CITY OF CENTRALIA PUBLIC WORKS

RECEIVING WATER ASSESSMENT, PRIORITIZATION, & STORMWATER MANAGEMENT ACTION PLAN

CENTRALIA Public Works

RKI planning engineering

March 24, 2023

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CITY OF CENTRALIA PUBLIC WORKS

2019 – 2024 NPDES PERMIT SUPPORT

Date:	March 24, 2023
Prepared By:	Robin Kirschbaum, Inc.
Prepared For:	Kim Ashmore / City of Centralia Public Works
Subject:	Receiving Water Assessment, Prioritization, and Stormwater Management Action Plan (Task 300)

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GLOSSARY

303(d) List: A list of assessed water bodies, required by the federal Clean Water Action, with categories that describe the quality of the water and status of any needed clean up.

Digital Elevation Model: A representation of the bare ground topographic surface of the Earth excluding trees, buildings, and any other surface objects.

Direct Discharge: Stormwater, treated or untreated, that is discharged directly via a Municipal Separate Storm Sewer System (MS4) into a stream or other receiving body that is a water of the United States.

EJSCREEN: an environmental justice mapping and screening tool that provides EPA with a nationally consistent dataset and approach for combining environmental and demographic indicators.

Indirect Discharge : The introduction of stormwater via non-MS4 conveyance system into a water of the United States.

Land Cover Type: Landscape-based data which describes land material. Land cover types provided in this assessment are impervious, pervious, and water.

Land Use Category: Categories that represent use of land. Categories may include commercial, industrial, and residential.

Municipal Separate Storm Sewer System: A conveyance or system of conveyances that is:

- owned by a state, city, town, village, or other public entity that discharges to waters of the U.S.,
- designed or used to collect or convey stormwater (e.g., storm drains, pipes, ditches),
- not a combined sewer, and
- not part of a sewage treatment plant, or publicly owned treatment works (POTW).

Raster: A GIS layer that consists of a matrix of cells or pixels organized into a grid where each cell contains a value representing information.

Receiving waters: Naturally and/or reconstructed naturally occurring surface water bodies, such as creeks, streams, rivers, lakes, wetlands, estuaries, and marine waters, or groundwater, to which a MS4 discharges.

Short-Term Stormwater Management Actions (SMAs): Stormwater Management Actions (SMAs) to be accomplished within 6 years.

Long-Term SMAs: Stormwater Management Actions (SMAs) to be accomplished within 20 years.

Surface waters: Includes lakes, rivers, ponds, streams, inland waters, salt waters, and all other surface waters and water courses within the jurisdiction of the State of Washington.

Urban Growth Areas (UGAs) : Regional boundaries set, typically on a County-wide scale, in an effort to control urban sprawl by directing urban development to the areas inside the boundary and by directing the area outside the boundary be preserved in its natural state or used for designated uses.

ACRONYMS

Acronym	Description
AADT	Average Annual Daily Traffic
BMP	Best Management Practice
CBP	Centralia Basin Partnership
DEM	Digital Elevation Model
Ecology	Washington State Department of Ecology
EJ	Environmental Justice
EN	Environmental
GIS	Geospatial Information System
GSU	Geospatial Unit
LQG	Large Quantity Generator
MS4	Municipal Separate Storm Sewer
NATA	National-Scale Air Toxics Assessment
NPL	National Priorities List
PCBs	Polychlorinated biphenyls
PM	Particulate Matter
RMP	Risk Management Plan
RSEI	Risk-Screening Environmental Indicators
SMA	Stormwater Management Action
SMAP	Stormwater Management Action Plan
SWMMWW	Stormwater Management Manual of Western Washington
SWMP	Stormwater Management Plan
TIP	Transportation Improvement Plan
TSDF	Treatment, Storage, and Disposal Facilities
UGA	Urban Growth Area
USEPA	United States Environmental Protection Agency
WADNR	Washington State Department of Natural Resources
WDFW	Washington Department of Fish and Wildlife
WRIA	Water Resource Inventory Area

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EXECUTIVE SUMMARY

Background

The Washington State Department of Ecology (Ecology) reissued the Western Washington Phase II Municipal Stormwater Permit (Permit) on July 1, 2019, with effective date August 1, 2019 and expiration date July 31, 2024. Special Condition (S) 5.C.1.d of the Permit requires the City of Centralia (City) to develop Stormwater Management Action Planning (SMAP) for at least one priority catchment located in the City's jurisdiction. This assessment documents and assesses existing information related to local receiving waters and contributing area conditions to identify which receiving waters are most likely to benefit from stormwater management planning.

Receiving Water Identification

Utilizing Geospatial Unit (GSU) data provided by *The Chehalis Basin Strategy Aquatic Species Restoration Plan* (Chehalis Basin Strategy; ASRP 2019), eight receiving water basins were identified (study area) for the City, including:

- Lincoln Creek
- Salzer Creek
- Lower Chehalis
- Lower Skookumchuck, including Skookumchuck Tributaries
- Middle Chehalis
- Scammon Creek
- China Creek
- Tributary 2286 (Dry Creek)

These eight basins were further delineated into 45 subbasins, as described in Section 2 of the main report.

Receiving Water Conditions

Receiving water conditions were assessed for each of the 45 subbasins located in the study area by evaluating water quality and designated use conditions (Section 3.1), landscape-scale data (Section 3.2), development pressure (Section 3.3), critical and sensitive areas (Section 3.4), and overburdened communities (Section 3.5). Within each of the sections listed, data and figures are presented to assist in formulating an overarching assessment for the basins and subbasins within the study area.

Stormwater Management Influence

Each of the 45 subbasins within the study area were assessed for stormwater management influence; that is, whether the City's MS4 system has influence on the subbasin's receiving water. A summary of decision criteria to assess location within the City's jurisdictional boundaries, hydrologic impact, and expected pollutant loading are presented in Section 4. The stormwater management influence assessment resulted in narrowing of the 45 subbasins within the study area to six subbasins to be included in the next step of the SMAP process or Receiving Water Prioritization.

Protection Goals

The City's 2018 Comprehensive Plan describes Environmental (EN) Goal 7 as the City's goal to protect and improve the water quality and biological health of surface waters (including wetlands and shoreline environments, see Section 3.4 in this report). These protection type actions may be most helpful in the Middle Chehalis basin and the Lower Chehalis basin, which contain the highest amount of wetland and shoreline environments.

Restoration Goals

The City has approximately 8 miles of transportation improvements planned (Section 3.3.2). Some of these TIPs could provide a good opportunity for partnering with Roads on joint roadway-stormwater improvement projects, potentially of a regionally significant scale and with multiple community benefits in addition to managing stormwater runoff. Dry Creek and LoC-1, contain the greatest length of planned improvements (approximately 2.3 and 1.2 miles, respectively).

Future development in the City's UGA (Section 3.3.1) is expected to trigger stormwater code requirements. The higher levels of future flow control and runoff treatment BMPs will help restore receiving waters over time.

Receiving Water Prioritization

The City prioritized the six subbasins identified as part of the candidate list (Section 5) based on a framework developed by Ecology as part of the Puget Sound Characterization Stormwater Management Framework and documented in the *Building Cities in the Rain* watershed prioritization guidance (Commerce 2016). A GIS-based screening process was used to score each subbasin on the candidate list ("candidate basins", see Section 5) in terms of its relative resource value (or importance for natural processes and aquatic species) and level of degradation from existing/future development and other human impacts (see Appendix D). In an April 13, 2022 meeting with the City, the City discussed that basins with the greatest degradation should receive the highest prioritization. Accordingly, MC-3, CC-1, LS-1, SC-1, and LoC-1 were prioritized for further stormwater action planning evaluation (Section 6.3).

Stormwater Management Action Plan

The SMAP provided in this report identifies approaches – in addition to current requirements of the Permit – to accommodate future growth and development while helping to reduce water quality degradation and/or improving conditions in receiving waters harmed by past development. The SMAP includes three stormwater facility retrofits, two land management/development strategies, and a total of five tailored/enhanced stormwater management strategies for short- (i.e., within 6 years) and long-term (i.e., within 20-year) time horizons. The SMAP also identifies necessary coordination with long-range plans and provides estimated implementation schedules, budgets, and potential budget sources (Section 7).

1 INTRODUCTION

1.1 Project Description

The Washington State Department of Ecology (Ecology) reissued the Western Washington Phase II Municipal Stormwater Permit (Permit) on July 1, 2019, with effective date August 1, 2019 and expiration date July 31, 2024. Special Condition (S) 5.C.1.d of the Permit requires the City of Centralia (City) to develop Stormwater Management Action Planning (SMAP) for at least one priority catchment located in the City's jurisdiction.

S 5.C.1.d of the Permit is conducted in three parts, as follows:

i. **Receiving Water Assessment :** This assessment will document and assess existing information related to local receiving waters and contributing area conditions to identify which receiving waters are most likely to benefit from stormwater management planning. The Receiving Water Assessment is due to Ecology by March 31, 2022.

ii. **Receiving Water Prioritization:** This plan will prioritize which receiving waters as identified in (I) will receive the most benefit from stormwater management planning. The Receiving Water Prioritization is due to Ecology by June 30, 2022.

iii. **Stormwater Management Action Plan (SMAP):** This plan will develop stormwater planning for at least one high-priority catchment area as outlined in the Receiving Water Prioritization (ii). The SMAP is due to Ecology by March 31, 2023.

The City retained Robin Kirschbaum, Inc. (RKI) to review the City's available data, perform analysis using Geographic Information System (GIS), and develop the SMAP in compliance with the Permit requirements.

1.2 Purpose of this Report

This report will provide for compliance for the Permit S 5.C.1.d.i, S 5.C.1.d.ii, and S5.C.1.d.iii (Receiving Water Assessment, Receiving Water Prioritization, and Stormwater Management Action Plan, respectively). Following the SMAP guidelines provided in *Stormwater Management Action Planning (SMAP) Guidance: Phase I and Western Washington Phase II Municipal Stormwater Permits* (Ecology 2019a), the Receiving Water Assessment and Receiving Water Prioritization described in this report use the following general steps:

- **Receiving Water Assessment**
    - Step 1: Delineate basins and identify receiving waters (Section 2);
    - Step 2: Assess receiving water conditions (Section 3);
    - Step 3: Assess stormwater management influence (Section 4); and
    - Step 4: Assess relative conditions and contribution (Section 5).
- **Receiving Water Prioritization**
    - Step 1: Develop priority ranking process used to identify high priority receiving waters (Section 6.1 and Section 6.2); and
    - Step 2: Identify high-priority catchment area(s) for focus of the Stormwater Management Action Plan (Section 6.3).

- **SMAP**
    - Step 1: Identify and describe stormwater facility retrofits needed for the high-priority catchment area(s)
    - Step 2: Identify land management/development strategies for water quality management
    - Step 3: Identify targeted, enhanced, or customized implementation of stormwater management actions related to permit section within S5

The outcome of the above steps is a watershed inventory that identifies a list of candidate basins, prioritizes subbasins based on a defined set of metrics, and identifies high-priority catchment areas needed to support the Stormwater Management Action Planning process (Ecology 2019b, S.5.C.1.d.iii).

1.3 Public Input

Ecology recommends in its SMAP guidelines (2019a) to leverage public input throughout the stormwater management action planning process. On June 4, 2022, the City issued a public water quality survey to their Stream Team to gauge feedback on priority subbasins. The completed surveys and a copy of the blank survey are provided in Appendix G.

Based on the ten responses received at the time of the Receiving Water Prioritization (RKI 2022), the main areas of public interest for water quality enhancements were the following:

- China Creek
- Hayes Lake
- Borst Park Lake
- Chehalis River at Borst Park Boat Launch; and
- Skookumchuck River at Pearl Street Bridge

An additional 23 responses were later received and analyzed in July 2022. Overall the results were consistent with the above, with most public interest for water quality enhancements in China Creek, Hayes Lake, Borst Lake and the Chehalis River.

During this SMAP development process, on February 27, 2023, the City distributed the survey again to the Chehalis Basin Partnership (CBP), which is comprised of a large group of members from multiple City and County jurisdictions, the Chehalis Tribe, Quinault Indian Nation, Washington State Department of Ecology, Washington Department of Fish and Wildlife, Ports, environmental groups, citizens, and businesses. No feedback was received as of the time of this SMAP. Once feedback is received from CBP members, it should be reviewed and incorporated into future updates of the SMAP and resulting stormwater management actions, as appropriate. See Section 8 for additional discussion of Recommendations and Next Steps.

2 BASIN DELINEATION AND RECEIVING WATER IDENTIFICATION

The City of Centralia is located along the Interstate-5 corridor, approximately 25 miles south of Olympia, WA within Lewis County (Figure 1). The City and its Urban Growth Area (UGA) lie at the confluence of several major river systems including the Chehalis River, the Skookumchuck River, and the Newaukum River.

The City's Municipal Sewer System (MS4) includes a collection of stormwater conveyance pipes, manholes

and outlets that directly discharge into the Chehalis River, China Creek, and the Skookumchuck River (Figure 2). The system also includes a collection of drywells (not part of the MS4 system) and retention/detention systems as shown in Figure 2. Drywells and retention/detention systems are generally located in the centralized developed portions of the City. The following assets make up the City's complete stormwater conveyance system:

- Approximately 163,178 linear feet (30.9 miles) of stormwater conveyance piping
- Unknown length of open ditches
- 1,137 catch basins
- 100 drywells
- 72 outfalls
    - 1 outfall to Salzer Creek (not shown in Figure 2)
    - 55 outfalls to China Creek
    - 10 outfalls to the Skookumchuck River
    - 6 outfalls to the Chehalis River
- 500 manholes
- 68 retention/detention basins
- Approximately 20,000 linear feet of private system piping

2.1 Chehalis River Basin

The Chehalis River is the central receiving water for the City of Centralia. Other major river systems that flow through or upstream of Centralia's jurisdictional boundaries, including the Skookumchuck River and the Newaukum Rivers, flow into the Chehalis River. The Chehalis River basin boundaries are divided into two water resource inventory areas (WRIAs): 1) WRIA 22, or the Lower Chehalis, with a total area of approximately 1,470 square miles, and 2) WRIA 23, the Upper Chehalis, with a total area of approximately 1,300 square miles. The total area of the Chehalis River basin, including the Upper and Lower Chehalis WRIAs, is approximately 2,770 square miles. The City of Centralia jurisdictional area covers approximately 15.1 square miles within WRIA 23.

The headwaters of the Chehalis River begin near the southwest corner of Lewis County. The Chehalis flows northeast through the City of Centralia. Downstream of the City, the Chehalis flows northwest through Grays Harbor County, and eventually discharges into the Pacific Ocean (Figure 1).

The Chehalis Basin Strategy Aquatic Species Restoration Plan (Chehalis Basin Strategy; ASRP 2019) delineates a total of 180 geospatial units (GSUs) for the Chehalis River within WRIA 22 and WRIA 23, as shown in Figure 3. Geospatial units are subdivisions of drainage basins and provide a means of describing location on the landscape and within a drainage network. Chehalis basin GSUs range between less than one square mile and 70 square miles.

2.2 Receiving Water Assessment Study Area

Due to the relatively large size and reach of the Chehalis River Basin (including WRIA 22 and WRIA 23,

approximately 2,770 square miles), for the purposes of Stormwater Management Action Planning, a smaller study area was defined for this assessment. The study area was determined by intersecting Chehalis Basin Strategy GSUs with the City of Centralia's jurisdictional boundaries, including the City's boundaries and the boundaries of its Urban Growth Area (UGA). The following nine Chehalis Basin Strategy GSUs resulted from the intersection (Figure 3):

- Lincoln Creek
- Salzer Creek
- Lower Chehalis
- Lower Skookumchuck, including Skookumchuck Tributaries
- Middle Chehalis
- Scammon Creek
- China Creek
- Tributary 2286 (Dry Creek)

Note that the Lower Skookumchuck GSU and the Skookumchuck Tributaries GSU (Figure 3) were grouped into one basin, resulting in a total of eight basins (Figure 3). The total area for the eight basins listed above, or the study area, is approximately 172.1 square miles (Table 1). These basins were further delineated into subbasins as discussed in Section 2.3.

2.3 Subbasin Delineation

Subbasins within the study area were initially delineated using Geographic Information Systems (GIS) procedures documented in *Watershed and Stream Network Delineation* (Tarboton 2017). The following assumptions and data were used for this initial delineation:

- **Base layer:** The base layer used for subbasin delineation was 30-meter resolution digital elevation model (DEM) raster layer provided by ESRI (see Appendix A)
- **DEM Reconditioning:** The DEM layer was reconditioned, or "burned" with a hydrography layer provided by the Washington State Department of Natural Resources (DNR; see Appendix A). The DNR hydrography layer makes up the most complete and up to date hydrography layer for the State of Washington, thus is more accurate than streams produced from GIS watershed analysis of the DEM layer alone with no stream and river reconditioning.
- **Flow Accumulation :** A flow accumulation raster was created in GIS to calculate the accumulated weight of all cells flowing into each downslope cell in the output raster. For this study, a weight of 1 was applied to each cell and the resulting value of cells in the output raster is the number of cells that flow into each cell.

The reconditioned DEM flow accumulation was redefined with streams and rivers that had a raster cell flow accumulation of 5,000 cells or greater. A value of 5,000 cells or greater removed very small streams, such as those in the headwaters of river systems, and produced subbasins that aligned with the Ecology SMAP guidelines of defining basins from about one square mile to up to about 20 miles total drainage area (Ecology 2019a).

This analysis resulted in 45 subbasins delineated for the study area ranging from approximately one to 12

square miles, as shown in Figure 4. Table 1 lists the 45 subbasins grouped by receiving water basin and summarizes the total area of each subbasin, the total area of each subbasin within the City's jurisdiction, and the percentage of each subbasin within the City's jurisdiction. As discussed in Section 4 (Stormwater Management Influence), many of the resulting subbasins lie completely outside the City's jurisdiction, where the City would be unable to implement stormwater retrofits or programs.

The subbasin and basin boundaries were refined during SMAP development (Section 7).

Figure 1. Vicinity Map

Figure 2. City of Centralia Stormwater System

Figure 3. Geospatial Units within the Study Area

Insert 11x17 landscape

Figure 4. Subbasin Delineation

Table 1. Subbasin Area Summary

Receiving Water Basin/Subbasin	Total Area (Square Miles)	Area Within Jurisdiction (Square Miles)	Percent Within Jurisdiction (%) [a]
China Creek			
CC-1	5.43	2.08	38.3%
China Creek Subtotal	**5.43**	**2.08**	**38.3%**
Dry Creek			
Dry Creek	3.59	1.87	52.1%
Dry Creek Subtotal	**3.59**	**1.87**	**52.1%**
Lincoln Creek			
Eagle Creek	3.42	0	0.0%
LC-1	1.8	0.76	42.2%
LC-2	4.8	0	0.0%
LC-3	2.86	0	0.0%
LC-4	2.16	0	0.0%
LC-5	1.97	0	0.0%
LC-6	2.98	0	0.0%
LC-7	2.32	0	0.0%
LC-8	1.74	0	0.0%
LC-9	1.67	0	0.0%
LC-10	2.37	0	0.0%
North Fork Lincoln Creek	3.38	0	0.0%
South Fork Lincoln Creek	5.2	0	0.0%
Sponenbergh Creek	4.5	0	0.0%
Wildcat Creek	2.26	0	0.0%
Lincoln Creek Subtotal	**43.43**	**0.76**	**1.7%**
Lower Chehalis			
LoC-1	4.89	4.17	85.3%
LoC-2	1.89	0	0.0%
LoC-3	1.09	0	0.0%
LoC-4	5.38	0	0.0%
LoC-5	1.67	0	0.0%
LoC-6	3.65	0	0.0%
Lower Chehalis Subtotal	**18.57**	**4.17**	**22.5%**
Lower Skookumchuck			
Bloody Run	3.29	0	0.0%
Coffee Creek	7.17	1.35	18.8%
Johnson Creek	11.04	0	0.0%
LS-1	1.9	1.62	85.3%
LS-2	1.45	0.32	22.1%
LS-3	4.66	0	0.0%

LS-4	2.38	0	0.0%
LS-5	3.99	0	0.0%
LS-6	2.94	0	0.0%
LS-7	3.4	0	0.0%
LS-8	4.1	0	0.0%
LS-9	2.39	0	0.0%
Salmon Creek	4.16	0	0.0%
Thompson Creek	11.63	0	0.0%
Lower Skookumchuck Subtotal	**64.5**	**3.29**	**5.1%**
Middle Chehalis			
MC-1	2.44	0	0.0%
MC-2	2.58	0.04	1.6%
MC-3	1.5	0.97	64.7%
Middle Chehalis Subtotal	**6.52**	**1.01**	**15.5%**
Salzer Creek			
Coal Creek	6.6	0	0.0%
SC-1	5.06	1.08	21.3%
SC-2	4.78	0	0.0%
SC-3	7.9	0	0.0%
Salzer Creek Subtotal	**24.34**	**1.08**	**4.4%**
Scammon Creek			
Scammon Creek	5.7	0.82	14.4%
Scammon Creek Subtotal	**5.7**	**0.82**	**14.4%**
Grand Total	**172.08**	**15.08**	**8.8%** [a,b]

Notes:

a. Subtotal 'Percent within Jurisdiction' = 'Percent within Jurisdiction' / 'Total Area'.

b. Grand Total 'Percent within Jurisdiction' (8.8%) = Grand Total ''Area within Jurisdiction' (15.08 sq. mi.) / Grand Total 'Total Area' (172.08 sq. mi.)

3 RECEIVING WATER CONDITIONS

Available information, including GIS data, comprehensive plans, and transportation plans, was compiled, reviewed, and organized to better understand the likely condition of each of the receiving waters to which the City's MS4 discharges (Section 2), whether directly or indirectly. This compiled dataset will be used to provide input to Receiving Water Prioritization (see Section 1).

In alignment with the Ecology SMAP Guidelines (Ecology 2019a), data was collected to help evaluate the following five receiving water conditions:

- Water quality and designated use conditions;
- Landscape-scale data;
- Development pressure;
- Critical and sensitive areas; and
- Overburdened communities.

The below sections provide additional context for each of the five receiving water conditions listed above. A summary of compiled data, sources and links can be found in Appendix A (Receiving Water Assessment – Data Sources).

4.1 Water Quality and Designated Use Conditions

Water quality and designated use conditions were assessed by reviewing which water bodies within the study area subbasins are considered impaired [303(d) list[1]], what the potential pollutant sources for the impairment are, and which water bodies are considered designated fish use.

4.1.1 Water Quality Assessment and 303 (d) List

Ecology's water quality assessment and 303(d) list was used to help evaluate water quality for waters within each of the subbasins listed in Table 1. The Ecology water quality assessment is a process of collecting data and assessing the quality of surface water in the State, including all rivers, lakes, and marine water (Ecology 2021). The water quality assessment groups water bodies into the following categories:

- **Category 1:** The water body meets tested standards for clean water;
- **Category 2:** The water body is considered a water of concern. Some evidence of water quality issue exists but not enough to show persistent impairment;
- **Category 3:** There is insufficient data to categorize the water body;
- **Category 4:** The water body is an impaired water that does not require a Total Maximum Daily Load (TMDL), where:
    - **Category 4a** – The water body already has an EPA-approved TMDL in place and implemented;

[1] See https://ecology.wa.gov/Water-Shorelines/Water-quality/Water-improvement/Assessment-of-state-waters-303d for more information.

    - **Category 4b** – The water body has a pollution control program, similar to a TMDL plan, that is expected to solve the pollution problems; and
    - **Category 4c** – The water body has an impairment that cannot be addressed through a TMDL plan; and
- **Category 5**: The water body is polluted and requires a water quality improvement project.

Only waters with 303(d) listings of Category 4a, 4b, or 5 were included in this assessment since these waters are considered impaired and would benefit from a water quality improvement project, whether or not a project already exists for the water body. Within the study area, no subbasin contained a water body listed as Category 4b. A summary of 303(d) listings for each subbasin within the study area is provided in Table 2. Subbasins within the study area are 303(d) listed for the following pollutants:

- Dissolved oxygen
- Temperature
- Bacteria
- pH
- Dioxins; and
- Polychlorinated biphenyls (PCBs)

4.1.2 Potential Pollutant Sources

Potential pollutant source data for impaired waters (see Section 3.1.1) was compiled from data presented in the *Surface/Storm Water Management Comprehensive Plan for the City of Centralia* (CH2MHill 2016), the *Upper Chehalis River Basin Temperature Total Maximum Daily Load* (Ecology 2001), and *The Chehalis Basin Salmon Habitat Restoration and Preservation Strategy for WRIA 22 and WRIA 23* (Salmon Habitat; Grays Harbor 2011).

The following is a list of five water assessment parameters in which impaired waters within the study area are caused by the following point/non-point sources:

- **Dissolved Oxygen** : A potential source for dissolved oxygen deficiency within the study area is agricultural runoff. Much of the study area receives organic and nutrient loading from farming activities (CH2Mhill 2016).
- **Temperature** : Increased water temperatures are contributed to by the following sources:
    - Riparian degradation and loss; and
    - Increased sediment loads.

    Riparian degradation and increased sediment loads within the study area are typically caused by conversion of forestland to agriculture, past logging, and stream bank erosion (Grays Harbor 2011).
- **Bacteria Levels:** High fecal coliform bacteria levels within the study area may be caused by livestock and agricultural runoff (CH2MHill 2016).
- **pH**: Invasive riparian plant species replace natural vegetation and can alter natural pH within the study area (Grays Harbor 2011).

- **Dioxins and Polychlorinated Biphenyls (PCBs):** Dioxins and PCBs are typically generated from manufacturing and industrial processes (Ecology 2015). No point or non-point source data was located for dioxins and PCBs within the study area.

A summary of potential pollutant sources for each subbasin is provided in Table 2.

4.1.3 Fish Use

The State of Washington Department of Natural Resources (WADNR) developed Fish Habitat Water Type Codes using on a water typing model based on thousands of field surveys of fish presence and fish habitat (WADNR 2006). Water Type Codes define whether a water body can support fish (F code), cannot support fish (N code), has unknown fish habitat (U code), does not have a type designation (X code), or is considered a Shoreline of the State (S code). Fish Habitat Water Type Codes were intersected with the study area boundaries to determine fish use for each subbasin.

For subbasins that contained waters with an S code (Shoreline of the State), fish use data was supplemented with designated use data from Washington Administrative Code (WAC) 173-201A-602, or use designations for fresh waters by water resource inventory area. See Appendix A for a list of compiled data sources to determine fish use.

All subbasins within the study area contain water body segments that have designated fish use. This information is summarized in Table 2.

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Table 2. Water Quality and Designated Use Conditions

Receiving Water/Subbasin	Count of Category 4A 303d Listing	Count of Category5 303d Listing	303d Listing (4a or 5)	Parameter	Potential Pollutant Sources	Fish Use (Y/N)
China Creek	**1**	**0**	**1**			
CC-1	1	0	1	Dissolved Oxygen	Riparian Loss/Degradation [d], Sedimentation [d]	Y
Dry Creek	**0**	**0**	**0**			
Dry Creek	0	0	0			Y
Lincoln Creek	**21**	**0**	**21**			
Eagle Creek	0	0	0			Y
LC-1	6	0	6	Temperature, Dissolved Oxygen	Riparian Loss/Degradation [c], Sedimentation [d], Agricultural Runoff	Y
LC-2	6	0	6	Temperature, Dissolved Oxygen	Riparian Loss/Degradation [c], Sedimentation [d], Agricultural Runoff	Y
LC-3	0	0	0			Y
LC-4	0	0	0			Y
LC-5	0	0	0			Y
LC-6	2	0	2	Temperature, Dissolved Oxygen	Riparian Loss/Degradation [c], Sedimentation [d], Agricultural Runoff	Y
LC-7	0	0	0			Y
LC-8	0	0	0			Y
LC-9	1	0	1	Temperature	Riparian Loss/Degradation [c], Sedimentation [d]	Y
LC-10	1	0	1	Temperature	Riparian Loss/Degradation [c], Sedimentation [d]	Y
North Fork Lincoln Creek	4	0	4	Temperature	Riparian Loss/Degradation [c], Sedimentation [d]	Y
South Fork Lincoln Creek	0	0	0			Y
Sponenbergh Creek	1	0	1	Dissolved Oxygen	Agricultural Runoff	Y
Wildcat Creek	0	0	0			Y
Lower Chehalis	**40**	**3**	**43**			
LoC-1	5	1	6	Dioxin, Dissolved Oxygen, Temperature	Agricultural Runoff [b], Riparian Loss/Degradation [b], Sedimentation [d]	Y
LoC-2	0	0	0			Y
LoC-3	2	0	2	Temperature, Dissolved Oxygen	Agricultural Runoff [b], Riparian Loss/Degradation [b], Sedimentation [d]	Y
LoC-4	13	2	15	pH, Bacteria, Dissolved Oxygen, Temperature	Agricultural Runoff [b], Riparian Loss/Degradation [b], Sedimentation [d]	Y
LoC-5	12	0	12	Bacteria, Dissolved Oxygen, Temperature	Agricultural Runoff [b], Riparian Loss/Degradation [b], Sedimentation [d]	Y
LoC-6	8	0	8	Bacteria, Dissolved Oxygen, Temperature	Agricultural Runoff [b], Riparian Loss/Degradation [b], Sedimentation [d]	Y
Lower Skookumchuck	**49**	**6**	**55**			
LS-1	31	6	37	Dioxin, Polychlorinated Biphenyls, Bacteria, Dissolved Oxygen, Temperature	Riparian Loss/Degradation [b], Agricultural Runoff	Y
LS-2	2	0	2	Temperature, Dissolved Oxygen	Riparian Loss/Degradation [b], Agricultural Runoff	Y
LS-3	6	0	6	Temperature, Dissolved Oxygen	Riparian Loss/Degradation [b], Agricultural Runoff	Y
LS-4	1	0	1	Temperature	Riparian Loss/Degradation [b]	Y
LS-5	0	0	0			Y
LS-6	0	0	0			Y
LS-7	6	0	6	Temperature, Dissolved Oxygen	Riparian Loss/Degradation [b], Sedimentation [d]	Y
LS-8	1	0	1	Temperature	Riparian Loss/Degradation [b], Sedimentation [d]	Y
LS-9	0	0	0			Y

Receiving Water/Subbasin	Count of Category 4A 303d Listing	Count of Category5 303d Listing	303d Listing (4a or 5)	Parameter	Potential Pollutant Sources	Fish Use (Y/N)
Bloody Run	0	0	0			Y
Coffee Creek	0	0	0			Y
Johnson Creek	0	0	0			Y
Salmon Creek	1	0	1	Temperature	Riparian Loss/Degradation [b], Sedimentation [d]	Y
Thompson Creek	1	0	1	Temperature	Riparian Loss/Degradation [b], Sedimentation [d]	Y
Middle Chehalis	**67**	**9**	**76**			
MC-1	30	3	33	Turbidity, Bacteria, Dissolved Oxygen, Temperature	Agricultural Runoff [b], Riparian Loss/Degradation [b], Sedimentation [d]	Y
MC-2	8	0	8	Temperature, Dissolved Oxygen	Agricultural Runoff [b], Riparian Loss/Degradation [b], Sedimentation [d]	Y
MC-3	29	6	35	Dioxin, Polychlorinated Biphenyls, Bacteria, Dissolved Oxygen, Temperature	Landfill Leachate [b], Agricultural Runoff [b], Riparian Loss/Degradation [b], Sedimentation [d]	Y
Salzer Creek	**42**	**0**	**42**			
Coal Creek	12	0	12	Bacteria, Dissolved Oxygen	Agricultural Runoff [d], Riparian Loss/Degradation [d], Sedimentation [d]	Y
SC-1	14	0	14	Bacteria, Dissolved Oxygen, Temperature	Agricultural Runoff [d], Riparian Loss/Degradation [d], Sedimentation [d]	Y
SC-2	13	0	13	Bacteria, Dissolved Oxygen, Temperature	Agricultural Runoff [d], Riparian Loss/Degradation [d], Sedimentation [d]	Y
SC-3	3	0	3	Bacteria, Dissolved Oxygen, Temperature	Agricultural Runoff [d], Riparian Loss/Degradation [d], Sedimentation [d]	Y
Scammon Creek	**2**	**1**	**3**			
Scammon Creek	2	1	3	Dioxin, Dissolved Oxygen, Temperature	Agricultural Runoff [d], Riparian Loss/Degradation [d], Sedimentation [d]	Y
Grand Total	**222**	**19**	**241**	**---**		**---**

Notes:

a. Data available only for City of Centralia and UGA.
b. Potential Pollutant Source noted in the 2016 Centralia Surface/Storm water Management Comprehensive Plan (CH2MHill 2016)
c. Potential Pollutant Source noted in the *Upper Chehalis River Basin Temperature Total Maximum Daily Load* (Ecology 2001)
d. Potential Pollutant Source noted in *The Chehalis Basin Salmon Habitat Restoration and Preservation Strategy for WRIA 22 and WRIA 23* (Grays Harbor 2011)

4.2 Landscape-Scale Data

4.2.1 Land Cover Types

Land cover data was based on 2011 land cover raster imagery provided by Ecology (see Appendix A). A total of 18 land cover categories provided in the raster imagery were reclassified as three land cover categories, including impervious, pervious, and water for purposes of this assessment.

Table 3 summarizes these 18 land cover categories and their assumed distribution of land cover types (e.g., impervious (including water) and pervious). Of the total 172.1 square miles within the study area, approximately 5.4% (9.35 square miles) is impervious, 89% (153.13 square miles) is pervious, and 5.6% (9.62 square miles) is water. This data shows that the study area is relatively minimally developed.

Table 4 summarizes landscape-scale data by receiving water basin and subbasin. Subbasins with the greatest impervious area coverage include the LS-1 (37%), MC-1 (30%), and MC-3 (29%). Both the LS-1 and the MC-3 lie mostly within the City's jurisdictional boundaries, while the MC-1 lies completely outside of the City's jurisdiction (see Table 1). The latter subbasin lies mostly within the City of Chehalis' jurisdiction, which accounts for the high amount of impervious area.

Table 3. Assumed Land Use based on Land Cover Type

Land Cover Category	Land Cover Type			Total (Square Miles / %)
	Impervious (Square Miles / %)	Pervious (Square Miles / %)	Water (Square Miles / %)	
Bare Land	1.96 / 100%	0 / 0%	0 / 0%	1.96 / 100%
Cultivated	0 / 0%	2.61 / 100%	0 / 0%	2.61 / 100%
Deciduous Forest	0 / 0%	16.32 / 100%	0 / 0%	16.32 / 100%
Developed Open Space	0 / 0%	3.6 / 100%	0 / 0%	3.6 / 100%
Evergreen Forest	0 / 0%	54.36 / 100%	0 / 0%	54.36 / 100%
Grassland	0 / 0%	9.96 / 100%	0 / 0%	9.96 / 100%
High Intensity Developed	1.22 / 90%	0.14 / 10%	0 / 0%	1.35 / 100%
Low Intensity Developed	3.93 / 70%	1.68 / 30%	0 / 0%	5.61 / 100%
Medium Intensity Developed	2.25 / 80%	0.56 / 20%	0 / 0%	2.81 / 100%
Mixed Forest	0 / 0%	14.99 / 100%	0 / 0%	14.99 / 100%
Palustrine Aquatic Bed	0 / 0%	0 / 10%	0.03 / 90%	0.03 / 100%
Palustrine Emergent Wetland	0 / 0%	0.35 / 10%	3.18 / 90%	3.53 / 100%
Palustrine Forested Wetland	0 / 0%	0.3 / 10%	2.73 / 90%	3.04 / 100%
Palustrine Scrub/Shrub Wetland	0 / 0%	0.28 / 10%	2.53 / 90%	2.82 / 100%
Pasture/Hay	0 / 0%	16.95 / 100%	0 / 0%	16.95 / 100%
Scrub/Shrub	0 / 0%	30.91 / 100%	0 / 0%	30.91 / 100%
Unconsolidated Shore	0 / 0%	0.1 / 100%	0 / 0%	0.1 / 100%
Water	0 / 0%	0 / 0%	1.16 / 100%	1.16 / 100%
Grand Total	**9.35 / 5.4%**	**153.13 / 89%**	**9.62 / 5.6%**	**172.1 / 100%**

4.2.2 Population and Population Density

The study area has a total population of approximately 29,759, with an average population density of 173 per

square mile. Population data for each subbasin was obtained from the United States Environmental Protection Agency's (USEPA's) Environmental Justice Screening and Mapping Tool (EJSCREEN[2], see Appendix A and Appendix B). See Section 3.5 for more information regarding EJSCREEN.

Population density (Figure 5) was calculated by dividing the total population provided by EJSCREEN (2019 population data) for each subbasin by its total area. Both population and population density are reported in Table 4 for each receiving water basin and subbasin. Subbasins with the highest population, and the highest population density, include CC-1, LoC-1, and LS-1. These three subbasin lie within the City's jurisdictional boundaries. Population and population density is relatively low for all subbasins outside of the City's jurisdictional boundaries (excluding MC-1, which is located withing the City of Chehalis' jurisdiction).

[2] See https://www.epa.gov/ejscreen for more information.

Table 4. Summary of Landscape-Scale Data

Receiving Water/Subbasin [a]	Imp. Area (Sq. Mi.)	Pervious Area (Sq. Mi.)	Water Area (Sq. Mi.)	% Imp.	% Pervious	% Water	Population (#)	Pop. Density (Per Sq. Mi.)
China Creek								
CC-1	1.01	4.27	0.28	18.2%	76.7%	5.0%	5,740	1,031
China Creek Subtotal	**1.01**	**4.27**	**0.28**	**18.2%**	**76.7%**	**5.0%**	**5,740**	**1,031**
Dry Creek								
Dry Creek	0.62	2.71	0.26	17.2%	75.5%	7.2%	383	107
Dry Creek Subtotal	**0.62**	**2.71**	**0.26**	**17.2%**	**75.5%**	**7.2%**	**383**	**107**
Lincoln Creek								
Eagle Creek	0.01	3.31	0.09	0.4%	96.9%	2.8%	10	3
LC-1	0.08	1.58	0.14	4.4%	88.0%	7.7%	363	202
LC-2	0.02	4.54	0.24	0.4%	94.7%	5.0%	33	7
LC-3	0.01	2.71	0.15	0.3%	94.7%	5.2%	69	24
LC-4	0.02	2.07	0.08	0.8%	95.6%	3.7%	24	11
LC-5	0.07	1.84	0.05	3.5%	93.6%	2.7%	6	3
LC-6	0.02	2.92	0.04	0.6%	97.9%	1.4%	15	5
LC-7	0.25	2.01	0.06	10.8%	86.8%	2.5%	N/A	N/A
LC-8	0.10	1.59	0.05	5.6%	91.5%	2.7%	35	20
LC-9	0.01	1.64	0.02	0.8%	98.2%	1.0%	5	3
LC-10	0.03	2.27	0.07	1.4%	95.7%	2.9%	N/A	N/A
North Fork Lincoln Creek	0.16	3.18	0.04	4.7%	94.1%	1.3%	0	0
South Fork Lincoln Creek	0.13	4.96	0.11	2.5%	95.4%	2.1%	16	3
Sponenbergh Creek	0.05	4.34	0.11	1.0%	96.5%	2.5%	71	16
Wildcat Creek	0.01	2.24	0.01	0.2%	99.2%	0.6%	11	5
Lincoln Creek Subtotal	**0.96**	**41.22**	**1.26**	**2.2%**	**94.9%**	**2.9%**	**658**	**15**
Lower Chehalis								
LoC-1	1.14	3.37	0.38	23.3%	68.9%	7.8%	5,486	1,122
LoC-2	0.01	1.81	0.07	0.4%	96.0%	3.4%	35	19
LoC-3	0.01	0.94	0.15	1.0%	85.9%	13.3%	0	0
LoC-4	0.23	4.72	0.42	4.3%	87.8%	7.8%	881	164
LoC-5	0.03	1.34	0.31	1.8%	80.2%	18.3%	49	29
LoC-6	0.11	3.03	0.50	3.0%	83.1%	13.8%	332	91
Lower Chehalis Subtotal	**1.53**	**15.21**	**1.82**	**8.2%**	**81.9%**	**9.8%**	**6,783**	**365**
Lower Skookumchuck								
LS-1	0.75	1.14	0.14	37.0%	56.3%	6.8%	3,187	1,578
LS-2	0.17	1.11	0.17	11.7%	76.5%	11.5%	N/A	N/A
LS-3	0.20	4.15	0.31	4.4%	89.0%	6.6%	788	169
LS-4	0.03	2.28	0.08	1.3%	95.7%	3.2%	300	126
LS-5	0.05	3.57	0.37	1.4%	89.5%	9.2%	218	55
LS-6	0.12	2.60	0.21	4.2%	88.6%	7.1%	41	14
LS-7	0.04	3.03	0.33	1.2%	89.0%	9.8%	159	47
LS-8	0.18	3.68	0.24	4.4%	89.7%	5.9%	519	127
LS-9	0.01	2.35	0.03	0.5%	98.4%	1.3%	50	21
Bloody Run	0.00	3.25	0.04	0.1%	98.7%	1.2%	0	0
Coffee Creek	0.32	6.30	0.55	4.4%	87.9%	7.7%	1,733	242
Johnson Creek	0.22	10.46	0.36	2.0%	94.8%	3.2%	60	5
Salmon Creek	0.01	4.07	0.08	0.1%	97.9%	2.0%	123	30
Thompson Creek	0.51	10.52	0.61	4.3%	90.4%	5.3%	165	14
Lower Skookumchuck Subtotal	**2.62**	**58.50**	**3.51**	**4.1%**	**90.5%**	**5.4%**	**7,343**	**114**
Middle Chehalis								
MC-1	0.73	1.48	0.23	30.0%	60.7%	9.3%	2,298	942
MC-2	0.05	2.24	0.28	2.0%	87.0%	11.0%	27	11
MC-3	0.41	0.80	0.23	28.6%	55.9%	15.6%	2,203	1,530
Middle Chehalis Subtotal	**1.20**	**4.52**	**0.74**	**18.5%**	**70.1%**	**11.4%**	**4,528**	**702**
Salzer Creek								
Coal Creek	0.48	5.65	0.47	7.3%	85.6%	7.2%	889	135
SC-1	0.55	3.82	0.50	11.3%	78.4%	10.3%	1,103	226
SC-2	0.03	4.58	0.17	0.6%	95.8%	3.6%	288	60
SC-3	0.11	7.43	0.36	1.4%	94.0%	4.6%	202	26
Salzer Creek Subtotal	**1.17**	**21.47**	**1.51**	**4.9%**	**88.9%**	**6.2%**	**2,482**	**103**
Scammon Creek								
Scammon Creek	0.24	5.21	0.25	4.2%	91.4%	4.4%	1,842	323
Scammon Creek Subtotal	**0.24**	**5.21**	**0.25**	**4.2%**	**91.4%**	**4.4%**	**1,842**	**323**
Grand Total	**9.35**	**153.13**	**9.62**	**5.4%**	**89.0%**	**5.6%**	**29,759**	**173**

Notes:

a. Basin and subbasin delineations were slightly modified during development of the SMAP (Section 7). Maps were updated but the values in this table reflect values at the time of the Receiving Water Prioritization (Section 6).

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Figure 5. Population Density

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4.3 Development Pressure

Development pressure for the study area was assessed by examining expected future land use and reviewing which portions of the study area lie within an urban growth area (UGA) and which subbasins contain planned transportation improvements or extensions.

4.3.1 Urban Growth Areas

Urban Growth Areas (UGAs) are regional boundaries set, typically on a county-wide scale, in an effort to control urban sprawl by directing development to areas inside the boundary. UGAs within the study area include the following:

- Lewis County
    - City of Centralia UGA
    - City of Chehalis UGA
- Thurston County
    - Town of Bucoda
    - Town of Tenino

UGA data for each subbasin is summarized in Table 5. As shown in the table, UGAs cover approximately 9 square miles (or roughly 5% of the study area). Within the City of Centralia, there are several UGA areas as shown in Figure 7. These City of Centralia UGA areas are generally concentrated in the far northern and western portions of the City, covering a total of approximately 7.3 square miles (or roughly 48 percent of the City's jurisdictional boundaries).

For purposes of this assessment, future development is assumed to be focused in these UGA areas and is expected to trigger stormwater code requirements (see Section 3.3.4). As such, those areas inside the UGAs will benefit from future installation of stormwater treatment and flow control facilities by the development community and will require fewer capital improvement projects by the City. Areas outside the UGA are assumed to have less intense future development, with less attendant water quality treatment and flow control as a result of code requirements. Therefore, the areas outside of UGAs, and particularly those areas where existing stormwater controls are inadequate and water quality impairments currently exist (Section 3.1) are the preliminary focus of this assessment.

4.3.2 Planned Transportation

Planned transportation improvements within the City of Centralia's jurisdictional boundaries were reviewed from the City's 2018 Transportation Plan (CH2MHill 2017). These plans include roadway capacity and public transit improvements and extensions. Planned transportation improvement locations and brief descriptions are summarized in Table 6. A total of approximately 8 miles are planned for transportation improvement and/or extension within the City's jurisdictional boundaries.

Table 5 summarizes the planned transportation improvements and extensions, in miles, by subbasin. The table shows that two subbasins, Dry Creek and LoC-1, contain the greatest length of planned improvements (approximately 2.3 and 1.2 miles, respectively). These roadway improvement projects could provide a potentially good opportunity for partnership between the City's Roads and Stormwater divisions to provide stormwater and multiple community benefit as part of the planned roadway construction.

Table 5. Urban Growth Areas and Planned Transportation Improvements

Receiving Water Basin/Subbasin [a]	Urban Growth Area (Square Miles)	Urban Growth Area (%)	Planned Transportation Improvements/ Extensions (in miles) [b]
China Creek			
CC-1	0.13	2.4%	0.36
China Creek Subtotal	**0.13**	**2.4%**	**0.36**
Dry Creek			
Dry Creek	1.84	51.3%	2.26
Dry Creek Subtotal	**1.84**	**51.3%**	**2.26**
Lincoln Creek			
Eagle Creek	0.00	0%	0.00
LC-1	0.76	42.2%	0.00
LC-2	0.00	0%	0.00
LC-3	0.00	0%	0.00
LC-4	0.00	0%	0.00
LC-5	0.00	0%	0.00
LC-6	0.00	0%	0.00
LC-7	0.00	0%	0.00
LC-8	0.00	0%	0.00
LC-9	0.00	0%	0.00
LC-10	0.00	0%	0.00
North Fork Lincoln Creek	0.00	0%	0.00
South Fork Lincoln Creek	0.00	0%	0.00
Sponenbergh Creek	0.00	0%	0.00
Wildcat Creek	0.00	0%	0.00
Lincoln Creek Subtotal	**0.76**	**1.7%**	**0.00**
Lower Chehalis			
LoC-1	2.31	47.2%	1.22
LoC-2	0.00	0%	0.00
LoC-3	0.00	0%	0.00
LoC-4	0.00	0%	0.00
LoC-5	0.00	0%	0.00
LoC-6	0.00	0%	0.00
Lower Chehalis Subtotal	**2.31**	**12.4%**	**1.22**
Lower Skookumchuck			
LS-1	0.34	16.8%	0.00
LS-2	0.14	9.5%	0.63
LS-3	0.58	12.5%	0.00
LS-4	0.00	0%	0.00

Receiving Water Basin/Subbasin [a]	Urban Growth Area (Square Miles)	Urban Growth Area (%)	Planned Transportation Improvements/ Extensions (in miles) [b]
LS-5	0.00	0%	0.00
LS-6	0.00	0%	0.00
LS-7	0.00	0%	0.00
LS-8	0.03	0%	0.00
LS-9	0.00	0%	0.00
Bloody Run	0.00	0%	0.00
Coffee Creek	1.05	14.6%	1.08
Johnson Creek	0.00	0%	0.00
Salmon Creek	0.00	0%	0.00
Thompson Creek	0.00	0%	0.00
Lower Skookumchuck Subtotal	**2.14**	**3.3%**	**1.70**
Middle Chehalis			
MC-1	0.02	0.6%	0.00
MC-2	0.00	0.1%	0.00
MC-3	0.19	13.1%	0.95
Middle Chehalis Subtotal	**0.21**	**3.2%**	**0.95**
Salzer Creek			
Coal Creek	0.70	10.6%	0.00
SC-1	0.69	14.1%	1.20
SC-2	0.00	0%	0.00
SC-3	0.00	0%	0.00
Salzer Creek Subtotal	**1.39**	**5.7%**	**1.20**
Scammon Creek			
Scammon Creek	0.36	6.3%	0.00
Scammon Creek Subtotal	**0.36**	**6.3%**	**0.00**
Grand Total	**9.13**	**5.3%**	**7.68**

Notes:

b. Basin and subbasin delineations were slightly modified during development of the SMAP (Section 7). Maps were updated but the values in this table reflect values at the time of the Receiving Water Prioritization (Section 6). These differences are considered minor and not expected to affect SMAP planning direction or results.

c. Data available only for City of Centralia and its Urban Growth Area.

Table 6. Roadway Capacity Improvements and Public Transit Extensions

Project Title	From/To	Description
Roadway Capacity		
Downing Road Extension	On Downing from Old Highway 99 to North Pearl	Extend road from current terminus to Old Highway 99. Widen and designate to a four lane major collector.
Blair Extension	On Blair Road from Old Highway 99 to Hobson Road	Upgrade road to 4/5 lane principal arterial road.
Salzer Valley Road	On Salzer Valley Road from National to Centralia Alpha	Provide two-way left turn lanes with left turn pockets at intersections.
Downing/I-5 Interchange	At Downing Road arterial and I-5	Construct a new interchange upon construction of Downing Road arterial.
North County Interchange	At future Downing Road arterial extension and I-5	Construct new interchange upon construction of Downing Road arterial extension.
Harrison Access Management	On Harrison from Galvin to Caveness	Reconstruct driveways and/or close off intersections to remove conflicts.
Schueber & Cooks Hill Rd	At Schueber and Cooks Hill Road Intersection	Add left turn pockets on all three approaches and signalize.
Mellen Street Gateway Connector Extension	I-5 to Mellen Street	Construct a new road from I-5/Mellen Street interchange to Yew Street Extension.
Mellen Street Gateway Connector Extension	Yew Street Extension to Alder Street	Construct a new road to extend from the intersection of Mellen Gateway Connector/Yew Street Extension to Alder Street (aligned with either long Road or a new road further east of Long Road).
Yew Street Extension Improvement	Yew Street from Mellen Street to South Street	Reconstruct Yew Street and construct new extension south to South Street.
Public Transit		
Twin Transit Route #21 Extension	Route #21 on Harrison from Russell to Prairie	Extend route #21on Harrison from Russell to Prairie to connect to Grand Mound.

Notes:

a. Roadway Capacity Improvements and Public Transit Extensions provided by the City's Transportation Plan (CH2MHill 2017).

4.3.3 Expected Future Land Use

Expected future land use was evaluated based on zoning data provided in the City's Comprehensive Plan (CH2MHill 2017) and right-of-way data provided by the City of Centralia (see Appendix A). To simplify this assessment, the 16 zoning designations were reclassified into nine land use categories, as summarized in Appendix C. Reclassified land use categories are summarized by subbasin in Table 7, and shown in Figure 6 and Figure 7. Note that this data is only available for areas within the City's jurisdictional boundaries.

- **Residential:** The majority of the jurisdictional area (roughly 55%) is residential, with approximately 41% low or very low density residential, followed by approximately 12% medium density residential, and less than 3% high or medium-high density.
- **Industrial:** Approximately 18% of the jurisdictional area is classified as industrial, found mostly in the northwestern portion of the City. These areas include the Dry Creek subbasin and the LoC-1.
- **Commercial:** Approximately 7% of the City is commercial, located throughout the City. These areas include LoC-1, LS-1, CC-1, and SC-1.
- **Open Space:** A relatively large (11%) portion of the City consists of open space, mostly located in SC-1, MC-3, LoC-1, and LS-1.

Figure 6. Expected Future Land Use

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Table 7. Land Use and Right-of-Way Breakdown by Subbasin

Receiving Water Basin/Subbasin [a]	Land Use/Right-of-Way Reclassification [b]									
	High Density Residential	Medium-High Density Residential	Medium Density Residential	Low Density Residential	Very Low Density Residential	Commercial	Right-of-Way	Open Space/Public Facilities	Industrial	Grand Total
China Creek										
CC-1	0.2%	0.8%	20.8%	2.7%	36.6%	6.4%	17.4%	10.4%	4.6%	100.0%
China Creek Subtotal	**0.2%**	**0.8%**	**20.8%**	**2.7%**	**36.6%**	**6.4%**	**17.4%**	**10.4%**	**4.6%**	**100.0%**
Dry Creek										
Dry Creek	0.0%	0.0%	17.1%	8.9%	14.2%	0.7%	6.9%	0.2%	52.1%	100.0%
Dry Creek Subtotal	**0.0%**	**0.0%**	**17.1%**	**8.9%**	**14.2%**	**0.7%**	**6.9%**	**0.2%**	**52.1%**	**100.0%**
Lincoln Creek										
LC-1	0.0%	0.0%	0.0%	0.0%	92.4%	0.0%	3.5%	4.1%	0.0%	100.0%
Lincoln Creek Subtotal	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**92.4%**	**0.0%**	**3.5%**	**4.1%**	**0.0%**	**100.0%**
Lower Chehalis										
LoC-1	1.3%	2.1%	2.2%	18.4%	21.9%	5.2%	6.7%	15.5%	26.7%	100.0%
Lower Chehalis Subtotal	**1.3%**	**2.1%**	**2.2%**	**18.4%**	**21.9%**	**5.2%**	**6.7%**	**15.5%**	**26.7%**	**100.0%**
Lower Skookumchuck										
Coffee Creek	0.3%	1.4%	11.2%	13.8%	55.9%	2.0%	5.4%	1.0%	8.9%	100.0%
LS-1	1.5%	2.2%	16.4%	22.2%	4.4%	9.8%	15.8%	14.8%	12.9%	100.0%
LS-2	0.0%	0.0%	0.0%	49.4%	42.8%	1.9%	6.0%	0.0%	0.0%	100.0%
Lower Skookumchuck Subtotal	**0.9%**	**1.7%**	**12.8%**	**21.4%**	**28.5%**	**6.0%**	**10.7%**	**7.9%**	**10.1%**	**100.0%**
Middle Chehalis										
MC-2	0.0%	0.0%	0.0%	83.5%	0.0%	0.0%	16.5%	0.0%	0.0%	100.0%
MC-3	3.1%	2.6%	16.5%	9.0%	5.1%	17.6%	16.2%	20.2%	9.7%	100.0%
Middle Chehalis Subtotal	**3.0%**	**2.5%**	**15.9%**	**12.0%**	**4.9%**	**16.9%**	**16.2%**	**19.3%**	**9.3%**	**100.0%**
Salzer Creek										
SC-1	2.9%	4.2%	17.0%	1.3%	7.0%	29.1%	8.7%	28.7%	1.2%	100.0%
Salzer Creek Subtotal	**2.9%**	**4.2%**	**17.0%**	**1.3%**	**7.0%**	**29.1%**	**8.7%**	**28.7%**	**1.2%**	**100.0%**
Scammon Creek										
Scammon Creek	0.0%	1.8%	22.9%	32.6%	32.6%	4.7%	4.4%	1.1%	0.0%	100.0%
Scammon Creek Subtotal	**0.0%**	**1.8%**	**22.9%**	**32.6%**	**32.6%**	**4.7%**	**4.4%**	**1.1%**	**0.0%**	**100.0%**
Grand Total	**1.0%**	**1.6%**	**11.9%**	**14.0%**	**26.8%**	**6.9%**	**9.6%**	**10.8%**	**17.5%**	**100.0%**

Notes:

d. Basin and subbasin delineations were slightly modified during development of the SMAP (Section 7). Maps were updated but the values in this table reflect values at the time of the Receiving Water Prioritization (Section 6). These differences are considered minor and not expected to affect SMAP planning direction or results.

e. To simplify assessment, 16 City-provided zoning designations were reclassified to nine land use categories. See Section 3.3.3 and Appendix C for more information.

Figure 7. Zoning, Right-of-Way, and Urban Growth Area

Land use designations were assigned a score of 1 to 5 to represent the level of potential degradation that each designation may cause to the environment, where a score of 1 represents the least amount of degradation and a score of 5 represents the most amount of degradation. These scores and assumptions are provided in Table 8. Scores were used as a way to develop weighted Future Land Use scores for use with basin prioritization. See Section 6 for more information regarding basin prioritization.

Table 8. Future Land Use Designation Scoring

Land Use Designation	Score	Assumptions [a]
Very Low Density Residential	1	Assumed to be untreated, but generates minimal untreated stormwater runoff
Low Density Residential	1	Assumed to be untreated, but generates minimal untreated stormwater runoff
Open Space/Public Facilities	1	Assumed to be untreated, but generates minimal untreated stormwater runoff
Commercial	2	Assumed to trigger all minimum requirements and therefore would be required to meet current stormwater code requirements
Industrial	2	Assumed to trigger all minimum requirements and therefore would be required to meet current stormwater code requirements
Medium-High Density Residential	3	May or may not trigger minimum requirements depending on size of parcel. This unknown assumed to increase potential for degradation
High Density Residential	3	May or may not trigger minimum requirements depending on size of parcel. This unknown assumed to increase potential for degradation
Medium Density Residential	4	Based on parcel size, potentially low likelihood to trigger all minimum requirements, which increases potential for degradation
Right-of-Way	5	Assumed to be untreated

Notes:

a. Assumptions are based on Ecology's 2019 Stormwater Manual of Western Washington, Volume I, Section I-3.3: Applicability of the Minimum Requirements.

4.3.4 Existing and Future Stormwater Management

As discussed in Section 2.1, the City has a collection of drywells and retention/detention basins mainly located within the developed areas of the City. Data regarding the efficacy, age, or condition of these facilities was not available for this analysis. Therefore, City staff provided ratings for existing stormwater management as either high, medium, or low based on their knowledge and experience maintaining the existing systems. See the resulting ratings in Table 9, intended to provide a general understanding of the adequacy of existing stormwater management at the subbasin-scale, including existing flow control and water quality treatment facilities.

Based on the information provided in Table 9, higher levels of existing stormwater management exist around the eastern areas of the City's jurisdiction, typically in areas that were more recently developed under current or recent stormwater codes. Lower levels of stormwater management exist around the northwestern areas of the City's jurisdiction, where relatively less development has occurred.

Future stormwater management was assessed based on review of available GIS parcel data and a series of assumptions, as follows.

- **Large parcels:** Parcels 15,000 square feet or larger are likely to be developed or redeveloped and will trigger Minimum Requirements (MR) #6 and #7 (Runoff Treatment and Flow Control, Ecology 2019b)

and therefore require installation and long-term operation and maintenance of flow control and treatment best management practices (BMPs).

- **Small parcels:** Parcels smaller than 15,000 square feet are less likely to trigger MRs #6 and #7 and therefore less likely to implement flow control or treatment BMPs. Capital projects that manage stormwater runoff from these small parcels would therefore more likely influence receiving water conditions than projects that manage stormwater runoff from large parcels.
- **Right of Way Areas:** Right of way areas are assumed to have low levels of stormwater management in the future condition, and therefore may benefit from capital projects.

Table 10 summarizes this data by subbasin, and Figure 8 shows the distribution of this data across subbasins within the City's jurisdiction. Using this data, a Future Stormwater Management Rating for each subbasin was determined by taking the 20th, 40th, 60th, and 80th percentile of the percent of large parcel area within each basin, and categorizing the results into the five ranges below. Future Stormwater Management Ratings were used as a metric for basin prioritization. See Section 6 for further discussion.

- **Future Stormwater Management Rating 5**: ≤ 20th percentile (65.5%)
- **Future Stormwater Management Rating 4:** ≤ 40th percentile (84.6%)
- **Future Stormwater Management Rating 3:** ≤ 60th percentile (87.1%)
- **Future Stormwater Management Rating 2:** ≤ 80th percentile (88.0%)
- **Future Stormwater Management Rating 1**: > 80th percentile (88.0%)

Areas with a low rating include CC-1, LS-1, MC-2, and MC-3. These areas are mostly categorized with a residential land use and are not expected to be significantly developed in the future (Figure 7 and Figure 8).

Table 9. Existing Stormwater Management Rating

Receiving Water Basin /Subbasin	Existing Stormwater Management Rating (High, Medium, Low) [a]
China Creek	
CC-1	High
Dry Creek	
Dry Creek	Low
Lincoln Creek	
LC-1	Low
Lower Chehalis	
LoC-1	Low
Lower Skookumchuck	
LS-1	Medium
LS-2	Medium
Coffee Creek	Medium
Middle Chehalis	
MC-2	Low
MC-3	Low
Salzer Creek	
SC-1	Medium
Scammon Creek	
Scammon Creek	Medium

Notes:

a. No data were available to quantify or quality the effectiveness, age, or condition of existing stormwater management facilities, including flow control and water quality treatment Best Management Practices. City of Centralia staff provided anecdotal ratings of Level of Stormwater Management as High, Medium, or Low based on their knowledge of the system.

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Table 10. Future Stormwater Management Rating

Receiving Water Basin/Subbasin [a]	Small Parcel Area [b]		Large Parcel Area [c]		Right of Way [d]		Grand Total		Future Stormwater Management Rating [e]
	Square Miles	%	Square Miles	%	Square Miles	%	Square Miles	%	
China Creek									
CC-1	0.49	22.4%	1.33	60.2%	0.38	17.4%	2.20	100%	5
China Creek Total	**0.49**	**22.4%**	**1.33**	**60.2%**	**0.38**	**17.4%**	2.20	**100%**	
Dry Creek									
Dry Creek	0.00	0.2%	1.74	92.9%	0.13	6.9%	1.87	100%	1
Dry Creek Total	**0.00**	**0.2%**	**1.74**	**92.9%**	**0.13**	**6.9%**	1.87	**100%**	
Lincoln Creek									
LC-1	0.00	0.0%	0.73	96.5%	0.03	3.5%	0.76	100%	1
Lincoln Creek Total	**0.00**	**0.0%**	**0.73**	**96.5%**	**0.03**	**3.5%**	0.76	**100%**	
Lower Chehalis									
LoC-1	0.26	6.2%	3.63	87.1%	0.28	6.7%	4.17	100%	3
Lower Chehalis Total	**0.26**	**6.2%**	**3.63**	**87.1%**	**0.28**	**6.7%**	4.17	**100%**	
Lower Skookumchuck									
Coffee Creek	0.09	6.6%	1.19	88.0%	0.07	5.4%	1.35	100%	2
LS-1	0.30	17.0%	1.16	67.2%	0.27	15.8%	1.73	100%	4
LS-2	0.02	6.1%	0.28	88.0%	0.02	6.0%	0.32	100%	2
Lower Skookumchuck Total	**0.40**	**11.9%**	**2.64**	**77.4%**	**0.37**	**10.7%**	3.41	**100%**	
Middle Chehalis									
MC-2	0.01	30.0%	0.02	53.5%	0.01	16.5%	0.04	100%	5
MC-3	0.17	18.3%	0.60	65.5%	0.15	16.2%	0.91	100%	5
Middle Chehalis Total	**0.18**	**18.8%**	**0.62**	**65.0%**	**0.15**	**16.2%**	0.95	**100%**	
Salzer Creek									
SC-1	0.06	6.8%	0.76	84.6%	0.08	8.7%	0.90	100%	4
Salzer Creek Total	**0.06**	**6.8%**	**0.76**	**84.6%**	**0.08**	**8.7%**	0.90	**100%**	

Receiving Water Basin/Subbasin [a]	Small Parcel Area [b]		Large Parcel Area [c]		Right of Way [d]		Grand Total		Future Stormwater Management Rating [e]
	Square Miles	%	Square Miles	%	Square Miles	%	Square Miles	%	
Scammon Creek									
Scammon Creek	0.08	9.8%	0.70	85.9%	0.04	4.4%	0.82	100%	3
Scammon Creek Total	**0.08**	**9.8%**	**0.70**	**85.9%**	**0.04**	**4.4%**	0.82	**100%**	
Grand Total	**1.48**	**9.8%**	**12.15**	**80.6%**	**1.45**	**9.6%**	**15.08**	**100%**	

Notes:

a. Basin and subbasin delineations were slightly modified during development of the SMAP (Section 7). Maps were updated but the values in this table reflect values at the time of the Receiving Water Prioritization (Section 6). These differences are considered minor and not expected to affect SMAP planning direction or results.

b. Small Parcels (smaller than 15,000 square feet) are assumed to be unlikely to trigger Minimum Requirements #6 and #7 (Runoff Treatment and Flow Control) based on future new or redevelopment, and therefore assumed to have are not expected to have adequate stormwater controls currently in place or in place in the future.

c. Large Parcels (larger than 15,000 square feet) are assumed to trigger Ecology Minimum Requirements #6 and #7 (Runoff Treatment and Flow Control) during new or redevelopment and are expected to install stormwater controls in the future.

d. Right of way area is assumed to not be treated in future conditions. See Section 3.3.4.

e. Future Stormwater Management Ratings are as follows.

- Future Stormwater Management Rating 5: ≤ 20th percentile (65.5%)
- Future Stormwater Management Rating 4: ≤ 40th percentile (84.6%)
- Future Stormwater Management Rating 3: ≤ 60th percentile (87.1%)
- Future Stormwater Management Rating 2: ≤ 80th percentile (88.0%)
- Future Stormwater Management Rating 1: > 80th percentile (88.0%)

Figure 8. Future Stormwater Management

4.4 Critical and Sensitive Areas

Based on available data, critical and sensitive areas were categorized into 1) wetland and 2) shoreline environments, including aquatic, high-intensity, rural or urban conservancy, or shoreline residential. Percent critical area and percent shoreline environment area are reported in Table 11 by subbasin, and shown in Figure 9.

The study area contains a total of approximately 7% wetland area and 9% shoreline environment area. Wetlands are located primarily in the Middle Chehalis basin (approximately 15% wetland), and the Lower Chehalis basin (approximately 10% wetland). Shoreline environments are located primarily in the Middle Chehalis basin (37% shoreline environment) and the Lower Chehalis basin (approximately 30% shoreline environment).

According to the City's 2018 Comprehensive Plan, Environmental (EN) Goal 7 (City of Centralia 2018), the City's goal is to protect and improve the water quality and biological health of surface waters (including wetlands and shoreline environments) by aiming for the following:

- Retain ponds, wetlands, rivers, lakes, and streams with their associated buffers and riparian areas substantially in their natural condition (EN 7.2);
- Protect and maintain the natural functions of wetlands by maintaining an undisturbed or restored native vegetation buffer around the wetland (EN 7.4); and
- Control shoreline development to prevent or minimize shoreline erosion, prevent pollution discharges into the water, protect shoreline aesthetics and habitat as consistent with the Shoreline Master Program and other local, state, and federal regulations and polices (EN 7.10).

Additional shoreline protection goals are found in the City's Shoreline Master Plan (City of Centralia 2019):

- Guide future use and development of the City of Centralia's shorelines in a positive, effective, and equitable manner;
- Ensure no net loss of shoreline ecological functions and processes; and
- Plan for restoration and enhancement of shorelines that have been impaired or degraded over time.

Table 11. Critical and Sensitive Areas

Receiving Water Basin/Subbasin [a]	Wetlands (Square Miles)	Percent Wetland (%)	Shoreline (Square Miles)	Percent Shoreline (%)
China Creek				
CC-1	0.28	5.1%	0.00	0.0%
China Creek Subtotal	**0.28**	**5.1%**	**0.00**	**0.0%**
Dry Creek				
Dry Creek	0.33	9.1%	1.03	28.8%
Dry Creek Subtotal	**0.33**	**9.1%**	**1.03**	**28.8%**
Lincoln Creek				
Eagle Creek	0.02	0.6%	0.01	0.2%
LC-1	0.09	5.2%	0.20	10.9%
LC-2	0.14	2.9%	0.31	6.4%
LC-3	0.15	5.1%	0.23	8.1%
LC-4	0.08	3.8%	0.10	4.6%
LC-5	0.01	0.4%	0.17	8.8%
LC-6	0.01	0.3%	0.23	7.6%
LC-7	0.02	1.0%	0.00	0.1%
LC-8	0.00	0.0%	0.18	10.5%
LC-9	0.01	0.3%	0.15	9.2%
LC-10	0.01	0.3%	0.00	0.1%
North Fork Lincoln Creek	0.00	0.0%	0.00	0.1%
South Fork Lincoln Creek	0.00	0.0%	0.02	0.3%
Sponenbergh Creek	0.04	1.0%	0.00	0.0%
Wildcat Creek	0.00	0.1%	0.00	0.1%
Lincoln Creek Subtotal	**0.58**	**1.3%**	**1.60**	**3.7%**
Lower Chehalis				
LoC-1	0.54	10.9%	1.33	27.1%
LoC-2	0.10	5.3%	0.50	26.3%
LoC-3	0.18	16.7%	0.80	73.3%
LoC-4	0.73	13.6%	1.72	31.9%
LoC-5	0.27	16.1%	1.20	71.7%
LoC-6	Not Available	Not Available	0.00	0.0%
Lower Chehalis Subtotal	**1.82**	**9.8%**	**5.54**	**29.8%**
Lower Skookumchuck				
LS-1	0.23	11.6%	0.23	11.6%
LS-2	0.13	9.0%	0.63	43.3%
LS-3	0.52	11.3%	1.28	27.6%
LS-4	0.21	8.8%	0.32	13.4%
LS-5	0.36	9.0%	1.08	27.1%

Receiving Water Basin/Subbasin [a]	Wetlands (Square Miles)	Percent Wetland (%)	Shoreline (Square Miles)	Percent Shoreline (%)
LS-6	0.30	10.3%	0.56	19.0%
LS-7	0.56	16.5%	0.00	0.1%
LS-8	0.50	12.2%	0.00	0.1%
LS-9	0.08	3.2%	0.19	7.9%
Bloody Run	0.03	0.8%	0.00	0.0%
Coffee Creek	0.93	13.0%	0.15	2.0%
Johnson Creek	0.45	4.1%	0.00	0.0%
Salmon Creek	0.04	1.0%	0.00	0.1%
Thompson Creek	0.73	6.3%	0.00	0.0%
Lower Skookumchuck Subtotal	**5.09**	**7.9%**	**4.46**	**6.9%**
Middle Chehalis				
MC-1	0.44	18.1%	0.72	29.4%
MC-2	0.27	10.4%	1.02	39.8%
MC-3	0.30	21.0%	0.67	46.4%
Middle Chehalis Subtotal	**1.01**	**15.6%**	**2.41**	**37.4%**
Salzer Creek				
Coal Creek	0.48	7.3%	0.01	0.1%
SC-1	0.96	19.7%	0.91	18.8%
SC-2	0.22	4.5%	0.03	0.6%
SC-3	0.41	5.2%	0.20	2.5%
Salzer Creek Subtotal	**2.07**	**8.6%**	**1.15**	**4.8%**
Scammon Creek				
Scammon Creek	0.07	1.2%	0.00	0.0%
Scammon Creek Subtotal	**0.07**	**1.2%**	**0.00**	**0.0%**
Grand Total	**11.25**	**6.5%**	**16.19**	**9.4%**

Notes:

a. Basin and subbasin delineations were slightly modified during development of the SMAP (Section 7). Maps were updated but the values in this table reflect values at the time of the Receiving Water Prioritization (Section 6). Minor differences are not expected to affect SMAP planning.

Figure 9. Critical and Sensitive Areas

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4.5 Overburdened Communities

Data from USEPA's EJSCREEN tool was obtained to evaluate overburdened communities within the study area (see Appendix B for compiled data). EJSCREEN is an environmental justice mapping and screening tool that provides a nationally consistent dataset and approach for combining environmental and demographic indicators (USEPA 2022).

EJSCREEN reports environmental and demographic indicators as Environmental Justice (EJ) indexes and summarizes the percentile of the subbasin in question for each EJ index as compared on a State level, EPA region level, and a national level. The following EJSCREEN indexes were collected to help evaluate overburdened communities within the study area (see Appendix B):

- EJ Index for Particulate Matter (PM) 2.5
- EJ Index for Ozone
- EJ Index for National-Scale Air Toxics Assessment (NATA) Diesel Particulate Matter (PM)
- EJ Index for NATA Air Toxics Cancer Risk
- EJ Index for NATA Respiratory Hazard Index
- EJ Index for Traffic Proximity and Volume
- EJ Index for Lead Paint Indicator
- EJ Index for Superfund Proximity
- EJ Index for Risk Management Plan (RMP) Proximity
- EJ Index for Hazardous Waste Proximity
- EJ Index for Wastewater Discharge Indicator

Due to limited population data, or a population of zero, the subbasins below have no reported data through the EJSCREEN tool. Further discussion is provided in Section 6 (Receiving Water Prioritization).

- LC-7
- LC-10
- LoC-3
- LS-2
- Bloody Run

4 STORMWATER MANAGEMENT INFLUENCE

Ecology's SMAP guidance (Ecology 2019a) suggests exclusion of receiving waters and subbasins in which 1) stormwater management actions cannot be implemented due to jurisdictional boundaries, 2) actions would provide minimal improvement to water quality due to low hydrologic impacts (such as discharging to flow-control exempt receiving waters as defined in the 2019 SWMMWW), and/or 3) subbasins have low expected pollutant loadings. Subbasins not excluded from stormwater management influence were further prioritized during Receiving Water Prioritization (Section 6).

Figure 10 summarizes the criteria that were used to determine which receiving waters and subbasins cannot feasibly implement stormwater management actions or which receiving waters and subbasins would provide minimal improvement to water quality via stormwater management actions.

Subbasins that lie completely outside the City's jurisdictional boundaries were initially excluded. The Chehalis and Skookumchuck Rivers are defined in the SWMMWW as flow-control exempt (Ecology 2019c) and are expected to have low hydrologic impacts from the City's MS4. Basins (Section 2.2) that discharge to these rivers include the following:

- Lower Chehalis
- Lower Skookumchuck
- Middle Chehalis

After initially excluding subbasins within the above basins (Figure 3), it became apparent that too little area within the City's jurisdictional boundary would remain in the study area in order for the SMAP to be effective. These areas were therefore maintained in the analysis.

The following criteria were used to identify and screen out subbasins with low expected pollutant loading and therefore low stormwater management influence:

- Subbasins with ≥ 50% low density or very low density land use (Table 7)
- Subbasins with ≥ 80% pervious area coverage (Table 4)
- Subbasins with ≥ 50% inside the City's UGA (Table 5) and containing ≥ 90% Large Parcels (Table 10). These subbasins are assumed to have relatively significant future development and associated high levels of future stormwater management per City stormwater code requirements. Capital projects are therefore assumed to have low influence in these areas (see Section 3.3.1 and 3.3.4).

See Figure 10 for a flow chart illustrating how these criteria were used to help identify subbasins to be included or excluded in Step 4 (Assess Relative Stormwater Management Influence), as discussed further below.

5 RELATIVE CONDITIONS AND CONTRIBUTIONS

Building on the findings of Step 2 (Assess Receiving Water Conditions) and Step 3 (Assess Stormwater Management Influence), this step (Assess Relative Conditions and Contributions) narrows down the number of receiving waters to a list of candidate receiving water to include in the Receiving Water Prioritization process (Section 6).

Using the criteria developed in Figure 10, the following receiving waters were included in the candidate list (subbasins shown in parenthesis):

- China Creek (CC-1)
- Lower Chehalis (LoC-1)
- Lower Skookumchuck (LS-1, LS-2)
- Middle Chehalis (MC-3)
- Salzer Creek (SC-1)

Those subbasins that were determined in Step 3 to have relatively low expected influence were not included in

this candidate list. See Figure 11 for a map of the prioritized basins and subbasins.

6.1 Protection Categories

As discussed above in Section 3.4 (Critical and Sensitive Areas), the City's 2018 Comprehensive Plan describes Environmental (EN) Goal 7 as the City's goal to protect and improve the water quality and biological health of surface waters (including wetlands and shoreline environments). To the extent practicable, SMAP actions should seek to help the City achieve this goal through stormwater protection actions, such as retaining ponds, wetlands, rivers, lakes, and streams with their associated buffers and riparian areas (EN 7.2). Protection actions could also include maintaining the natural functions of wetlands by maintaining an undisturbed or restored native vegetation buffer around wetlands (EN 7.4).

In shoreline environments controlling development can help prevent or minimize shoreline erosion, reduce pollutant loading to the water, and protect shoreline aesthetics and habitat as consistent with the Shoreline Master Program and other local, state, and federal regulations and polices (EN 7.10).

These protection type actions may be most helpful in the Middle Chehalis basin and the Lower Chehalis basin, which contain the highest amount of wetland and shoreline environments.

6.2 Restoration Categories

As discussed above in Section 3.3.2 (Planned Transportation), the City has approximately 8 miles of transportation improvements planned. Some of these Transportation Improvement Plans (TIPs) could provide a good opportunity for partnering with Roads on joint roadway-stormwater improvement projects, potentially of a regionally significant scale and with multiple community benefits in addition to managing stormwater runoff. Dry Creek and LoC-1, contain the greatest length of planned improvements (approximately 2.3 and 1.2 miles, respectively).

Also as discussed above (Section 3.3.4), future development in the City's UGA is expected to trigger stormwater code requirements. The higher levels of future flow control and runoff treatment BMPs will help restore receiving waters over time.

Figure 10. Decision Criteria for Identifying Receiving Waters to be Included in Prioritization

Insert 8.5x11 portrait

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Figure 11. Candidate Basins for Receiving Water Prioritization

Insert 11x17 landscape

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6 RECEIVING WATER PRIORITIZATION

7.1 Background

Consistent with Ecology SMAP guidance (Ecology, 2019a), the City prioritized the six subbasins identified as part of the candidate list (Section 5) based on a framework developed by Ecology as part of the Puget Sound Characterization Stormwater Management Framework and documented in the *Building Cities in the Rain* watershed prioritization guidance (Commerce 2016).

The Puget Sound Characterization Stormwater Management Framework (Figure 12) allows the user to sort subbasins into four different categories – "Protection", "Restoration", "Conservation", and "Development" (Figure 12). *Building Cities in the Rain* describes that these categories can be used to recommend broad management strategies for specific subbasins. The most intensive strategies (denoted "Restoration") apply to subbasins most important to restoring water resource functions but that also have experienced the greatest degradation. Conversely, as described in *Building Cities in the Rain*, areas of low importance but also low degradation should require a much lower level of management attention (termed "Conservation"). Those with high importance and low existing degradation may need little or no active intervention (other than appropriate zoning or protective easements) to maintain their high functional conditions ("Protection"). Those with low importance and significant existing human impact are broadly the most appropriate areas for "Development," given continued population pressures.

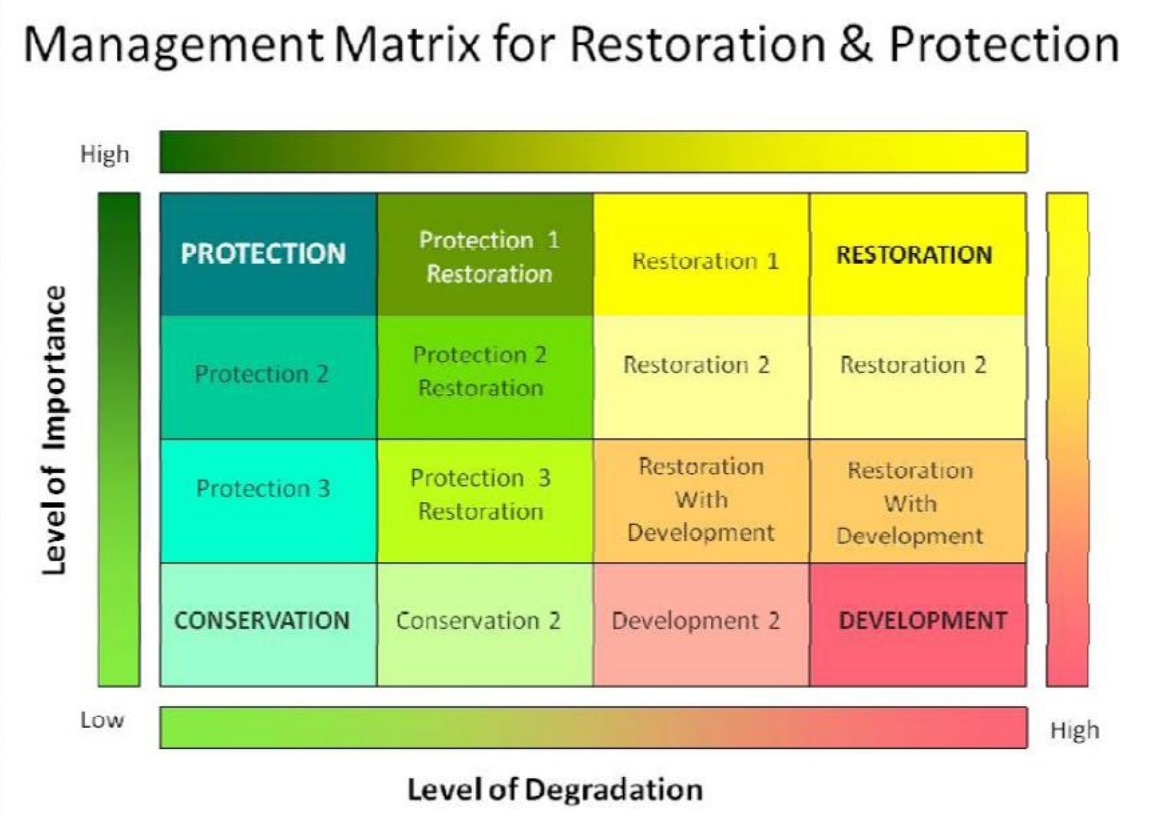

Figure 12. Puget Sound Characterization Stormwater Management Framework (Commerce, 2016)

7.2 Method and Process

A GIS-based screening process was used to score each subbasin on the candidate list ("candidate basins", see Section 5) in terms of its relative resource value (or importance for natural processes and aquatic species) and level of degradation from existing/future development and other human impacts. Data described in Section 3 was used to develop a set of prioritization metrics, broken down into the following two categories and six subcategories:

- 15 Importance metrics
    - Two Land Cover metrics
    - Two Critical and Sensitive Areas metrics
    - 11 Overburdened Communities metrics
- Seven Degradation metrics
    - Two Land Cover metrics
    - Two Water Quality Impairment metrics
    - Three Future Conditions metrics
- **Total of 22 metrics**
- **Total of two categories**
- **Total of six subcategories (three per category)**

Each of the 22 metrics has scoring values ranging from 1 to 5, with the low score (1) indicating the subbasin has less opportunity to protect and/or restore or has less potential for degradation, and the high score (5) indicating the subbasin has greater opportunity to protect or restore or has greater potential for degradation. During the prioritization process, the steps below were followed to develop Final Importance and Degradation Scores for each candidate subbasin (see Appendix D for a detailed scoring breakdown):

- **Step 1**: Scoring Ranges were developed for each of the 22 metrics. Typically, these ranges were based on percentiles (≥ 80th percentile receives score of 5, ≥ 60th percentile receives score of 4, etc.; See Table 12 and Table 13).
- **Step 2:** Each candidate basin was assigned a raw score for each metric, depending on the Scoring Range, with a value of 1 to 5 to obtain Raw Scores (Section 6.3, Table 14).
- **Step 3:** Scores within each subcategory were normalized by dividing the Raw Scores for each metric by the number of metrics in the subcategory. The resulting Normalized Scores remove bias that could be introduced by having a lot more metrics in one subcategory as compared to another. For example:
    - The Raw Scores for Overburdened Communities were divided by 11, since there are 11 metrics associated with this subcategory.
    - The Raw Scores for Pervious Land Cover were divided by two, since there are two metrics within the Land Cover subcategory within the Importance category (Table 12, Section 6.3, Table 14).
- **Step 4:** Weighting was applied to each of the Normalized Scores. For the purposes of this phase in

the SMAP work, all weights were assigned a value of one. Further discussion is provided in Section 6.3.

- **Step 5:** Weighted Scores were subtotaled by subcategory, for a total of six subtotal scores for six subcategories, per candidate basin. Because of the normalization in **Step 3**, the maximum subtotal score by category is 5.

  In this step, basins that contained no population-based Overburdened Communities data were "zeroed" out to indicate that these basins hold minimal importance in Overburdened Communities metrics due to lack of population.

- **Step 6:** Weighted Score subtotals were totaled by category (Importance or Degradation) to develop a Total Weighted Importance Score and a Total Weighted Degradation Score for each candidate basin. The maximum value for Total Weighted Importance/Degradation is 15 (maximum subtotal score of 5 x 3 subcategories)

- **Step 7:** Total Weighted Importance Scores and a Total Degradation Scores for each basin were normalized on a scale of 1 to 15 using by using the maximum value in each category to develop Normalizing Factors. Normalizing Factors were used to calculate the Final Importance Scores and Final Degradation Scores. See Section 6.3 for further discussion.

Table 12 and Table 13 outline each of the 22 Importance and Degradation metrics, divided into a total of six subcategories. Table 12 and Table 13 also provide scores (from 1 to 5), scoring descriptions, scoring ranges, and a brief metric description to explain how the metric is used in its respective category. A breakdown of candidate basin prioritization scoring is provided in Appendix D, and candidate basin prioritization results are discussed in Section 6.3.

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Table 12. Importance Metrics

Metric #	Metric (Section)	Score	Scoring Description	Scoring Range [a]	Metric Description
Land Cover					
1	Pervious Land Cover (Section 3.2.1)	5	≥ 80th percentile	≥ 76.7%	Based on percent pervious land cover over the entire subbasin area. Pervious areas produce a hydrologic response with less surface runoff and higher baseflows—conditions that are correlated with stable stream channels and higher ecological function.
		4	≥ 60th percentile	≥ 76.5%	
		3	≥ 40th percentile	≥ 68.9%	
		2	≥ 20th percentile	≥ 56.3%	
		1	< 20th percentile	< 56.3%	
2	Open Space (Section 3.3.4)	5	≥ 80th percentile	≥ 12.9%	Based on the percent open space area over the entire subbasin area. Open spaces satisfy community recreation need while providing wildlife habitat and water quality protection.
		4	≥ 60th percentile	≥ 9.7%	
		3	≥ 40th percentile	≥ 4.6%	
		2	≥ 20th percentile	≥ 1.2%	
		1	< 20th percentile	< 1.2%	
Critical and Sensitive Areas					
3	Wetlands (Section 3.4)	5	≥ 80th percentile	≥ 19.7%	Based on the percent wetland cover over the entire subbasin area. Wetlands provide aquatic habitat, water quality benefits, and natural flow buffering.
		4	≥ 60th percentile	≥ 11.6%	
		3	≥ 40th percentile	≥ 10.9%	
		2	≥ 20th percentile	≥ 9.0%	
		1	< 20th percentile	< 9.0%	
4	Shoreline Environment (Section 3.4)	5	≥ 80th percentile	≥ 43.3%	Based on the percent shoreline environment area over the entire subbasin area. Shoreline environments are sensitive areas that provide nutrient inputs, wood recruitment, and shading critical to maintaining fish-friendly stream temperatures.
		4	≥ 60th percentile	≥ 27.1%	
		3	≥ 40th percentile	≥ 18.8%	
		2	≥ 20th percentile	≥ 11.6%	
		1	< 20th percentile	< 11.6%	
Overburdened Communities [b, c]					
5	EJ Index for PM2.5	5	≥ 80th percentile	N/A	PM2.5 levels in air, in µg/m3 as an annual average
		4	≥ 60th percentile		
		3	≥ 40th percentile		
		2	≥ 20th percentile		
		1	< 20th percentile		
6	EJ Index for Ozone	5	≥ 80th percentile	N/A	Ozone summer seasonal average. of daily maximum eight-hour concentration in air in parts per billion
		4	≥ 60th percentile		
		3	≥ 40th percentile		
		2	≥ 20th percentile		
		1	< 20th percentile		
7	EJ Index for NATA* Diesel PM	5	≥ 80th percentile	N/A	Diesel particulate matter level in air, in µg/m3
		4	≥ 60th percentile		
		3	≥ 40th percentile		
		2	≥ 20th percentile		
		1	< 20th percentile		
8	EJ Index for NATA* Air Toxics Cancer Risk	5	≥ 80th percentile	N/A	Lifetime cancer risk from inhalation of air toxics
		4	≥ 60th percentile		
		3	≥ 40th percentile		
		2	≥ 20th percentile		
		1	< 20th percentile		
9	EJ Index for NATA* Respiratory Hazard Index	5	≥ 80th percentile	N/A	Ratio of exposure concentration to health-based reference concentration
		4	≥ 60th percentile		
		3	≥ 40th percentile		
		2	≥ 20th percentile		
		1	< 20th percentile		
10	EJ Index for Traffic Proximity and Volume	5	≥ 80th percentile	N/A	Count of vehicles (AADT [average annual daily traffic]) at major roads within 500 meters, divided by distance in meters (not kilometers)
		4	≥ 60th percentile		
		3	≥ 40th percentile		
		2	≥ 20th percentile		
		1	< 20th percentile		
11	EJ Index for Lead Paint Indicator	5	≥ 80th percentile	N/A	Percent of housing units built pre-1960, as indicator of potential lead paint exposure
		4	≥ 60th percentile		
		3	≥ 40th percentile		
		2	≥ 20th percentile		
		1	< 20th percentile		
12	EJ Index for Superfund Proximity	5	≥ 80th percentile	N/A	Count of proposed or listed National Priorities List (NPL) - also known as superfund - sites within five kilometers (or nearest one beyond five kilometers), each divided by distance in kilometers
		4	≥ 60th percentile		
		3	≥ 40th percentile		
		2	≥ 20th percentile		
		1	< 20th percentile		
13	EJ Index for Risk Management Plan (RMP) Proximity	5	≥ 80th percentile	N/A	Count of RMP (potential chemical accident management plan) facilities within five kilometers (or nearest one beyond five kilometers), each divided by distance in kilometers
		4	≥ 60th percentile		
		3	≥ 40th percentile		
		2	≥ 20th percentile		
		1	< 20th percentile		
14	EJ Index for Hazardous Waste Proximity	5	≥ 80th percentile	N/A	Count of hazardous waste facilities (Treatment, Storage, and Disposal Facilities [TSDFs] and Large Quantity Generators [LQGs]) within five kilometers (or nearest beyond five kilometers), each divided by distance in kilometers
		4	≥ 60th percentile		
		3	≥ 40th percentile		
		2	≥ 20th percentile		
		1	< 20th percentile		
15	EJ Index for Wastewater Discharge Indicator	5	≥ 80th percentile	N/A	Risk-Screening Environmental Indicators (RSEI) modeled toxic concentrations at stream segments within 500 meters, divided by distance in kilometers
		4	≥ 60th percentile		
		3	≥ 40th percentile		
		2	≥ 20th percentile		
		1	< 20th percentile		

Notes*:*

a. Scoring Ranges for Overburdened Communities metrics are provided as a percentile based on Washington State-wide data.

b. EJ Indexes combine demographic factors with a single environmental factor. See https://www.epa.gov/ejscreen/overview-environmental-indicators-ejscreen for more information.

c. Overburdened Communities metrics are introduced in Section 3.5.

Table 13. Degradation Metrics

Metric #	Metric (Section)	Score	Scoring Description	Scoring Range	Metric Description
Land Cover					
1	Impervious Land Cover (Section 3.2.1)	5	≥ 80th percentile	≥ 28.6%	Based on the percent impervious land cover over the entire subbasin area. Higher runoff from impervious surfaces increases peak flows and stormwater values in streams, which leads to erosion and channel instability that disrupt habitat and stream biology.
		4	≥ 60th percentile	≥ 23.3%	
		3	≥ 40th percentile	≥ 18.2%	
		2	≥ 20th percentile	≥ 11.7%	
		1	< 20th percentile	< 11.7%	
2	Population (Section 3.2.2)	5	≥ 80th percentile	≥ 1,539	Population by subbasin. Higher population may indicate increased development.
		4	≥ 60th percentile	≥ 1,285	
		3	≥ 40th percentile	≥ 1,085	
		2	≥ 20th percentile	≥ 870	
		1	< 20th percentile	< 870	
Water Quality Impairment					
3	Water Quality Impairment (Section 3.1.1)	5	≥ 80th percentile	≥ 14	Based on the count of 305 (b) Category 4a, 4b, and 5 listed waters that are located in each candidate basin. These categories represent impaired waters that would benefit from projects or retrofits to help improve water quality
		4	≥ 60th percentile	≥ 6	
		3	≥ 40th percentile	≥ 5	
		2	≥ 20th percentile	≥ 2	
		1	< 20th percentile	< 2	
4	Number of Outfalls	5	≥ 80th percentile	≥ 7	Number of outfalls is indicative to how much untreated stormwater a subbasin is contributing to its receiving water(s).
		4	≥ 60th percentile	≥ 5	
		3	≥ 40th percentile	≥ 4	
		2	≥ 20th percentile	≥ 1	
		1	< 20th percentile	<1	
Future Conditions					
5	Right-of-Way Areas (Section 3.3.4)	5	≥ 80th percentile	≥ 22.2%	Based on square miles of right-of-way area over the entire subbasin area. Right-of-way areas are assumed to have low levels of stormwater management and therefore may lead to increased water quality degradation.
		4	≥ 60th percentile	≥ 18.4%	
		3	≥ 40th percentile	≥ 9%	
		2	≥ 20th percentile	≥ 2.7%	
		1	< 20th percentile	< 2.7%	
6	Expected Future Land Use (Section 3.3.3)	5	Industrial	N/A	Weighted score based on the percent expected future land use for each candidate basin.
		4	Commercial, High Density Residential	N/A	
		3	Medium-High Density Residential	N/A	
		2	Medium Density Residential	N/A	
		1	Very Low Density Residential, Low Density Residential, Open Space/Public Facilities	N/A	
7	Future Stormwater Management Rating (Section 3.3.4)	5	5	N/A	Based on percent of parcels that are expected to have inadequate future stormwater management after development. Parcels less than 15,000 square feet are assumed to not to trigger flow control or water quality stormwater management requirements, thus these parcels may indicate greater degradation.
		4	4	N/A	
		3	3	N/A	
		2	2	N/A	
		1	1	N/A	

Notes*:*

a. Scoring assumptions for Expected Future Land Use are provided in Section 3.3.3.

7.3 Prioritization Results and Subbasin Selection

Table 14 summarizes the Final Importance and Degradation Scores that were developed using the methodology provided in Section 6.2. Figure 13 shows these scores plotted on the Management Matrix for Restoration & Protection. This plot was adapted from *Building Cities in the Rain* (Commerce 2016; See Section 6.1), where the x-axis represents level of degradation, and the y-axis represents level of importance.

As described in Section 6.2, each of the six subcategories were weighted equally. The weights may be adjusted in the future based on public feedback, City leadership input, or other factors in accordance with the City's priorities.

The following subbasins all lie within the Restoration quadrant, indicating that these basins may be severely degraded and would be ideal candidates for restoration actions:

- MC-3 (Middle Chehalis)
- CC-1 (China Creek)
- LS-1 (Lower Skookumchuck)
- SC-1 (Salzer Creek)
- LoC-1 (Lower Chehalis)

LS-2 lies within the Protection 3 Restoration category, signifying that this basin may have some opportunities for protection actions and some opportunities for restoration actions.

In an April 13, 2022 meeting with the City, the City discussed that the subbasins with the greatest degradation should receive the highest prioritization. Accordingly, MC-3, CC-1, LS-1, SC-1, and LoC-1 were prioritized for further stormwater action planning evaluation. These subbasins received the highest degradation scores (13, 9, 15, 8, and 11, respectively) with relatively high importance scores (15, 11, 12, 13, and 12, respectively).

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Table 14. Summary of Importance and Degradation Scores by Candidate Basin

Candidate Subbasin	Step 2 [a]		Step 3 [a]		Steps 4, 5 and 6 [a,b]		Step 7 [a]	
	Total Raw Importance Score	Total Raw Degradation Score	Total Normalized Importance Score	Total Normalized Degradation Score	Total Weighted Importance Score	Total Weighted Degradation Score	Final Importance Score	Final Degradation Score
CC-1 (China Creek)	47	22	8	7	8	7	**11**	**9**
LoC-1 (Lower Chehalis)	42	22	10	8	10	8	**12**	**11**
LS-1 (Lower Skookumchuck)	50	28	9	11	9	11	**12**	**15**
LS-2 (Lower Skookumchuck)	9	18	5	5	5	5	**6**	**7**
MC-3 (Middle Chehalis)	61	24	12	10	12	10	**15**	**13**
SC-1 (Salzer Creek)	52	16	10	6	10	6	**13**	**8**
Maximum Weighted Score					12	11		
Normalizing Factor [c]					1.28	1.37		

Notes*:*

a. Methodology and process for developing importance and degradation scores are provided in Section 6.2
b. Weighting for each of the six subcategories discussed in Section 6.2 were assigned a value of one to indicate equal weighting across each of the six subcategories.
c. Normalizing Factors were developed by dividing the maximum score in each category into 15. See Section 6.2 for further discussion.

Figure 13. Plotted Importance and Degradation Scores

7 STORMWATER MANAGEMENT ACTION PLAN

8.1 SMAP Overview

The City's planned stormwater management actions (SMAs) are summarized in Table 15 and described further in the text below in this Section. SMAs are grouped in the table as Short-Term (i.e., to be accomplished within 6 years) or Long-Term (i.e., to be accomplished within 20 years), consistent with the definitions in Section S5.C.1.d.iii.(e) of the Permit. The table also includes Future Assessment Frequency, which is defined per Permit Section S5.C.1.d.iii.(f) as:

> *A process and schedule to provide future assessment and feedback to improve the planning process and implementation of procedures or projects.*

The SMAs described in this report are at the planning-level and may be updated as the SMA development progresses.

Table 15. SMAP Overview

Time Horizon	Proposed Stormwater Management Action (SMA)	Implementation Schedule	Future Assessment Frequency
Stormwater Facility Retrofits			
Short-Term	**Site 10:** Centralia College area (137.7-ac drainage, near Centralia College; could be educational opportunities)	2026	Every 1 year
Short-Term	**Site 1:** Mellen St (156.1 ac drainage, City-owned parcel)	2028	Every 1 year
Long-Term	**Site 24:** Fort Borst Park (25.3-ac drainage, replenish lake with treated stormwater runoff; top water body of concern based on survey responses)	2030	Every 1 year
Land Management/Development Strategies/Actions			
Short-Term	Conduct a stormwater rate study. Consider partnering with stormwater/wastewater/water/City Light.	2024	Every 7 years
Long-Term	Review shoreline protection opportunities for large parcel located between Plummer Lake and Hayes Lake. WDFW, who owns the parcel, has indicated a possible interest in donating this parcel to the City.	2030	Every 5 years
Tailored/Enhanced Stormwater Management Actions			
Short-Term	Public Education and Outreach behavior change programs to support SMAP actions for China Creek. Implement or coordinate with priorities documented in *NPDES Stormwater Public Education and Outreach Evaluation* (RKI, June 2020).	2024	Every 2 years
Short-Term	Increase street sweeping. The City currently	2024	Every 2 years

	conducts approximately 4,000 mi/yr, but no set schedule. Increase inspection to prioritized basins, increase frequency to 10% every 2 years in high-priority basins		
Short-Term	Condition assessment program for ditches and culverts. Develop a condition assessment checklist and perform condition assessment reviews. Perform rehab or maintenance and update GIS data as needed.	2024	Every 1 year
Short-Term	Condition assessment program for stormwater pipes, perform spot maintenance as-needed	2024	Every 1 year
Short-Term	Rehabilitation program for outdated drywells, restoring the intended functions of the drywells and adding pre-treatment where needed.	2024	20% every year/100% every 5 years

8.2 Stormwater Facility Retrofits

8.2.1 Permit Requirement

Per Section S5.C.1.d.iii.(a) of the Permit, the SMAP must include the following:

> *A description of the stormwater facility retrofits needed for the area, including the BMP types and preferred locations.*

8.2.2 Methods

A total of 29 potential candidate stormwater facility retrofits were identified in the prioritized subbasins CC-1 (China Creek basin), MC-3 (Middle Chehalis basin), LS-1 (Lower Skookumchuck basin), and SC-1 (Salzer Creek basin). Of these 29 potential retrofits, seven are Protection and the remaining 22 are Restoration. Table 16 provides a summary and Figure 14 shows the candidate sites on a map.

The City selected three retrofit SMAs to include in the SMAP based on the following considerations and criteria:

- City-owned parcel or right-of-way areas
- Existing drainage issues identified in the City's *Surface/Storm Water Management Comprehensive Plan* (see summary in Appendix E of this report)
- End-of-pipe treatment or centralized treatment of relatively large drainage areas
- Public input and education opportunities (Borst Lake)

Table 16. Candidate Stormwater Facility Retrofit Descriptions

#	Location	Restoration or Protection Action	Basin / Subbasin	Notes
1	**Mellen Street / Airport Road**	**Restoration**	**Middle Chehalis / MC-3**	**City-owned parcel with outfall. Outfall is to the Chehalis River but located just a few feet from China Creek**
2	Elm St & Ash St	Restoration	China Creek / CC-1	Potential to install treatment and new conveyance in Right-of-Way. Located in an area with known street deterioration due to lack of conveyance.
3	Chestnut St	Restoration	China Creek / CC-1	Potential to install water quality treatment and new conveyance in Right-of-Way. Located in an area with existing drainage issues.
4	Lakeshore Dr	Protection	China Creek / CC-1	City-owned property next to China Creek. Good potential opportunity for riparian protection.
5	W Cherry St	Restoration	China Creek / CC-1	Potential for end-of-pipe treatment within the Right-of-Way.
6	W Pear Street/Yew St	Restoration	China Creek / CC-1	Potential for end-of-pipe treatment within the Right-of-Way.
7	Hemlock/Yew St	Restoration	China Creek / CC-1	Potential for riparian restoration within City-owned parcel.
8	W Walnut St/S Cedar St	Restoration	China Creek / CC-1	Potential for end-of-pipe treatment within the Right-of-Way.
9	S Ash St/Centralia College Blvd	Restoration	China Creek / CC-1	Potential for end-of-pipe treatment within the Right-of-Way.
10	**Centralia College Blvd/N Washington Ave**	**Restoration**	**China Creek / CC-1**	**Potential for end-of-pipe treatment within the Right-of-Way.**
11	S Ash St/Centralia College Blvd	Restoration	China Creek / CC-1	Potential for end-of-pipe treatment within the Right-of-Way.
12	W Pine St/N Rock St	Restoration	China Creek / CC-1	Potential for end-of-pipe treatment within the Right-of-Way.
13	W Maple St/S Pearl St	Restoration	China Creek / CC-1	Potential for end-of-pipe treatment within the Right-of-Way.
14	W Maple St	Restoration	China Creek / CC-1	Potential for end-of-pipe treatment within the Right-of-Way.
15	Maple St/N Railroad Ave	Restoration	China Creek / CC-1	Potential for end-of-pipe treatment within the Right-of-Way.
16	Agnew Ponds	Protection	China Creek / CC-1	Restoration has been completed as part of Phase 2 of the China Creek Restoration Project. Additional restoration is planned in Phases 3 and 4 pending available funding. Potential opportunity to integrate water quality treatment with Phases 3 and/or 4 to better protect the restoration work and downstream creek water quality.
17	China Creek - Crosby Ave/Logan St	Protection	China Creek / CC-1	Undeveloped City-owned parcels may be conserved. Portions of these parcels are riparian areas for China Creek.
18	Ham Hill Road	Protection	China Creek / CC-1	Undeveloped City-owned parcel may be an area of conservation. China Creek is located nearby.
19	Seminary Hill	Protection	Salzer Creek / SC-1	Seminary Hill was acquired by the County in 2014. May be a good opportunity for protection according to 3/11/2021 email from City.
20	E Summa Street	Restoration	Salzer Creek / SC-1	Potential for treatment and restoring conveyance in and area with existing drainage issues.
21	W Plum Street	Restoration	China Creek / CC-1	Potential to install water quality treatment while fixing known drainage issues documented in the City's 2016 SWMP. Small drainage area.
22	Jefferson Street and Pearl Street	Restoration	Middle Chehalis / MC-3	Potential to install water quality treatment while fixing known drainage issues documented in the City's 2016 SWMP. Small drainage area.
23	Chehalis River outfalls – Military Road / Mellon Street	Restoration	Middle Chehalis / MC-3	Potential for end-of-pipe treatment within the Right-of-Way.
24	**Fort Borst Park**	**Restoration**	**Lower Skookumchuck / LS-1**	**City-owned parcel at Fort Borst Park. Opportunity to potentially treat and divert baseflows from 36-inch-diameter stormwater conveyance pipe to the lake to help replenish inflows and lake levels. Consider installing floating wetlands or fountain for aeration.**
25	Pioneer Park	Restoration	Lower Chehalis / LoC-1	City-owned parcel at Pioneer Park may have potential for end-of-pipe treatment.
26	Plummer Lake	Protection	Lower Skookumchuck / LS-1	City recently acquired Plummer Lake, may provide good opportunity for protection.
27	Hayes Lake	Protection	Lower Skookumchuck / LS-1	Undeveloped City-owned parcel located adjacent to Hayes Lake, may provide good opportunity for conservation.
28	Skookumchuck River– Denny Way and Harrison Avenue	Restoration	Lower Skookumchuck / LS-1	Two outfalls Skookumchuck River, may be good opportunity for end-of-pipe treatment within the Right-of-Way.
29	Skookumchuck River– N Pearl Street	Restoration	Lower Skookumchuck / LS-1	Potential for end-of-pipe treatment within the Right-of-Way.

Notes:

a. Selected projects are shown in bold blue font.

Figure 14. Potential Stormwater Retrofit Sites

INSERT 11X17

8.2.3 Selected Projects

Stormwater facility retrofits planned for the short-term horizon are summarized below in Table 17, while those planned for the long-term horizon are summarized in Table 18. The SMAs are also shown on Figure 14 and detailed further in the Fact Sheets provided in Appendix F.

All work is assumed to occur on City-owned parcels or right-of-way, with no land acquisition needed. BMPs are assumed to be Contech Bioscape ® based on cost-effectiveness comparison, which showed an approximate 3- to 4-fold cost reduction as compared to Contech StormFilter cartridges with ZPG media, which the City has traditionally used for water quality treatment.

Table 17 and Table 18 summarize the proposed implementation schedule and the estimated cost to implement SMAP projects and activities. These costs include facility design, permit fees, and installation. Because all projects are proposed on City-owned parcels or right-of-way, no land acquisition costs are included. See the high-level planning cost opinions provided in Appendix F.

Table 17. Short-Term Selected Projects

#	Proposed Stormwater Management Action (SMA)	Potential Drainage Area (ac.)	Potential BMP type	High Planning-Level Cost ($)	Implementation Schedule	Future Assessment Frequency	Notes
1	Mellen St.	156.1	Bioscape	$1,283,250	2028	Every 1 year	▪ High planning-level cost is based on Bioscape.(Enhanced Treatment). ▪ Could alternatively consider StormFilter cartridges with ZPG or other media, but costs increase significantly, feasibility requires min. 2.4' drop from inlet to outlet pipe elevation, and Ecology approved for Basic Treatment only. ▪ Bioscape may require bubblers.
10	Centralia College	137.7	Bioscape	$1,427,120	2026	Every 1 year	▪ Washington St. is vacated from intersection south of Centralia College Blvd. ▪ Kaiser Natural Learning Laboratory (KNOLL) built in 2011 in block southwest of Centralia College Blvd. and Washington St. • Significant opportunity for education benefit, located across the street from Centralia College and near multiple discharges to China Creek. Could include exhibits, maps, public signage to educate the public about stormwater problems and solutions. ▪ Consider bioretention in grassy area in northern portion of KNOLL with waterfall into the creek to enhance Dissolved Oxygen of stormwater entering the creek and enhance public education opportunities. ▪ See above notes RE BMP opportunities and constraints.

Table 18. Long-Term Selected Projects

#	Proposed Stormwater Management Action (SMA)	Potential Drainage Area (ac.)	Potential BMP type	High Planning-Level Cost ($)	Implementation Schedule	Future Assessment Frequency	Notes
24	Fort Borst Park	25.3	Bioscape	$258,240	2030	Every 1 year	▪ The Washington Department of Fish and Wildlife stocks the lake with fish annually for the Lion's Club Fishing Derby. ▪ The City reports that the lake has been drying up over time. ▪ The City identified the opportunity to divert stormwater baseflows to the lake via Underground Injection Controls (UICs). ▪ Divert 36-inch-diameter pipe to treatment/UIC(s). ▪ Consider adding fountain or floating wetland to the lake for aeration. ▪ Use existing natural flow path to Skookumchuck. ▪ High planning-level cost is based Bioscape.(Enhanced Treatment). ▪ See Site #1 notes (Table 17) for further discussion of BMP opportunities and constraints.

8.3 Land Management/Development Strategies

8.3.1 Permit Requirement

Permit Section S5.C.1.d.iii.(b) requires the SMAP to include the following:

> *Land management/development strategies and/or actions identified for water quality management.*

8.3.2 Methods

The City's Community Development and Public Works divisions collaboratively reviewed potential land management and development strategies and selected actions that could most readily and reasonably be implemented to benefit the prioritized subbasins. These include the following:

1. **Growth management.** The City will be updating its Comprehensive Plan starting in 2024 with a due date of 2025. The City is also currently updating the Parks Plan. For both of these updates, the City will identify updates that may be needed to incorporate long-range stormwater management and pollution reducing strategies (City of Centralia, 2023).
2. **Code updates.** Reviewing the existing City ordinances and codes for potential updates to development requirements that assist in requiring LID Principles and LID BMPs when updating, revising, and developing new local development-related codes, rules, standards or other enforceable documents, as needed.
3. **City policies.** Updating City policies—for example, the City is currently updating their zoning code and will incorporate updates in Title 20 as needed and as practicable, for adoption in 2023.

8.3.3 Selected Actions

Table 19 provides a summary of selected short-term land management/development strategies.

Table 19. Land Management/Development Strategies

Proposed Stormwater Management Action (SMA)	Implementation Schedule	Future Assessment Frequency
Conduct a stormwater rate study. Consider partnering with stormwater/wastewater/water/City Light.	2024	Every 7 years
Review shoreline protection opportunities for large parcel located between Plummer Lake and Hayes Lake in the China Creek and Lower Skookumchuck basins. WDFW, who owns the parcel, has indicated a possible interest in donating this parcel to the City.	2030	Every 5 years

8.4 Tailored/Enhanced Stormwater Management Actions

8.4.1 Permit Requirement

Section S5.C.1.d.iii.(c) of the Permit requires the SMAP to include the following:

> *Targeted, enhanced, or customized implementation of stormwater management actions related to permit sections within S5, including:*

- *IDDE field screening,*
- *Prioritization of Source Control inspections,*
- *O&M inspections or enhanced maintenance, or*
- *Public Education and Outreach behavior change programs.*

Identified actions shall support other specifically identified stormwater management strategies and actions for the basin overall, or for the catchment area in particular.

8.4.2 Methodology

The City's Public Works department reviewed the existing stormwater management program components, which include the following:

- Public education and outreach.
- Public involvement and participation.
- Mapping and documentation.
- Illicit discharge, detection, and elimination (IDDE).
- Controlling runoff from new development, redevelopment and construction sites.
- Operations and maintenance.
- Monitoring.

The details of the City's existing program are presented in the Stormwater Management Plan (City of Centralia 2022). Based on the requirements of Permit Section S5.C.1.d.iii.(c), the City reviewed the existing program to identify elements that could most readily and reasonably be tailored or enhanced to benefit the prioritized subbasins. The elements are described in the section below.

8.4.3 Selected Actions

Tailored stormwater management program actions planned for the short-term horizon (0 to 6 years) are summarized below in Table 20.

Table 20. Tailored/Enhanced Stormwater Management Actions

Proposed Stormwater Management Action (SMA)	Implementation Schedule	Future Assessment Frequency
Public Education and Outreach behavior change programs to support SMAP actions for China Creek. Review and coordinate as appropriate with the priorities documented in *NPDES Stormwater Public Education and Outreach Evaluation* (RKI, June 2020).	2024	Every 2 years
Increase street sweeping. The City currently conducts approximately 4,000 mi/yr, but no set schedule. Increase inspection to prioritized basins, increase frequency by at least 10% every 2 years in high-priority basins	2024	Every 2 years

Condition assessment program for ditches and culverts. Develop a condition assessment checklist and perform condition assessment reviews. Perform rehab or maintenance and update GIS data as needed.	2024	Every 1 year
Condition assessment program for stormwater pipes, perform spot maintenance as-needed	2024	Every 1 year
Rehabilitation program for outdated drywells, restoring the intended functions of the drywells and adding pre-treatment where needed.	2024	20% every year/100% every 5 years

8.5 Long-Range Plans

8.5.1 Permit Requirement

Section S5.C.1.d.iii.(d) of the Permit requires the SMAP to include the following:

> *Identification of changes needed to local long-range plans, to address SMAP priorities.*

8.5.2 Identified Coordination with Long-Range Plans

In order to identify with relevant long-range plans, the City will incorporate contents of the SMAP into the next updates of the following plans or related documents:

- Comprehensive Plan
- Surface/Stormwater Management Plan
- Parks Plan

8.6 Implementation Schedule and Budget

8.6.1 Permit Requirement

Section S5.C.1.d.iii.(e) of the Permit requires the SMAP to include the following:

> *A proposed implementation schedule and budget sources for:*
>
> - *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).*

8.6.2 Estimated Implementation Schedules and Budgets

Estimated implementation schedules and budgets are listed above for each proposed SMA in Sections 7.2 through Section 7.4 of this report.

8.6.3 Potential Budget Sources

The City is tracking the potential funding sources outlined below in Table 21 and may apply for funding projects identified in this SMAP. The table is grouped by funding source and categorized by project phase and funding type.

Table 21. Potential Funding Sources

Grant Name	Phase	Funding Type	Description
Washington State Department of Ecology			
Stormwater Capacity Grants Program	Permit Implementation	Grant	Awarded to NPDES municipal stormwater permittees to implement their municipal stormwater programs as outlined in the municipal stormwater permits.
Water Quality Combined Funding	Design and Construction	Grants and Loans	Integrated funding program for projects that improve and protect water quality. The program combines grants and loans from state and federal funding sources and provides technical assistance in navigating the process.
Rural Community Assistance Corporation (RCAC)			
RCAC Feasibility and Pre-development Loan	Feasibility and Pre-development	Loan	Eligible for low-income rural communities with a 50,000 population or less, or 10,000 or less if proposed permanent financing is through USDA Rural Development. Typically up to $50,000 for feasibility loan, typically up to $350,000 for pre-development loan, typically up to a 1-year term. 5% interest rate and 1% loan fee apply.
RCAC Feasibility and Intermediate Term Loan	Small Capital Needs	Loan	
RCAC Construction Loan	Construction	Loan	
Public Works Board			
Pre-Construction Program	Pre-Construction	Loan	Low-interest loans to fund pre-construction activities that prepare a specific project for construction, including stormwater facilities.
Washington State Department of Commerce			
Community Development Block Grant – General Purpose Grants	Final Design and Construction	Grant	Final design and construction of community facility projects, including stormwater facilities in support of economic development or affordable housing.

8.7 Future Assessment and Feedback

Section S5.C.1.d.iii.(f) of the Permit requires the SMAP to include the following:

> *A process and schedule to provide future assessment and feedback to improve the planning process and implementation of procedures or projects.*

8.7.1 Process

During each review, the Future Assessment considerations listed in Table 17 through Table 21 for each SMA will be evaluated. In addition, the status of the following progress metrics will be reviewed and documented:

1. Is the action still feasible and effective based on ongoing research/action exploration? If not, should the action be removed from the SMAP process?
2. Are there any adjustments that should be made to the review frequency in Table 15?
3. Are there any adjustments that should be made to the Future Assessment considerations where the SMA is listed in Tables 17 through 21?
4. What portion of the action has taken place?
5. How much of the basin has been addressed?
6. What portion of the budget has been spent?
7. What changes in funding needs or opportunities have been identified?
8. Are there elements of the previous SMAP development process that should be updated in the future based on the progress of this SMA?
9. Is there an opportunity for monitoring associated with this SMA?
10. Are there other SMAPs that would provide greater impact to the receiving water than those previously identified?

8.7.2 Schedule

Each SMA identified in this plan will be reviewed based on the schedule outlined in Table 15.

8 RECOMMENDATIONS AND NEXT STEPS

This section provides recommendations and next steps that should be considered to support future SMAP planning.

9.1 Data Gaps

The City categorizes wetlands within its jurisdiction using the Washington State Department of Ecology wetland rating system, as defined in the Centralia Municipal Code Chapter 16.17.040. Wetland location data was available, but wetland category data was not available at the time of submittal. If available in the future, this data should be incorporated into any future prioritization process.

No data were available to quantify or quality the effectiveness, age, or condition of existing stormwater management facilities, including flow control and water quality treatment Best Management Practices (Section 3.3.4). If available in the future, this data should also be incorporated into any future prioritization process.

9.2 On-going Public Input

As discussed above in Public Involvement (Section 1.3), the City distributed a public input survey to the Chehalis Basin Partnership (CBP) on February 27, 2023. CBP is comprised of a large group of members from multiple City and County jurisdictions, the Chehalis Tribe, Quinault Indian Nation, Washington State Department of Ecology, Washington Department of Fish and Wildlife, Ports, environmental groups, citizens, and businesses.

As documented in notes from a meeting with Ecology on December 6, 2022 regarding the City's 2021 Annual Report review, the City will continue reaching out to local tribal entities to seek SMAP input in an on-going manner.

As additional input continues to be sought, the City may consider online surveys so the greater number of results can continue to be collected, analyzed, and efficiently used to help guide future planning and action implementation.

The City may also consider coordinating any future public outreach with the recommendations outlined in the City's *NPDES Stormwater Public Education and Outreach Evaluation* (RKI 2020).

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APPENDIX A

Receiving Water Assessment – Data Sources

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APPENDIX B

EJScreen Reports

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APPENDIX C

Zoning Reclassification

Table C-1: Zoning Reclassification

The table below summarizes land use reclassifications for zoning provided in the City's Comprehensive Plan (City of Centralia, 2018). See Section 3.3.3 for more information.

Table C-1. Zoning Reclassification

Comprehensive Plan Zoning	Zone Code	Reclassified Land Use
CBD Commercial	C3	Commercial
Gateway Commercial District	GCD	Commercial
General Commercial	C1	Commercial
Heavy Industrial	M2	Industrial
High Density Residential	R20	High Density Residential
Highway Commercial	C2	Commercial
Light Industrial	M1	Industrial
Limited Business District	LBD	Commercial
Low Density Residential	R4	Low Density Residential
Medical/Health Care	H1	Commercial
Medium Density Residential	R8	Medium Density Residential
Medium-High Density Residential	R15	Medium-High Density Residential
Open Space/Public Facilities	OSPF	Open Space/Public Facilities
Port Master Plan	PMP	Industrial
Right-of-Way		Right-of-Way
Rural Residential	R5A	Very Low Density Residential
Very Low Density Residential	R2	Very Low Density Residential

APPENDIX D

Candidate Basin Prioritization Scoring

Table D-1: Importance Scoring

Table D-2: Degradation Scoring

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Table D-1. Importance Scoring

	Land Cover (LC)			Critical and Sensitive Areas (CSA)			Overburdened Communities (OC)											
	LC - 1	LC - 2		CSA - 1	CSA - 2		OC - 1	OC - 2	OC - 3	OC - 4	OC - 5	OC - 6	OC - 7	OC - 8	OC - 9	OC - 10	OC - 11	
Subbasin	% Pervious	Open Space/ Public Facilities	Total Land Cover	% Wetland	% Shore-line Environ-ment	Total Critical and Sensitive Areas	EJ Index for PM2.5	EJ Index for Ozone	EJ Index for NATA* Diesel PM	EJ Index for NATA* Air Toxics Cancer Risk	EJ Index for NATA* Respiratory Hazard Index	EJ Index for Traffic Proximity and Volume	EJ Index for Lead Paint Indicator	EJ Index for Superfund Proximity	EJ Index for RMP Proximity	EJ Index for Hazardous Waste Proximity	EJ Index for Wastewater Discharge Indicator	Total Overburdened Communities
CC-1	76.7%	4.6%		5.1%	0.0%		67	66	64	66	66	58	37	43	63	68	4	
LoC-1	68.9%	26.7%		10.9%	27.1%		44	41	46	43	41	51	34	11	22	63	7	
LS-1	56.3%	12.9%		11.6%	11.6%		71	71	70	71	71	78	36	62	72	71	5	
LS-2	76.5%	0.0%		9.0%	43.3%		No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	
MC-3	55.9%	9.7%		21.0%	46.4%		79	80	78	79	79	86	90	95	81	75	19	
SC-1	78.4%	1.2%		19.7%	18.8%		67	67	66	67	67	78	36	76	72	68	8	
Scoring Ranges																		
80th Percentile	76.7%	12.9%		19.7%	43.3%		80	80	80	80	80	80	80	80	80	80	80	
60th Percentile	76.5%	9.7%		11.6%	27.1%		60	60	60	60	60	60	60	60	60	60	60	
40th Percentile	68.9%	4.6%		10.9%	18.8%		40	40	40	40	40	40	40	40	40	40	40	
20th Percentile	56.3%	1.2%		9.0%	11.6%		20	20	20	20	20	20	20	20	20	20	20	
Raw Scores																		
CC-1	5	3	**8**	1	1	**2**	4	4	4	4	4	3	2	3	4	4	1	**37**
LoC-1	2	5	**7**	3	4	**7**	3	3	3	3	3	3	2	1	2	4	1	**28**
LS-1	1	5	**6**	3	2	**5**	4	4	4	4	4	4	2	4	4	4	1	**39**
LS-2	3	1	**4**	1	4	**5**	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	**0**
MC-3	1	4	**5**	5	5	**10**	4	5	4	4	4	5	5	5	5	4	1	**46**
SC-1	5	2	**7**	4	2	**6**	4	4	4	4	4	4	2	4	4	4	1	**39**
Normalized Scores																		
CC-1	2.5	1.5	**4**	0.5	0.5	**1**	0.36	0.36	0.36	0.36	0.36	0.27	0.18	0.27	0.36	0.36	0.09	**3.4**
LoC-1	1	2.5	**3.5**	1.5	2	**3.5**	0.27	0.27	0.27	0.27	0.27	0.27	0.18	0.09	0.18	0.36	0.09	**2.5**
LS-1	0.5	2.5	**3**	1.5	1	**2.5**	0.36	0.36	0.36	0.36	0.36	0.36	0.18	0.36	0.36	0.36	0.09	**3.5**
LS-2	1.5	0.5	**2**	0.5	2	**2.5**	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	**0.0**
MC-3	0.5	2	**2.5**	2.5	2.5	**5**	0.36	0.45	0.36	0.36	0.36	0.45	0.45	0.45	0.45	0.36	0.09	**4.2**
SC-1	2.5	1	**3.5**	2	1	**3**	0.36	0.36	0.36	0.36	0.36	0.36	0.18	0.36	0.36	0.36	0.09	**3.5**
Weighted Scores																		
CC-1	2.5	1.5	**4**	0.5	0.5	**1**	0.36	0.36	0.36	0.36	0.36	0.27	0.18	0.27	0.36	0.36	0.09	**3.4**
LoC-1	1	2.5	**3.5**	1.5	2	**3.5**	0.27	0.27	0.27	0.27	0.27	0.27	0.18	0.09	0.18	0.36	0.09	**2.5**
LS-1	0.5	2.5	**3**	1.5	1	**2.5**	0.36	0.36	0.36	0.36	0.36	0.36	0.18	0.36	0.36	0.36	0.09	**3.5**
LS-2	1.5	0.5	**2**	0.5	2	**2.5**	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	**0.0**
MC-3	0.5	2	**2.5**	2.5	2.5	**5**	0.36	0.45	0.36	0.36	0.36	0.45	0.45	0.45	0.45	0.36	0.09	**4.2**
SC-1	2.5	1	**3.5**	2	1	**3**	0.36	0.36	0.36	0.36	0.36	0.36	0.18	0.36	0.36	0.36	0.09	**3.5**

Table D-2. Degradation Scoring

	Land Cover (LC)			Water Quality Impairment (WQ)			Future Conditions (FC)											
	LC - 1	LC - 2		WQ - 1	WQ - 2		FC - 1	FC - 2	FC - 2	FC - 2	FC - 2	FC - 2	FC - 2	FC - 2	FC - 2	FC - 2	FC - 3	
Subbasin	% Impervious	Population	Total Land Cover	Total 303d Listing	# of Outfalls	Total Water Quality Impairment	Right-of-Way	High Density Residential	Medium-High Density Residential	Medium Density Residential	Low Density Residential	Very Low Density Residential	Open Space/Public Facilities	Commercial	Industrial	Total Expected Future Land Use	Future Stormwater	Total Future Conditions
CC-1	18.2%	5740		1	61		2.7%	0.2%	0.8%	6.4%	17.4%	10.4%	4.6%	20.8%	36.6%		5	
LoC-1	23.3%	5486		6	2		18.4%	1.3%	2.1%	5.2%	6.7%	15.5%	26.7%	2.2%	21.9%		3	
LS-1	37.0%	3187		37	7		22.2%	1.5%	2.2%	9.8%	15.8%	14.8%	12.9%	16.4%	4.4%		4	
LS-2	11.7%	N/A		2	0		49.4%	0.0%	0.0%	1.9%	6.0%	0.0%	0.0%	0.0%	42.8%		2	
MC-3	28.6%	2203		6	5		9.0%	3.1%	2.6%	17.6%	16.2%	20.2%	9.7%	16.5%	5.1%		5	
SC-1	11.3%	1103		14	0		1.3%	2.9%	4.2%	29.1%	8.7%	28.7%	1.2%	17.0%	7.0%		4	
Scoring Ranges																		
80th Percentile	28.6%	5537		14	7		22.2%	2.9%	2.6%	17.6%	16.2%	20.2%	12.9%	17.0%	36.6%		5	
60th Percentile	23.3%	4107		6	5		18.4%	1.5%	2.2%	9.8%	15.8%	15.5%	9.7%	16.5%	21.9%		4	
40th Percentile	18.2%	2793		5	4		9.0%	1.3%	2.1%	6.4%	8.7%	14.8%	4.6%	16.4%	7.0%		3	
20th Percentile	11.7%	1983		2	1		2.7%	0.2%	0.8%	5.2%	6.7%	10.4%	1.2%	2.2%	5.1%		2	
Raw Scores																		
CC-1	2	5	**7**	1	5	**6**	2	0.01	0.02	0.26	0.17	0.10	0.05	0.42	0.73	**1.76**	5	**8.8**
LoC-1	4	4	**8**	4	2	**6**	4	0.04	0.06	0.21	0.07	0.15	0.27	0.04	0.44	**1.28**	3	**8.3**
LS-1	5	3	**8**	5	5	**10**	5	0.04	0.07	0.39	0.16	0.15	0.13	0.33	0.09	**1.35**	4	**10.4**
LS-2	2	5	**7**	2	1	**3**	5	0.00	0.00	0.08	0.06	0.00	0.00	0.00	0.86	**0.99**	2	**8.0**
MC-3	5	2	**7**	4	4	**8**	2	0.09	0.08	0.70	0.16	0.60	0.10	0.33	0.10	**2.17**	5	**9.2**
SC-1	1	1	**2**	5	1	**6**	1	0.09	0.13	1.16	0.09	0.57	0.01	0.34	0.14	**2.53**	4	**7.5**
Normalized Scores																		
CC-1	1	1.67	**1**	0.5	2.5	**3.0**	0.7	0.00	0.01	0.09	0.06	0.03	0.02	0.14	0.24	0.59	1.67	**2.9**
LoC-1	2	1.33	**2**	2.0	1.0	**3.0**	1.3	0.01	0.02	0.07	0.02	0.05	0.09	0.01	0.15	0.43	1.00	**2.8**
LS-1	2.5	1.00	**2.5**	2.5	2.5	**5.0**	1.7	0.01	0.02	0.13	0.05	0.05	0.04	0.11	0.03	0.45	1.33	**3.5**
LS-2	1	N/A	**1**	1.0	0.5	**1.5**	1.7	0.00	0.00	0.03	0.02	0.00	0.00	0.00	0.29	0.33	0.67	**2.7**
MC-3	2.5	0.67	**2.5**	2.0	2.0	**4.0**	0.7	0.03	0.03	0.23	0.05	0.20	0.03	0.11	0.03	0.72	1.67	**3.1**
SC-1	0.5	0.33	**0.5**	2.5	0.5	**3.0**	0.3	0.03	0.04	0.39	0.03	0.19	0.00	0.11	0.05	0.84	1.33	**2.5**
Weighted Scores																		
CC-1	1	1.67	**1**	0.5	2.5	**3.0**	0.7	0.00	0.01	0.09	0.06	0.03	0.02	0.14	0.24	0.59	1.67	**2.9**
LoC-1	2	1.33	**2**	2.0	1.0	**3.0**	1.3	0.01	0.02	0.07	0.02	0.05	0.09	0.01	0.15	0.43	1.00	**2.8**
LS-1	2.5	1.00	**2.5**	2.5	2.5	**5.0**	1.7	0.01	0.02	0.13	0.05	0.05	0.04	0.11	0.03	0.45	1.33	**3.5**
LS-2	1	N/A	**1**	1.0	0.5	**1.5**	1.7	0.00	0.00	0.03	0.02	0.00	0.00	0.00	0.29	0.33	0.67	**2.7**
MC-3	2.5	0.67	**2.5**	2.0	2.0	**4.0**	0.7	0.03	0.03	0.23	0.05	0.20	0.03	0.11	0.03	0.72	1.67	**3.1**
SC-1	0.5	0.33	**0.5**	2.5	0.5	**3.0**	0.3	0.03	0.04	0.39	0.03	0.19	0.00	0.11	0.05	0.84	1.33	**2.5**

APPENDIX E

Drainage Issues Documented in the City's 2016 Stormwater Master Plan

Table E-1. Drainage Issues Documented in the City's 2016 Stormwater Master Plan (City of Centralia 2016)

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Table E-1. Drainage Issues Documented in the City's 2016 Stormwater Master Plan (CH2MHill 2016)

ID#	Location Description	Issue Description	Capital Improvement Projects Program	Completed?	Year Completed	YCOORD	XCOORD
4	Intersection of E Summa & S Buckner	West side of the road ponds. Ditch not deep enough, needs sump and pipe.	Summa East CIP	Not Completed		46.706047	-122.951736
5	Intersection of E Summa & Pacific	Ditches are working correctly.	Summa East CIP	Not Completed		46.705750	-122.950017
7	Intersection of Elm & Ash	Roots. Street deteriorating due to no storm drain. Water collects on street during rains, which helps vegetation growth.	Cherry Street CIP	Not Completed		46.711356	-122.967136
8	Intersection of W Cherry & Ash	Roots. The curbs are vegetated, which promotes drain plugging.	Cherry Street CIP	Not Completed		46.713283	-122.966147
10	Intersection of Jefferson & S Pearl	Plugged northwest and southeast drain.	Jefferson Street CIP	Completed	2010	46.708808	-122.958897
11	Intersection of Summa St & Gold St	Drain line is a winding snake.	Summa West CIP	Not Completed		46.705942	-122.955300
14	Intersection of W Center & N Iron	Plugged drain on the northwest side of the intersection.	Center Street CIP	Not Completed		46.720639	-122.956128
15	On W Center, between N Iron & N Rock	The north drain is located just at the intersection with a dirt road. Ponding, possible plugged drain.	Center Street CIP	Not Completed		46.720722	-122.956736
16	Intersection of W Hanson & N Rock	Plugged drain.	Center Street CIP	Completed		46.721717	-122.957083

ID#	Location Description	Issue Description	Capital Improvement Projects Program	Completed?	Year Completed	YCOORD	XCOORD
17	On N Rock, between W Center & W Hanson	Drainage problem.	Center Street CIP	N/A - No Issue		46.721036	-122.957256
18	Intersection of W Chestnut & S Cedar	Street deteriorating due to no storm drain. Water collects on street during rains, promoting vegetation growth.	Cherry Street CIP	Not Completed		46.712517	-122.968011
22	Intersection of N Pearl & W Center	Drainage problem.	Center Street CIP	Not Completed		46.720111	-122.954131
23	Intersection of N Oak & W Maple	Ponding on the west of the intersection due to undersized or blocked drainage system.	Center Street CIP	Not Completed		46.720347	-122.959028
24	On E Plum St, between S Pearl & S Tower	Drainage problem.	Tower Street CIP	Not Completed		46.712489	-122.956500
25	Intersection of S Tower St & E Plum	No catch basins on the southwest corner of the intersection.	Tower Street CIP	Not Completed		46.712314	-122.955875
26	Intersection of S Pearl St & E Plum	Noted some sheen in the northwest corner of the intersection. Some periodic ponding.	Tower Street CIP	Not Completed		46.712611	-122.957139
27	Intersection of S Pearl & W Cherry	Some periodic ponding	Jefferson Street CIP	Completed	2010	46.711639	-122.957792
28	Intersection of S Tower & W Cherry	Some periodic ponding.	Tower Street CIP	Completed	2010	46.712611	-122.956556
29	Intersection of Jackson & S Pearl	Drain on the southeast corner is plugged.	Jefferson Street CIP	Not Completed		46.707336	-122.959528

ID#	Location Description	Issue Description	Capital Improvement Projects Program	Completed?	Year Completed	YCOORD	XCOORD
37	Jefferson	Pipe failure	Jefferson Street CIP	Completed	2020	46.708942	-122.963050
38	Between S Pearl & S Tower St, on Cherry & Jefferson	Drainage problem.	Jefferson Street CIP	Not Completed		46.708808	-122.958897
40	On Chestnut, between Rock & Silver	Storm drain disconnected from the sewer system in 1987. No sign of ponding water. Water flow direction could not be identified. Possible capacity issue.	Jefferson Street CIP	Not Completed		46.710892	-122.960472
42	On Chestnut between Yew & Cedar	Storm drain disconnected from the sewer system in 2000. See Chestnut and Cedar intersection comments. No drainage on Chestnut between Yew and Cedar. It seems on pond on the side of the road.	Cherry Street CIP	Not Completed		46.712556	-122.968639
43	On Jackson, Between Hamilton & Silver	Storm drain disconnected from the sewer system in 1990. No obvious problem, no ponding. Intersection of Jackson and Silver could use some maintenance.	Jefferson Street CIP	Not Completed		46.707650	-122.961233
45	On Alder, between Richmond & Woodland	Storm drain disconnected from the sewer system in 1998. Storm drain on Alder St between Woodland and Richmond St is ineffective. Fully plugged.	Jefferson Street CIP	Not Completed		46.711272	-122.965264
46	Intersection of 6th & E	Storm drain clearly disconnected from the sewer system in 1999.	Sixth Street CIP	Completed	2012	46.728947	-122.955081

ID#	Location Description	Issue Description	Capital Improvement Projects Program	Completed?	Year Completed	YCOORD	XCOORD
47	Intersection of 6th & F	Storm drain disconnected from the sewer system in 1999. Seems okay. Possible capacity issue.	Sixth Street CIP	Completed	2012	46.728947	-122.956478
49	Intersection of Oak & Center	Storm drain disconnected from the sewer system in 1999.	Center Street CIP	N/A - No Issue		46.721111	-122.958639
58	Intersection of 6th & G	Storm drain disconnected from sewer system in 1999. Ponding on the north side of intersection.	Sixth Street CIP	Completed	2012	46.728947	-122.957833

APPENDIX F

Stormwater Facility Retrofit Fact Sheets and High-Level Planning Cost Opinions

F-1. Site 1 – Mellen St. Fact Sheet

F-2. Site 10 – Centralia College Fact Sheet

F-3. Site 24 – Fort Borst Park Fact Sheet

F-4. Site 1 – High-Level Planning Cost Opinion

F-5. Site 10 – High-Level Planning Cost Opinion

F-6. Site 24 – High-Level Planning Cost Opinion

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APPENDIX G

Public Surface Water Quality Survey

G-1. Blank Survey Form

G-2. Results Summary for Survey Responses as of June 4, 2022 and as of July 7, 2022

G-3. Individual Completed Surveys through July 7, 2022

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