quality and numerous water resource uses at risk. Detailed results are provided in Appendix B.

Table 5. City of Edmonds Receiving Water Conditions Assessment Scores.

Basin	Score: Water Resource Condition + Water Resource Uses	Rank	Rationale
Edmonds Marsh	18	1	High score due to multiple water quality concerns and multiple water resource uses (community and aquatic species).
Hall Creek–Ballinger	14	2	High score due to multiple water quality concerns and multiple water resource uses (community and aquatic species).
Lund's Gulch	11	3	Moderate score due to multiple water quality concerns and a moderate number of water resource uses.
Deer Creek	9	5	Moderate score due high drinking water supply importance but low to moderate aquatic species use.
Shell Creek	9	5	Moderate score due to few water quality concerns and moderate water resource uses in for aquatic species at both the nearshore and stream.
Perrinville	7	6	Moderate score due to some water quality concerns and a moderate number of water resource uses.
Southwest Edmonds	3	7	Low score due to no open stream channel present in the basin.
Stilthouse-Terrace	2	9	Low score due to minimal fish use.
Northstream-Fruitdale	2	9	Low score due to minimal water resource uses (only nearshore eelgrass).

The sum of the scores for the receiving water conditions assessment ranged from 2 to 18. A score of 2 to 3 represents a basin with no identified problems with condition and low water resource uses. Scores of 14 to 18 represents a basin experiencing water quality issues and an abundance of water resource uses.

The basins were then given a number from 1 to 9 (accounting for ties) to cover all 9 basins. The two basins with the highest water quality issues and potential to support multiple water resource uses were Edmonds Marsh and Hall Creek – Ballinger.

STORMWATER MANAGEMENT INFLUENCE ASSESSMENT

The intent of this step in the process was to evaluate the extent to which stormwater might be expected to impact water resource conditions and thereby indirectly provide an evaluation of the extent to which stormwater management actions might benefit a basin.

Methods

The next step of this analysis was to calculate a list of metrics that might be used to evaluate the basins with respect to stormwater management influence. Table 6 summarizes by metric the data sources and method notes. The metrics not used in the scoring that are summarized in Table A-3 in Appendix A and may be useful during sub-catchment delineation and prioritization., While a wide variety of metrics were initially calculated, those that clearly described stormwater impacts and prevented autocorrelation (i.e., degree of similarity) were evaluated.

Table 6. Data Sources for Stormwater Management Influence Assessment.

Metric Category	Metric	Data Source(s)	Method Notes
Existing Landscape Condition	% Total Impervious Area	2019 MRLC NLCD Impervious Layer	% impervious surface based on processed NLCD grids. This layer provides full coverage of all watersheds regardless of jurisdiction
	Road Density	Merged King County and Snohomish County road shapefiles	Length of roads (including highways) per acre
	Highways	WSDOT highway mapping	List of highways that cross through the basin
	Mapped WDFW Fish Passage Barriers Related to Road Crossings	• WDFW Web Map Tool • King County stream layer (modified/simplified) • Supplemented by SWIFD and Edmonds stream mapping (simplified to main stem)	Count of all 0% passable barriers; count of barriers per stream mile (filtered to road crossings)
	Length of Stream Prior to First Complete Barrier	• WDFW Web Map Tool • King County stream layer (modified/simplified) • Supplemented by SWIFD and Edmonds stream mapping (simplified to main stem)	Identify first full barrier and measure downstream linear feet

Table 6 (continued). Data Sources for Stormwater Management Influence Assessment.

Metric Category	Metric	Data Source(s)	Method Notes
Existing Landscape Condition (continued)	% Development in Riparian Buffer	• 2019 NLCD – filtered to Development Codes 21, 22, 23, 24 • Buffer: DNR stream typing • City GIS data: wetlands and waterbodies	% development in riparian buffer (includes streams, lakes, and wetlands)
	% Canopy Cover in Riparian Buffer	• 2019 NLCD – filtered to Forest Codes 41, 42, 43 (excludes wetlands, marsh, shrub) • Buffer: DNR stream typing • City GIS data: wetlands and waterbodies	% forest cover in riparian buffer (includes streams, lakes, and wetlands)
	Areas of Canopy Loss in Watershed	WDFW Puget Sound HRCD 2006–2017 Change Data layer	% area with 50% or greater canopy loss from 2006 to 2017
	Recent Redevelopment/ Development Patterns	WDFW Puget Sound HRCD 2006–2017 Change Detection layer	% area with redevelopment or development activity from 2006-2017. Includes "Development" and "Redevelopment" change categories
	Length of Stormwater Pipe	City GIS data: "STORM_LINE" mapping	Linear feet of stormwater pipe in City MS4
	MS4 Outfalls to Streams	City GIS data: "STORM_CULVERTS" point layer, modified to classify as Riparian, Marine, or Other & filtered to remove BNSF-owned outfalls according to "STORM_LINE" jurisdiction field	Count of MS4 outfalls in riparian buffer
	MS4 Outfalls to Shoreline/ Marine Discharge	City GIS data: "STORM_CULVERTS" point layer, modified to classify as Riparian, Marine, or Other & filtered to remove BNSF-owned outfalls according to "STORM_LINE" jurisdiction field	Count of MS4 outfalls to lakes and Puget Sound
	% Flow Control Exempt Areas	City GIS data: Watershed layer indicating "Puget Sound" or "Puget Sound Piped" drainage	% flow control exempt drainage area
	% Area within 10-year Travel Time for WHPA	WSDOH Wellhead Protection Area Map, 10-year Travel Time layer	% area that is sensitive for drinking water in watershed

Table 6 (continued). Data Sources for Stormwater Management Influence Assessment.

Metric Category	Metric	Data Source(s)	Method Notes
Future Development	Buildable Lands Projection	Snohomish County Buildable Lands Report and associated GIS layers	% area from Snohomish County Buildable Lands Report
	Areas with Higher Projected Population Growth	ESRI 2021-2026 USA Population Growth (Block group scale)	% area by block group with projected population growth greater than 1.25% from 2021-2026

BNSF: Burlington Northern Santa Fe
ESRI: Environmental Systems Research Institute
GIS: Geographic Information Systems
HRCD: High resolution change data
MRLC: Multi-Resolution Land Characteristics
MS4: Municipal separate storm sewer system
NLCD: National Land Cover Database
SWIFD: Statewide Washington Integrated Fish Distribution
WDFW: Washington Department of Fish and Wildlife
WSDOH: Washington State Department of Health
WSDOT: Washington State Department of Transportation

The metrics selected from those listed in Table 6 to represent stormwater impacts were:

- Percent total impervious surface
- Percent basin within City control
- Road density
- Percent of riparian canopy cover
- Fish passage barriers
- Expected population growth
- Future buildable lands

Table 7 provides a list of these metrics and a brief description of the scoring and weighting of metrics evaluated. All metrics results are summarized in Table A-3 in Appendix A.

Stormwater management influence scoring was based upon the concept that higher levels of impact receive higher scores. An assigned weight of "1" indicated "moderate importance." An assigned weight of "2" indicated "high importance." The following metrics were assigned a weighting of "2": percent total impervious surface, percent of riparian canopy cover and percent of basin within City control. Percent total impervious surface and percent of riparian canopy cover show excellent correlation to stream degradation when measuring the benthic index of biotic integrity (King County 2019). Percent basin within City control implies that projects could be implemented more readily receiving greater points.

Table 7. Scoring and Weighting Method Used to Complete Stormwater Management Influence Assessment.

Metric	Method	Weighting
Landscape Condition		
Percent Total Impervious Area	Calculated basin wide. Weighting was scored at 2 due to high correlation of percent total impervious area to stream bioassessment impairment. ● **Score 0:** Less than 10 percent impervious area ● **Score of 1**: 10 to 30 percent impervious area ● **Score of 2:** 30 to 50 percent impervious area ● **Score of 3:** 50 percent and greater impervious area	Assigned weight = 2 High importance
Percent of Basin within City Control	The area of the basin within city limits was divided by the total basin area. Weighting was scored at 2 due to high importance of the City's ability to implement stormwater management actions. Refer to Table 1 for details. Basin scores were based on the following percentages: ● **Score of 0:** 25 percent and less within city limits ● **Score of 1:** 25 to 50 percent within city limits ● **Score of 2:** 50 to 75 percent within city limits ● **Score of 3:** Greater than 75 percent within city limits	Assigned weight = 2 High importance
Road Density	The total length of road was calculated within basin for road per acre (linear feet per acre). Road density correlates with fragmented habitat and potential export of high metal concentrated pollutants. ● **Score of 0:** 80 to 100 linear feet per acre ● **Score of 1:** 100 to 120 linear feet per acre ● **Score of 2:** 120 to 140 linear feet per acre ● **Score of 3:** Greater than 140 linear feet per acre	Assigned weight = 1 Moderate importance
Percent of Riparian Canopy Cover	Riparian stream buffers were based on stream buffer standards. The total percent canopy cover was then calculated within these buffer widths. Basin scores were based on the following percentages: ● **Score of 0:** 75 to 100 percent canopy cover ● **Score of 1:** 50 to 75 percent canopy cover ● **Score of 2:** 25 to 50 percent canopy cover ● **Score of 3:** Less than 25 percent canopy cover	Assigned weight = 2 High importance

Table 7 (continued). Scoring and Weighting Method Used to Complete Stormwater Management Influence Assessment.

Metric	Method	Weighting
Future Development		
Expected Population Growth	Relative development pressure within each basin was calculated from census population growth statistics. Growth was calculated as area of basin with greater than 1.25% growth. ● **Score of 0:** Minimal pressure: Less than 25 percent of area with greater than 1.25% growth ● **Score of 1:** Moderate pressure: 25 to 50 percent of area with greater than 1.25% growth ● **Score of 2:** Moderate high pressure: 50 to 75 percent of area with greater than 1.25% growth ● **Score of 3:** High pressure: Greater than 75 percent of area with greater than 1.25% growth	Assigned weight = 1 Moderate importance
Future Buildable Lands	Percent of City basin areas identified as redevelopment or development activity were calculated. ● **Score of 0:** 0 percent of land area ● **Score of 1:** 0 to 4 percent of land area ● **Score of 2:** Greater than 4 percent of land area	Assigned weight = 1 Moderate importance

Results

Table 8 provides a summary of the stormwater management influence scoring results. Detailed results are provided in Appendix B. The three basins that received the highest scores for stormwater management influence from the City were Edmonds Marsh, Hall Creek-Ballinger, and Shell Creek. Moderate scores were received by Northstream-Fruitdale, Stilthouse-Terrace, and Perrinville Creek. Low scores were received by Southwest Edmonds, Lund's Gulch, and Deer Creek.

Table 8. Stormwater Management Influence Assessment Scores.

Basin	Score	Rank	Rationale
Edmonds Marsh	24	1	High basin stormwater influence due to high total impervious surface percentage, a majority of the basin is within the City limits, and the presence of numerous fish passage barriers on Willow and Shellabarger Creeks.
Hall Creek-Ballinger	17	2	High basin stormwater influence due to high total impervious surface percentage, numerous fish passage barriers, high road density, and low riparian canopy cover.
Shell Creek	16	3	High stormwater influence due to high basin total impervious surface percentage, the basin is within the City limits, high road density, and low riparian canopy cover.
Northstream-Fruitdale	15	4	Moderate basin stormwater influence due to moderate total impervious surface percentage, a majority of the basin is within the City limits, moderate road density, and moderate riparian canopy cover.
Stilthouse-Terrace	13	5	Moderate basin stormwater influence due to lower total impervious surface percentage, a majority of the basin is within the City limits, moderate road density, and low riparian canopy cover.
Perrinville	11	6	Moderate basin stormwater influence due to moderate total impervious surface percentage, moderate road density, and low riparian canopy cover.
Southwest Edmonds	10	7	Low basin stormwater influence due to total basin impervious surface percentage, moderate road density, and low riparian canopy cover.
Lund's Gulch	10	7	Low basin stormwater influence due to low total impervious surface percentage, low presence of stormwater infrastructure, no fish passage barriers, and good canopy cover.
Deer Creek	8	9	Low basin stormwater influence due to low total impervious surface percentage, low presence of stormwater infrastructure, no fish passage barriers, and good canopy cover.

CANDIDATE BASINS FOR PRIORITIZATION

The purpose of the scoring matrix is to identify a manageable list of candidate basins to move forward for prioritization.

Table 9 combines the water conditions scores with the stormwater management influence scores for each basin, prioritization recommendation, and rationale for retaining or setting aside from prioritization step in the SMAP process.

Table 9. Combined Scoring and Candidate Basins for Prioritization.

Basin	Score	Prioritization Recommendation	Rationale
Edmonds Marsh	42	Retain for prioritization	High stormwater influence
Hall Creek–Ballinger	31		High stormwater influence
Shell Creek	25		High stormwater influence
Perrinville	18		Moderate stormwater influence
Northstream-Fruitdale	17		Moderate stormwater influence
Stilthouse-Terrace	15		Moderate stormwater influence
Lund's Gulch	21	Set aside from prioritization	Low jurisdiction control
Deer Creek	17		Low stormwater influence
Southwest Edmonds	13		Low stormwater influence

Based upon the combined scoring and ranking shown in Table 9, Edmonds Marsh, Hall Creek-Ballinger, Shell Creek, Perrinville, Northstream-Fruitdale and Stilthouse Terrace have moderate and high City stormwater influence and should be retained for prioritization. Lund's Gulch, at 4 percent jurisdiction control, should not be moved forward for prioritization. Deer Creek and Southwest-Edmonds, with some water resource uses, both ranked low for City stormwater influence. Summary descriptions of each retained basin, stormwater contributions, and opportunities are provided below.

Edmonds Marsh

Edmonds Marsh, Willow Creek, Shellabarger Creek, and Puget Sound

Summary: The Edmonds Marsh drainage basin is approximately 2.9 square miles and is 76 percent within the city limits. Willow Creek and Shellabarger Creek flow into Edmonds Marsh prior to flowing into Puget Sound south of the Edmonds-Kingston Ferry Terminal. The basin has four public access points on the marine shoreline. Recent studies have shown sediment contamination at the north end of the marsh for typical stormwater metals and organics. Surf smelt and sand lance spawning habitat is present along the shoreline. A pocket estuary and

continuous eelgrass beds provide habitat for juvenile salmon. The streams have documented presence of coho and resident coastal cutthroat trout.

The landscape is fragmented by ten fish passage barriers, high road density and two major highways (SR-524 and SR-104). Canopy cover in the riparian area is low, numerous outfalls discharge into the riparian buffer area, and 51 percent of the basin is impervious.

Stormwater Contributions: Stormwater impacts likely contribute to fragmented habitat, poor water quality and erosive flows. A higher level of population growth and development is predicted.

Opportunities: Potential actions include addressing issues through policies and codes in the City-controlled portions of the basin, coordinating with state agencies regarding fish passage barriers, and restoration in the marsh and stream corridor. The City is leading an effort to implement the Willow Creek Daylight and Marsh Enhancement Project. This project would remove a tide gate, daylight and naturalize the stream connection between the marsh and Puget Sound, and restore the marsh.

Hall Creek–Ballinger

Hall Creek, Lake Ballinger, McAleer Creek, Lake Washington

Summary: The Hall Creek–Ballinger drainage basin is the largest in this assessment at approximately 8.1 square miles. The receiving waters are the upper Hall Creek, flowing into Lake Ballinger, and then flowing out to McAleer Creek, and then Lyon Creek flows into McAleer near the terminus to Lake Washington. Although the City influence only represents 16 percent of the basin, City stormwater impacts Hall Creek significantly and flooding and erosion are well documented. The city limits are adjacent to Hall Creek, but do not include the creek corridor.

The basin has public access at Lake Ballinger that includes a swimming beach and boat launch. There is ample water quality data for the creeks and Lake Ballinger. Lake Ballinger is subject to a water quality clean-up plan for phosphorus. Gains have been made in recent years and the lake currently meets the phosphorus loading allocation. Multiple salmon species are documented in the basin including fall chinook, coho, winter steelhead and sockeye, along with resident coastal cutthroat trout.

The landscape is fragmented by 10 fish passage barriers, high road density and three major highways (I-5, SR-99 and SR-104). Canopy cover in the riparian areas is low, numerous outfalls discharge into the riparian buffer area, and 50 percent of the basin is impervious.

Stormwater Contributions: Stormwater impacts likely contribute to fragmented habitat, poor water quality and erosive flows. A high level of growth is expected in this basin.

Opportunities: The City only has control of 16 percent of the basin, indicating codes and policies may be minimally effective unless in coordination with adjacent jurisdictions. However, City control of flows into Hall Creek have been shown to be erosive and contribute to downstream flooding and stream degradation. The City is in the planning stage for the Ballinger Regional Stormwater Facility. The facility would be located upstream of Hall Creek to control flows currently flooding and damaging Hall Creek. Another project is the Lake Ballinger Aquatic Ecosystem Restoration Project lead by the City of Mountlake Terrace. The project would enhance and restore the floodplain area at the north end of Lake Ballinger. Controlling flows to Hall Creek could benefit the downstream floodplain project.

Shell Creek

Shell Creek, Hindley Creek

Summary: The Shell Creek drainage basin is approximately 2.1 square miles and is 99 percent within the city limits. Shell Creek is the mainstem and Hindley Creek merges at about 750 feet upstream of the discharge point into Puget Sound. Erosion is a water quality concern. Surf smelt and sand lance spawning habitat is present along the shoreline. A pocket estuary and continuous eelgrass beds provide habitat for juvenile salmon. The streams have documented presence of coho and resident coastal cutthroat trout.

The landscape is fragmented by high road density and one major highway (SR-524), but no fish passage barriers. Canopy cover in the riparian area is moderate, numerous outfalls discharge into the riparian buffer area, and 48 percent of the basin is impervious.

Stormwater Contributions: Stormwater impacts likely contribute to fragmented habitat, poor water quality, and erosive flows. A high level of development and redevelopment is predicted.

Opportunities: No stormwater projects or plans have been identified for the Shell Creek basin.

Perrinville

Perrinville Creek

Summary: The Perrinville Creek drainage basin is approximately 2.01 square miles and is 42 percent within the city limits. Perrinville Creek is the mainstem and discharges into Puget Sound. Erosion is a water quality concern. Limited eelgrass and kelp beds provide habitat for juvenile salmon. The stream has documented presence of coho and resident coastal cutthroat trout.

The landscape is fragmented by high road density and one major highway (SR-524), and two fish passage barriers. Canopy cover in the riparian area is moderate, numerous outfalls discharge into the riparian buffer area, and 41 percent of the basin is impervious.

Stormwater Contributions: Stormwater impacts likely contribute to fragmented habitat, poor water quality, and erosive flows. A moderate level of development and redevelopment is predicted.

Opportunities: The Perrinville Creek Stormwater Flow Reduction Retrofit Study was completed in 2015. Flow reduction projects were identified in Edmonds and Lynnwood as part of that study.

Northstream-Fruitdale

Northstream Creek, Fruitdale Creek

Summary: The Northstream-Fruitdale drainage basin is approximately 1.21 square miles and is 100 percent within the city limits. Two short and steep drainages are present, Northstream Creek and Fruitdale Creek, with both discharging separately into Puget Sound. Sparse eelgrass and kelp beds provide habitat for juvenile salmon. The streams have no documented presence of salmonids.

The landscape is fragmented by high road density and four fish passage barriers. Canopy cover in the riparian area is moderate and 37 percent of the basin is impervious.

Stormwater Contributions: Stormwater impacts likely contribute to poor water quality and erosive flows. A high level of redevelopment is predicted.

Opportunities: No stormwater projects or plans have been identified for the Northstream-Fruitdale basin.

Stilthouse-Terrace

Outfall Creek, Stilthouse Creek, Terrace Creek

Summary: The Stilthouse-Terrace drainage basin is approximately 0.87 square miles and is 86 percent within the city limits. Three short and steep drainages are present, Outfall Creek, Stilthouse Creek, and Terrace Creek, all three discharging separately into Puget Sound. Sparse eelgrass and kelp beds provide habitat for juvenile salmon. The streams have no documented presence of salmonids.

The landscape is fragmented by high road density and one major highway (SR-524), and two fish passage barriers. Canopy cover in the riparian area is moderate and 28 percent of the basin is impervious.

Stormwater Contributions: Stormwater impacts likely contribute to fragmented habitat, poor water quality, and erosive flows.

Opportunities: No stormwater projects or plans have been identified for the Stilthouse-Terrace basin.

SUMMARY

All basins were scored and ranked separately based upon the receiving water conditions assessment and then the stormwater management influence assessment. The scores were combined for a final cumulative score and ranking. Table 10 summarizes the results of the combined score. The basins proposed to be retained for prioritization include Edmonds Marsh, Hall Creek-Ballinger, Shell Creek, Perrinville, Northstream-Fruitdale, and Stilthouse-Terrace due to their rating as high or moderate City stormwater influence.

Table 10. Combined Results of Receiving Water Conditions Assessment and Stormwater Management Influence Assessment.

Basin	Result
Edmonds Marsh	Retained for prioritization for near-term actions
Hall Creek-Ballinger	
Shell Creek	
Perrinville	
Northstream-Fruitdale	
Stilthouse-Terrace	
Deer Creek	Eliminated from near-term evaluation due to low jurisdiction control or stormwater influence, but may be considered for potential future actions
Lund's Gulch	
Southwest Edmonds	

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APPENDIX A

Receiving Water Conditions Assessment Tables

Table A-1. Delineate Basins and Identify Receiving Waters.

Metric/Basin	Basin Identification	Basin Area		Receiving Waters			Basin Jurisdiction Control	
	Watershed	Area (square miles)	Area (acres)	Streams	Lakes	Marine	% In City	% in City UGA
Metric Description	Watershed name based on historical, anecdotal, or stream names	Total basin area		List of streams	List of lakes	List of marine waters	% Area of basin in City limits; excludes UGA, County, and neighboring cities	% Area of basin in UGA only
Data Source	GIS	GIS	GIS	City GIS data: "STORM_DITCH_CREEK" layer, Documents, DNR stream mapping	GIS: NHD layer	GIS, Documents	GIS	GIS
City only or Basin wide Metric?	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide
	Deer Creek	0.35	224	Deer Creek		Puget Sound	42.7%	0%
	Halls Creek-Ballinger	8.10	5,182	Hall Creek, McAleer Creek (outside City)	Lake Ballinger, Lake Washington	Puget Sound	15.5%	5.7%
	Lund's Gulch	2.11	1,349	Lund's Gulch Creek		Puget Sound	3.7%	0%
	Northstream-Fruitdale	1.21	774	Fruitdale Creek, Northstream Creek		Puget Sound	100%	0%
	Perrinville	2.01	1,289	Perrinville Creek		Puget Sound	41.9%	0%
	Shell Creek	2.11	1,353	Hindley Creek, Shell Creek		Puget Sound	99.7%	0%
	Southwest Edmonds	1.46	932	Unnamed Creek (outside City)		Puget Sound	20.8%	0%
	Stilthouse-Terrace	0.87	554	Outfall Creek, Stilthouse Creek, Terrace Creek		Puget Sound	85.8%	0%
	Edmonds Marsh	2.89	1,851	Shellabarger Creek, Willow Creek, Edmonds Marsh		Puget Sound	76.6%	8.4%

DNR: Department of Natural Resources
GIS: Geographic Information Systems
NHD: National Hydrography Dataset
UGA: urban growth area

Table A-2. Assess Receiving Water Conditions.

	Water Quality										
	Benthic Index of Biotic Integrity (B-IBI)		303(d) Listed Water					Water Quality Conditions (by Parameter)			
Metric/Basin	**Score**	**Description**	**Dissolved Oxygen**	**Temperature**	**Bacteria**	**Bioassessment**	**Phosphorus**	**pH**	**Dissolved Oxygen**	**Temperature**	**Bacteria**
Metric Description	Excellent (80-100), Good (60-80), Fair (40-60), Poor (20-40), Very Poor (<20)		Creek/waterbody name					Creek/lake name and condition			
Data Source	Puget Sound Benthos Database, Willow Creek Study (Shannon and Wilson, 2019)		Ecology WQA Database (2016 Assessment)					2020 Edmonds Stream Team Report, Willow Creek Study (Shannon and Wilson, 2019), 2019-2020 Snohomish County Lakes Program Report			
City only or Basin wide Metric?	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide
Deer Creek	No Data	Not Applicable	None	None	None	None	None	No data	No data	No data	No data
Hall Creek-Ballinger	Poor-Fair	Downstream of City 36 results, 2001-2021	McAleer Creek	McAleer Creek	McAleer Creek, Hall Creek	McAleer Creek	Lake Ballinger	No data	No data	No data	No data
Lund's Gulch	Very Poor - Poor	Outside of City 3 results, 2013-2017	None	None	Lund's Gulch	None	None	**Upper Lund's Gulch** Poor - low in summer	**Upper Lund's Gulch** Poor	**Lund's Gulch** Good	No data
Northstream-Fruitdale	No Data	Not Applicable	None	None	None	None	None	No data	No data	No data	No data
Perrinville	Very Poor	1 result, 2013	None	None	None	None	None	**Perrinville Creek** Good	**Perrinville Creek** Good	**Perrinville Creek** Good	No data
Shell Creek	No Data	Not Applicable	None	None	None	None	None	**Shell Creek** Good	**Shell Creek** Good	**Shell Creek** Good	No data
Southwest Edmonds	No Data	Not Applicable	None	None	None	None	None	No data	No data	No data	No data
Stilthouse-Terrace	No Data	Not Applicable	None	None	None	None	None	No data	No data	No data	No data
Edmonds Marsh	**Willow Creek** Poor-Very Poor **Shellabarger Creek** Very Poor	**Willow Creek** 5 results averaged, 2017 **Shellabarger Creek** 1 result, 2017	None	None	Marina Park	None	None	**Willow Creek** Concern	**Willow Creek** Concern **North Marsh** Concern	**Marsh** High summer **Willow Creek** Good	**Marine Beach** Good - Recent 3-year BEACH shows meeting standard **Willow Creek** Concern

ESA: Endangered Species Act
FEIS: Final Environmental Impact Statement
GIS: Geographic Information Systems
SWIFD: Statewide Washington Integrated Fish Distribution
WDNR: Washington Department of Natural Resources
WQA: Water Quality Assessment
WSDOH: Washington State Department of Health

Table A-2. Assess Receiving Water Conditions.

	Water Quality (continued)				Water Flow		Nearshore Conditions		
	Water Quality Conditions (by Parameter)								
Metric/Basin	**Phosphorus**	**Sediment Quality**	**Sediment/ Erosion**	**Metals Export**	**Water Flow**	**Groundwater Protection**	**Nearshore Habitat**	**Marine Nearshore Biological**	**Mapped Marine Pocket Estuary**
Metric Description	Creek/lake name and condition			Metals Export Degradation (surrogate for WQ impacts to aquatic life and salmonids)	Water Flow: Overall Importance	Groundwater level of risk	Presence of eelgrass (sparse/moderate, patchy/moderate, continuous), kelp, invasives, and native plants	Presence of surf smelt spawning, sand lance spawning, wildlife haul out, sea bird colony	Presence of NOAA Puget Sound natal and pocket estuaries
Data Source	2020 Edmonds Stream Team Report, Willow Creek Study (Shannon and Wilson, 2019), 2019-2020 Snohomish County Lakes Program Report (continued)			Puget Sound Watershed Characterization	Puget Sound Watershed Characterization	WSDOH Wellhead Protection Times of Travel Map	Shore Zone Inventory (WDNR 2001), King County Brightwater FEIS (2001), City Shoreline Master Program	Shore Zone Inventory (WDNR 2001), King County Brightwater FEIS (2001), City Shoreline Master Program	Puget Sound Nearshore Ecosystem Recovery Project
City only or Basin wide Metric?	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide
Deer Creek	No data	No data	No data	Moderate-High	Low	Wellhead Protection Zone-High Risk	Patchy/moderate eelgrass	No biology identified	Yes
Hall Creek-Ballinger	**Lake Ballinger** Fair (meeting TMDL levels, improving trend)	No data	No data	High	High	None	Invasives: Eurasian milfoil/fragrant water lily (2020 survey); Native plants: present	Not Applicable	Not Applicable
Lund's Gulch	No data	No data	No data	Moderate	High	None	Dense eelgrass	No biology identified	Yes
Northstream-Fruitdale	No data	No data	No data	Moderate	Moderate	None	Sparse/moderate eelgrass, kelp	No biology identified	No
Perrinville	No data	No data	**Perrinville Creek** Concern	Moderate	Low	None	Sparse/moderate eelgrass, kelp	No biology identified	Yes
Shell Creek	No data	No data	**Shell Creek** Concern	Moderate	Moderate-High	None	Sparse/moderate eelgrass, kelp	Surf Smelt Spawning, Sand Lance Spawning, Wildlife Haul out	Yes
Southwest Edmonds	No data	No data	No data	Moderate-High	Low	None	Sparse/moderate eelgrass, kelp	No biology identified	Not Applicable
Stilthouse-Terrace	No data	No data	No data	Low	Moderate-High	None	Sparse/moderate eelgrass	No biology identified	No
Edmonds Marsh	**Willow Creek** Good	**North Marsh** Concern (standard exceedances) PAHs and metals (nickel)	No data	Moderate	High	None	Continuous eelgrass, kelp	Surf Smelt Spawning, Sand Lance Spawning, Sea Bird Colony	Yes

Table A-2. Assess Receiving Water Conditions.

	Water Resource Uses									
		Salmonids and Resident Fish								
Metric/Basin	**ESA Listed Salmon Units**	**Presence**	**Rearing**	**Spawning**	**Fish Hatcheries**	**Public Contact Recreation Condition**	**Shellfish Harvesting**	**Recent Fish Releases**	**Recent Observed Spawning**	**Water Supply**
Metric Description	Presence of chinook, steelhead (yes/no); GIS intersect of the SWIFD line features for each basin filtered by species	Listed salmonid and resident (Res) species by creek; GIS intersect of the SWIFD line features for each basin filtered by species			List of fish hatcheries by creek, lake, or marine waterbody	List of beaches	Approved, Conditionally Approved, Prohibited	Description of recent fish releases	Fish counts and year	Drinking Water Supply Level of Risk
Data Source	SWIFD (Statewide Salmon Distribution Database), Salmon Scape, 2010 Storm and Surface Water Comprehensive Plan	SWIFD (Statewide Salmon Distribution Database)			Ecology Coastal Atlas, 2020 Stream Team Report, SalmonScape	WSDOH Recreational Beach Classifications Map	WSDOH Shellfish Growing Areas Map	2020 Stream Team Report	2020 Stream Team Report	WSDOH Wellhead Protection Times of Travel Map
City only or Basin wide Metric?	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide
Deer Creek	No	**Deer Creek** Res Coastal Cutthroat	None	None	None	None	Prohibited	None found	None reported	High
Hall Creek-Ballinger	Yes	**Hall, McAleer & Lyon Creeks** Coho Fall Chinook Res Coastal Cutthroat Winter Steelhead **Hall & McAleer Creeks** Sockeye	**Hall Creek** Coho	**Lyon Creek** Sockeye **McAleer Creek** Coho Fall Chinook Sockeye	**Hall Lake** Remote incubator **McAleer Creek** Remote site incubator **Lake Ballinger** Boeing Creek	Lake Ballinger Park Beach (swimming) Lake Ballinger Boat Ramp	Not Applicable	Coho and Chinook 1970's to 2000's.	None reported	Low
Lund's Gulch	No	**Lund's Gulch** Res Coastal Cutthroat	**Lund's Gulch** Coho	None	Lower Lund's Gulch	Meadowdale Beach Park	Prohibited	Chum hatch boxes and hatcher in lower Lund's Gulch for release into upper Lund's Gulch	Coho (4) 2019	None
Northstream-Fruitdale	No	None	None	None	None	None	Prohibited	None found	None reported	None
Perrinville	No	**Perrinville Creek** Coho Res Coastal Cutthroat	None	None	None	None	Prohibited	None found	None reported	None
Shell Creek	No	**Shell Creek** Coho Res Coastal Cutthroat	None	None	None	None	Prohibited	Chum hatch boxes, Coho from Willow Creek Hatchery	Coho (15-25); Chum (5) in 2019	None
Southwest Edmonds	No	None	None	None	None	None	Prohibited	None found	None reported	Low
Stilthouse-Terrace	No	None	None	None	None	None	Prohibited	None found	None reported	None
Edmonds Marsh	No	**Shellabarger & Willow Creeks** Coho Res Coastal Cutthroat	None	None	**Puget Sound** Edmonds Net Pen at marine shoreline **Willow Creek (aka Deer Creek)** Fish Hatchery (eggs) at creek mouth	Edmonds Underwater Park Olympic Beach Park Edmonds Marina Edmonds Marina Beach Park (Dog Park)	Prohibited	None found	None reported	Low

Table A-3. Assess Stormwater Management Influence.

Metric/Basin	Existing Landscape Condition						
		Roads		Road Crossings (Fish Passage Barriers)			Habitat Fragmentation - Furthest Downstream Fish Barrier
	% Total Impervious Area (TIA)	Road Density (linear feet per acre)	Highways	# of Barriers per Stream Mile	# of Barriers in Basin	# of Complete Barriers in Basin	Description of Complete Barriers in Basin
Metric Description	% impervious surface based on processed NLCD grids	Length of roads (including highways) per acre	List of highways that cross through the basin	Mapped WDFW fish passage barriers related to road crossings		Subset of mapped barriers that are not passable by fish	
Data Source	2019 MRLC NLCD Impervious Layer	Merged King County and Snohomish County road shapefiles	WSDOT highway mapping	WDFW Web Map Tool; King County stream layer (modified/ simplified)	WDFW Web Map Tool; King County stream layer (modified/ simplified)	WDFW Web Map Tool, extracted data Jan 2022; King County stream layer (modified)	WDFW Web Map Tool, extracted data Jan 2022; King County stream layer (modified)
City only or Basin wide Metric?	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide
Deer Creek	20.4%	81	None	0	0	0	No mapped total barriers
Hall Creek-Ballinger	50.0%	136	I-5 SR-99 SR-104	13.9	91	10	Total/partial barrier mapping on McAleer Creek at I-5 (outside Edmonds) may block access to/from Lake Washington
Lund's Gulch	34.7%	96	SR-99	2.7	6	0	No mapped total barriers
Northstream-Fruitdale	37.2%	121	SR-524	1.4	2	0	Unknown % passable
Perrinville	40.8%	126	SR-524	2.4	2	1	Total barrier on Perrinville Creek at
Shell Creek	47.5%	144	SR-524	1.8	3	0	No mapped total barriers
Southwest Edmonds	44.0%	122	None	Not Applicable	6	0	Not Applicable - no channel in City
Stilthouse-Terrace	28.2%	107	None	2.7	4	1	Total barrier at mouth of Outfall Creek Unknown % passable at Stilthouse and Terrace Creek mouths
Edmonds Marsh	51.1%	142	SR-524 SR-104	10.5	23	10	Total barrier on Shellabarger Creek at SR-524 (owned by WSDOT) Total barrier on Willow Creek at Pine St culvert (owned by City)

BNSF: Burlington Northern Santa Fe
ESRI: Environmental Systems Research Institute
GIS: Geographic Information Systems
HRCD: High resolution change data
MRLC: Multi-Resolution Land Characteristics
MS4: Municipal separate storm sewer system
NLCD: National Land Cover Database
SWIFD: Statewide Washington Integrated Fish Distribution
WDFW: Washington Department of Fish and Wildlife
WSDOH: Washington State Department of Health
WSDOT: Washington State Department of Transportation

Table A-3. Assess Stormwater Management Influence.

	Existing Landscape Condition (continued)				
	Habitat Fragmentation - Furthest Downstream Fish Barrier (continued)	Riparian Buffer		Tree Canopy Loss	Recent Redevelopment/ Development Patterns
Metric/Basin	**Length of stream prior to first complete barrier (linear feet)**	**% Development in Riparian Buffer**	**% Canopy Cover in Riparian Buffer**	**Area with 50% or Greater Canopy Loss (%)**	**% of Basin with Recent Redevelopment or Development**
Metric Description	Identify first full barrier and measure downstream linear feet	% development in riparian buffer (includes streams, lakes, and wetlands)	% forest cover in riparian buffer (includes streams, lakes, and wetlands)	Includes areas with 50% or greater canopy loss from 2006 to 2017	Area with redevelopment or development activity from 2006-2017
Data Source	WDFW Web Map Tool, extracted data Jan 2022; King County stream layer (modified)	2019 NLCD - Development Codes 21, 22, 23, 24 Buffer: DNR stream typing; City GIS data: wetlands and waterbodies	2019 NLCD - Forest Codes 41, 42, 43 (excludes wetlands, marsh, shrub) Buffer: DNR stream typing; City GIS data: wetlands and waterbodies	WDFW Puget Sound High Resolution Change Detection (HRCD) 2006 - 2017 Change Data layer	WDFW Puget Sound High Resolution Change Data (HRCD) 2006 - 2017 Change Detection layer, includes "Development" and "Redevelopment" change categories
City only or Basin wide Metric?	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide
Deer Creek	No mapped total barriers	18.9%	81.1%	1.17%	1.90%
Hall Creek-Ballinger	17,971	63.6%	6.3%	0.78%	2.09%
Lund's Gulch	No mapped total barriers	19.3%	75.6%	2.83%	4.13%
Northstream-Fruitdale	Unknown	60.1%	39.5%	1.01%	1.23%
Perrinville	575	40.8%	56.4%	0.73%	1.54%
Shell Creek	No mapped total barriers	66.4%	30.2%	0.77%	1.32%
Southwest Edmonds	Not Applicable - no channel in City	56.6%	38.5%	0.49%	2.11%
Stilthouse-Terrace	Stilthouse Creek: Unknown Terrace Creek: Unknown Outfall Creek: 0	59.6%	40.0%	0.69%	0.73%
Edmonds Marsh	Shellabarger Creek: 3,490 Willow Creek: 1,558	76.2%	5.3%	0.62%	1.33%

Table A-3. Assess Stormwater Management Influence.

	Existing Landscape Condition (continued)					Future Development	
	Stormwater Infrastructure	Stormwater Infrastructure			Drinking Water Resources	Buildable Lands Projection	Areas with Higher Projected Population Growth
Metric/Basin	**Length of Stormwater Pipe (linear feet)**	**# of MS4 Outfalls to Streams**	**# of MS4 Outfalls to Shoreline/ Marine Discharge**	**% of Basin that is Flow Control Exempt**	**% of Basin within 10-year Travel Time for WHPA**	**% of Basin that is Redevelopable**	**% of Basin with Projected Population Growth Greater Than 1.25%**
Metric Description	City MS4	MS4 outfalls in riparian buffer	MS4 outfalls to lakes and Puget Sound	Acres of FC Exempt/ total acres	Area that is sensitive for drinking water	From Snohomish County Buildable Lands Report	Area by block group with projected population growth greater than 1.25% from 2021-2026
Data Source	City GIS data: Edmonds STORM_LINE mapping	City GIS data: "STORM_CULVERTS" point layer, modified to classify as Riparian, Marine, or Other & filtered to remove BNSF-owned outfalls according to STORM_LINE jurisdiction field.	City GIS data: "STORM_CULVERTS" point layer, modified to classify as Riparian, Marine, or Other & filtered to remove BNSF-owned outfalls according to STORM_LINE jurisdiction field.	City GIS data: Watershed layer indicating "Puget Sound" or "Puget Sound Piped" drainage	WSDOH Wellhead Protection Area Map, 10-year Travel Time layer	Snohomish County Buildable Lands Report and associated GIS layers	ESRI 2021-2026 USA Population Growth (Block group scale)
City only or Basin wide Metric?	City	City	City	Basin wide	Basin wide	Basin wide	Basin wide
Deer Creek	9,326	1	0	0%	65.6%	1.90%	47.2%
Hall Creek-Ballinger	119,915	14	0	0%	4.0%	2.50%	17.2%
Lund's Gulch	2,533	1	1	0%	0%	0%	68.3%
Northstream-Fruitdale	92,914	2	1	48.7%	0%	3.20%	0%
Perrinville	58,088	5	0	0%	0%	1.70%	4.7%
Shell Creek	192,492	16	2	10.2%	0%	5.30%	6.9%
Southwest Edmonds	19,231	0	0	0%	10.4%	0.40%	17.2%
Stilthouse-Terrace	53,222	1	3	35.7%	0%	1.90%	1.1%
Edmonds Marsh	192,578	16	16	54.1%	5.1%	5.50%	35.3%

Table A-4. Overburdened Communities Evaluation.

Metric/Basin	Equity						
	EHD Weighted	**Sensitive Population Weighted**	**Socioeconomics Weighted**	**Population Burden Score Weighted**	**Environmental Exposure Weighted**	**Environmental Effects Weighted**	**Population Characteristics Score Weighted**
Metric Description	Composite score evaluating threat to and vulnerability of populations	This category includes indicators related to intrinsic and extrinsic vulnerabilities in communities that can modify the environmental risk factors. Indicators in this theme relate to biological susceptibility. People with pre-existing cardiovascular disease or low-birth-weight infants may be more vulnerable to environmental risk factors.	This category includes indicators related to intrinsic and extrinsic vulnerabilities in communities that can modify the environmental risk factors.	Composite of Sensitive Populations and Socioeconomics	Environmental exposure refers to how a person comes into contact with an environmental hazard. Examples of exposure include breathing air, eating food, drinking water or living near to where environmental hazards are released or are concentrated.	Environmental effect refers to adverse environmental quality generally, even when population contact with an environmental hazard is unknown or uncertain.	Composite of Environmental Exposure and Environmental Effects (0.5 multiplier for EE)
Data Source	WA Environmental Health Disparities Map	WA Environmental Health Disparities Map	WA Environmental Health Disparities Map	WA Environmental Health Disparities Map	WA Environmental Health Disparities Map	WA Environmental Health Disparities Map	WA Environmental Health Disparities Map
City only or Basin wide Metric?	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide
Deer Creek	2.4	1.9	1.5	3.5	4.9	4.1	1.7
Hall Creek-Ballinger	6.4	4.3	5.7	4.8	7.8	3.6	5.0
Lund's Gulch	3.1	2.2	5.2	2.4	3.7	2.1	3.7
Northstream-Fruitdale	1.0	1.1	1.1	1.9	1.7	4.4	1.1
Perrinville	3.4	2.9	5.3	2.4	3.2	3.4	4.1
Shell Creek	2.6	3.8	1.3	2.7	3.6	3.7	2.6
Southwest Edmonds	3.1	2.2	2.8	3.6	5.3	3.8	2.5
Stilthouse-Terrace	1.1	3.0	2.1	1.3	1.1	3.0	2.6
Edmonds Marsh	2.8	2.8	1.8	3.0	4.1	3.9	2.3

EE: Environmental Exposures

EHD: Environmental Health Disparities

APPENDIX B

Detailed Scoring Matrix

			Weight	Deer Creek	Hall Creek-Ballinger	Lund's Gulch	Northstream-Fruitdale	Perrinville	Shell Creek	Southwest Edmonds	Stilthouse-Terrace	Edmonds Marsh
Stormwater Influence	Stormwater Impacts	Percent Total Impervious Surface	2	1	3	2	2	2	2	2	1	3
		Percent Basin within City Control	2	1	0	0	3	1	3	0	3	3
		Road Density	1	1	2	1	2	2	3	2	1	3
		Percent of Riparian Canopy Cover	1	0	3	0	2	1	2	2	2	3
		Fish Passage Barriers	1	0	4	0	0	1	0	0	1	4
	Future Growth	Expected Population Growth	1	2	0	3	0	0	0	0	0	1
		Future Buildable Lands	1	1	2	2	1	1	1	2	2	1