



CITY OF **LACEY**

STORMWATER COMPREHENSIVE PLAN 2020

ABBREVIATIONS & ACRONYMS

BMPs	Best management practices
CBSM	Community-based social marketing
CIP	Capital improvement program
ECOLOGY	Washington State Department of Ecology
ESA	Federal Endangered Species Act
FTE	Full Time Equivalent
GMA	Washington State Growth Management Act
GREEN	Global Rivers Environmental Education Network
IDDE	Illicit discharge detection and elimination
LID	Low Impact Development
LMC	Lacey Municipal Code
MS4	Municipal separate storm sewer system
NPDES	National Pollutant Discharge Elimination System
O&M	Operations and Maintenance
PHASE II PERMIT	Western Washington NPDES Phase II Municipal Stormwater Permit

PSP	Puget Sound Partnership
REEP	Regional Environmental Education Program
SCP	Stormwater Comprehensive Plan
SDM	Stormwater Design Manual
SMAP	Stormwater Management Action Planning
SOPs	Standard operating procedures
STORM	Stormwater Outreach for Regional Municipalities Group
SWMP	Stormwater Management Program
SWPPPs	Stormwater Pollution Prevention Plans
TMDL	Total maximum daily load
UGA	Urban growth area
UIC	Underground Injection Control
WSDOT	Washington State Department of Transportation

ACKNOWLEDGEMENTS

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1 INTRODUCTION



COLLEGE STORM FACILITY AERIAL

This update of the City of Lacey's Stormwater Comprehensive Plan (SCP) is intended to guide the City's Stormwater Utility programs and projects for the next 6 years. This plan is the first major revision of the City's Stormwater Comprehensive Plan since the original 2013 plan (Lacey 2013). In addition to detailing Stormwater Management Program (SWMP) activities and projects for the 6-year planning horizon (2020 through 2025), this plan describes SWMP goals and accomplishments; the development and organization of this plan; background information including descriptions of water bodies, stormwater infrastructure, climate change considerations, and regulatory environment; and proposed programs, policies, and activities to meet the SWMP goals.

1.1

PURPOSE OF THIS PLAN

The purpose of this plan is to guide the City's SWMP in a manner consistent with applicable local, state, and federal regulations while charging consumers an equitable stormwater utility rate and supporting the goals and policies expressed in The City of Lacey and Thurston County Land Use Plan for the Lacey Urban Growth Area. This plan includes:

- Long-term goals of the SWMP
- Summary of background information relevant to the SWMP
- Identification of and proposed solutions to flooding and water quality issues
- Actions necessary to ensure compliance with applicable federal, state, and local requirements, especially the Western Washington National Pollutant Discharge Elimination System (NPDES) Phase II Municipal Stormwater Permit (Phase II Permit) issued by the Washington State Department of Ecology (Ecology)
- A financial plan to address the two items above

Since most land within Lacey is developed, most of the identified issues are a result of:

- Uncontrolled runoff from development that occurred prior to the implementation of modern stormwater requirements
- Aging infrastructure
- Regulatory mandates



1.2

LONG-TERM GOALS

All functions performed or influenced by the SWMP can be divided into nine major program elements, which are listed in bold below. City staff developed long-term goals for each program element of the SWMP, which are listed under the applicable program element. Policies related to these long-term goals are provided in Appendix A.



Flood Reduction:

There is no flooding of the public stormwater system due to large storm events.



Surface Water Quality Improvement (retrofitting):

All surface water bodies in Lacey meet water quality criteria for designated recreation and fish uses.



Groundwater Quality Protection:

Groundwater quality is not negatively affected (quantity or quality) by stormwater practices.



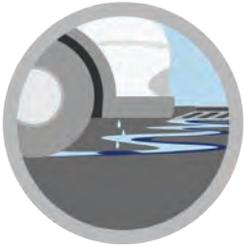
Habitat Improvement:

Aquatic species thrive in surface water bodies in Lacey.



Public Participation (education, outreach, and involvement):

City residents understand how their actions and choices affect stormwater, and they act in ways that reduce stormwater flow rates and improve water quality and aquatic habitat.



Pollutant Source Control:

Pollutants do not enter stormwater.



Infrastructure Operations and Maintenance:

All stormwater infrastructure functions as intended.



Development Practices:

Runoff from developed areas mimics forested hydrology and water quality. Prompt service is provided to applicants for development projects.



Stormwater Planning, Administration, and Funding:

Revenue is wisely invested and produces measurable positive outcomes, including regulatory compliance. Utility rates are fair and equitable.

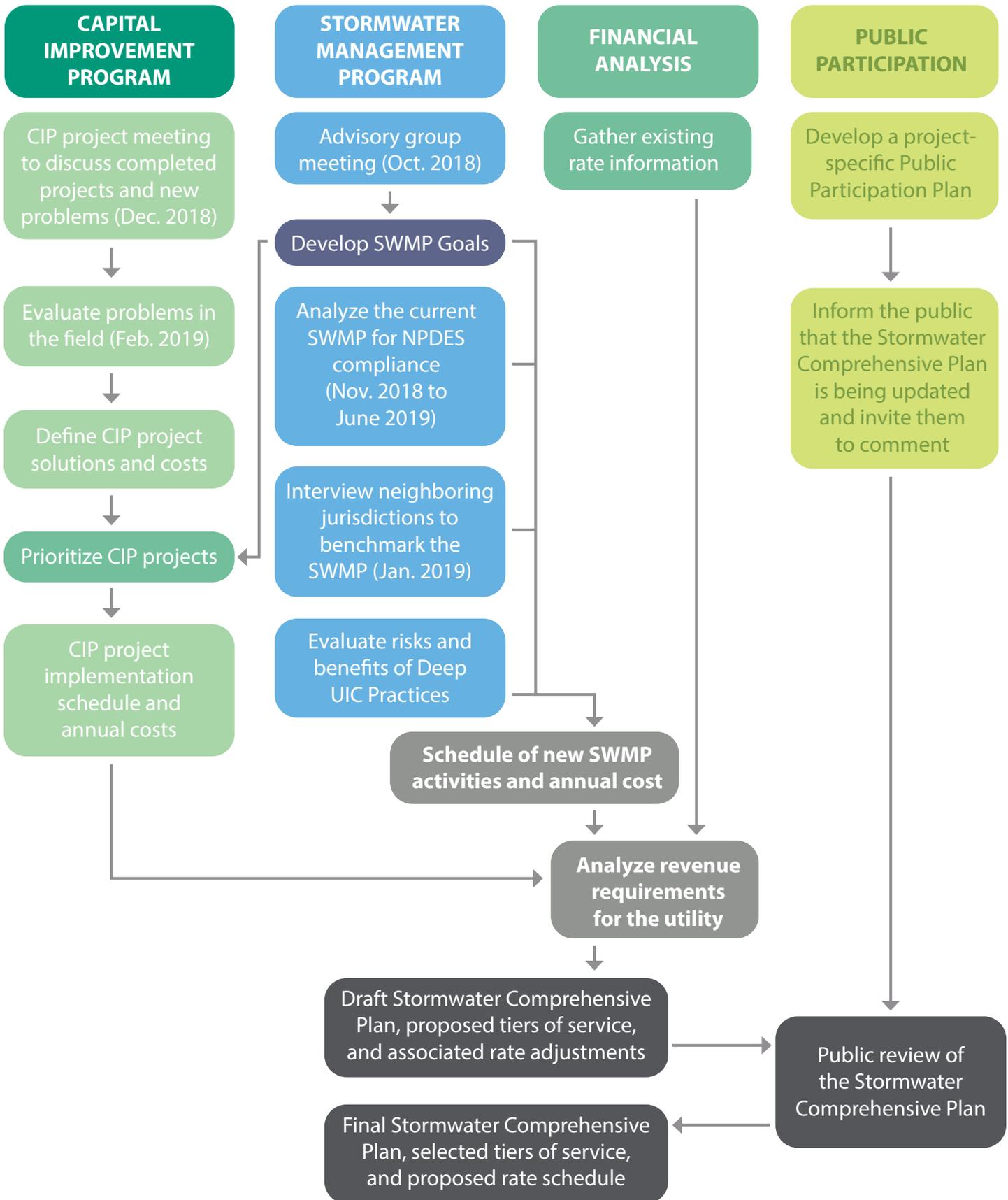
1.3

STORMWATER COMPREHENSIVE PLAN DEVELOPMENT

City staff and consultants conducted detailed analyses to support the conclusions and recommendations in later chapters of this plan. The analyses included interviews with City staff, a staffing needs evaluation, field review of problem sites, hydrologic modeling, development of construction projects to solve stormwater programs (i.e. Capital Improvement Program {CIP} projects), and calculation of funding needs to implement this plan.

Past studies and plans were reviewed to gather information on drainage and water quality issues and to evaluate the existing SWMP. To supplement existing drainage and water quality information and recent documentation of the status of the City's SWMP, City staff participated in an advisory group meeting and workshop and provided input throughout the development of this plan.

The figure below illustrates the process that was used to develop this plan.



1.4

STORMWATER MANAGEMENT PROGRAM ACCOMPLISHMENTS

Since the Stormwater Utility was founded in 1985, the City of Lacey has made significant progress in reducing detrimental effects of stormwater runoff on receiving waters in and around Lacey. The City has built many capital projects to alleviate drainage problems and has analyzed other problems to identify future activities. The City has also adopted ordinances, provided public education, and implemented monitoring programs to address water quality concerns. Since the creation of the City's original Stormwater Comprehensive Plan in 2013, the City has implemented the following significant projects, programs, and policies:

2016



In 2016, the newly constructed Chambers Lake Stormwater Treatment Wetlands project won a Silver Award from the American Council of Engineering Companies for social and economic sustainability. The Chambers Lake Stormwater Treatment Wetlands treat 187 acres of previously untreated stormwater entering Chambers Lake and was partly funded by a \$1M grant from Ecology.

The City completed construction of the Vector Waste Decant Facility for efficient handling and disposal of debris removed from the storm drainage system.

The City updated its Stormwater Design Manual (SDM) to assist developers in identifying, selecting, and designing best management practices (BMPs) for controlling stormwater flows and for preparing drainage plans, reports, and related documents for submittal to the City and compliance with regulations.

2017



In 2017, the City completed a Low Impact Development (LID) Code Review of documents that guide development in Lacey to ensure that LID principles are allowed and encouraged. The City was awarded a Green Star by Puget Soundkeeper and the Washington Environmental Council in 2017 for this effort.

The City completed the Brentwood Stormwater Installation project to relieve chronic flooding by adding runoff collection and conveyance infrastructure.

The City created LMC 14.27 – Stormwater Management, and LMC 14.29 – Illicit Discharges

The City conducted predesign work and soils analysis to replace the failing stormwater system in 25th Loop SE.



In 2018, the City completed the design for the 22nd Avenue SE System project. The project will convey stormwater to the College Street stormwater system while preserving existing parking.

The City began work on the 33rd and Stikes Conveyance Improvements project. The project, located at Stikes Drive and the eastern portion of 32nd Avenue SE, includes revision and expansion of the storm drainage system to improve stormwater conveyance and reduce local flooding.

The City completed the Ulery Drainage System Improvements project. The project included installing new catch basins and connecting drainage to the existing stormwater system.

The City acquired parcels in the Woodland Creek corridor to protect buffers and to improve water quality and aquatic habitat in the stream.

In addition to providing educational materials and outreach events, the City offered many public participation opportunities for the community. Specific programs from 2018 included:

- Puget Sound Starts Here campaign through participation in the Stormwater Outreach for Regional Municipalities (STORM) Group Stream Team Program

1,006 HOURS VOLUNTEERED

442 TREES AND SHRUBS PLANTED



- South Sound GREEN (Global Rivers Environmental Education Network): place-based learning program to engage students through field and classroom studies focused on stormwater and non-point source pollution

2,229 STUDENTS REACHED

378.25 VOLUNTEER HOURS

- Pet Waste Awareness program

8 NEW STATIONS INSTALLED

3,000 EDUCATIONAL PET WASTE BROCHURES DISTRIBUTED





Photo Courtesy of The Inn at Mallard Cove



- “No Dumping, Flows to Waterways” markers

210 MARKERS INSTALLED

- Clean Cars, Clean Streams program

344 CHARITY CAR WASH TICKETS SOLD

- 3-Day Stormwater Lesson taught by City of Lacey staff at multiple Lacey schools

RECEIVED BY 1,526 STUDENTS

- Facilitate Lacey school fieldtrips to Billy Frank Jr. Nisqually National Wildlife Refuge

WORKSHOPS FOR 30 STUDENTS

- Hosting and facilitating volunteer opportunities within the riparian buffer at Woodland Creek Community Park including:

MARTIN LUTHER KING, JR. DAY MEMORIAL TREE PLANTING, PLANT MAINTENANCE, AND INVASIVE SPECIES REMOVAL

ARBOR DAY TREE PLANTING WITH CITY OF LACEY PARKS AND RECREATION CAMPERS

CHINOOK DAY OF CARING WITH CHINOOK MIDDLE SCHOOL STUDENTS TO PERFORM PLANT MAINTENANCE

KOMACHIN DAY OF CARING WITH KOMACHIN MIDDLE SCHOOL STUDENTS TO PERFORM PLANT MAINTENANCE

JBLM* DAY OF SERVICE WITH ENLISTED AIR FORCE MEMBERS TO REMOVE INVASIVE SPECIES

THANKSGIVING WEEKEND PLANTING EVENT

* JOINT BASE LEWIS MCCHORD



- Share hands-on stormwater education at large community events including:

CITY OF LACEY FUN FAIR

CITY OF LACEY STEM FAIR

THURSTON CONSERVATION DISTRICT NATIVE PLANT FESTIVAL

CITY OF LACEY ARBOR DAY SEEDLING GIVEAWAY

SOUTH SOUND GREEN STUDENT GREEN CONGRESS

Each year, the City's Stormwater Operations and Maintenance (O&M) team works to maintain and improve the stormwater system. Accomplishments from 2018 are listed below:



REPLACED A FAILING INFILTRATION GALLERY THAT WAS CAUSING FLOODING AT 1502 HOMANN DRIVE.

UPGRADED THE STORM SYSTEM AT 5518 34TH AVENUE SE BY INSTALLING A CATCH BASIN AND 100 FEET OF PIPE TO INTERCEPT RUNOFF.

FIXED A FLOODING PROBLEM AT 2610 GREENLAWN BY INSTALLING 250 FEET OF PIPE, TWO CATCH BASINS, AND CONNECTION TO THE RUDDELL ROAD STORMWATER MAIN.

REMOVED 74.5 CUBIC YARDS OF DEBRIS FROM CATCH BASINS.

COMPLETED 340 PRIVATE STORMWATER FACILITY INSPECTIONS.

MORE THAN DOUBLED THE PRIVATE FACILITIES MAINTENANCE AND ANNUAL REPORTING PROGRAM COMPLIANCE.

AWARDED A GRANT FROM ECOLOGY FOR PURCHASE OF A SECOND HIGH-EFFICIENCY RECIRCULATING-AIR STREET SWEEPER.



1.5 PUBLIC INVOLVEMENT AND PARTICIPATION CONDUCTED FOR THIS PLAN

The City encourages the public to contribute to the Stormwater Comprehensive Plan Update. The City has developed and is implementing a Public Participation Plan to create multiple opportunities for the public to get involved. The first few steps in the public involvement process included briefing the planning commission on June 18, 2019 and the City Council Utilities Committee on August 5, 2019. There will be several opportunities for public input before the plan is adopted, including:

- Draft SCP for public review (Winter/Spring 2020)
- Utilities Committee briefing (March 2, 2020)
- Planning Commission workshop (March 17, 2020)
- Planning Commission public hearing (Spring 2020)
- City Council meeting work session (Spring 2020)
- City Council meeting - adoption of updated SCP with annual City Comprehensive Plan amendments (Summer 2020)

The final Stormwater Comprehensive Plan will be provided on the City's website following approval by City Council.



A CITY OF LACEY STORMWATER WORKSHOP

1.6

PLAN ORGANIZATION

This plan is organized into five chapters:

- 1** AN INTRODUCTION TO THIS PLAN AND THE SWMP
- 2** A DISCUSSION OF BACKGROUND MATERIAL THAT IS RELEVANT TO THE SWMP
- 3** A DESCRIPTION OF THE SWMP AND ACTIVITIES REQUIRED TO COMPLY WITH REGULATIONS AND MAKE PROGRESS TOWARDS DEFINED PROGRAM GOALS
- 4** A DESCRIPTION OF STORMWATER CIP PROJECTS DEVELOPED TO ADDRESS CITYWIDE AND SITE-SPECIFIC STORMWATER PROBLEMS
- 5** INSTRUCTIONS FOR IMPLEMENTING THIS PLAN AND SWMP ACTIVITIES AND PROJECTS, INCLUDING ADJUSTMENTS TO THE STORMWATER UTILITY RATES

Appendices to this plan provide more detailed background information, calculations, and data related to this plan's recommendations.



2 BACKGROUND

This chapter describes the environment in Lacey that affects stormwater management, water bodies within the city limits and the urban growth area (UGA) that receive surface water or stormwater from within the city limits, climate change considerations, applicable regulations, and a brief history of the stormwater utility fund.

Lacey is located at the southern tip of Puget Sound and is bordered to the west by the city of Olympia. Unincorporated areas of Thurston County border the city limits to the north, east, and south. The city limits encompass approximately 17 square miles, and the current population is 50,170 (Lacey 2019a). Since the 1960s, Lacey has experienced one of the highest growth rates in the county (Lacey and Thurston County 2008). Population growth is accompanied by increased land development and stormwater runoff, resulting in a greater burden on the City's stormwater infrastructure and SWMP. The relationship between land use and stormwater is discussed further in Section 2.1 below.



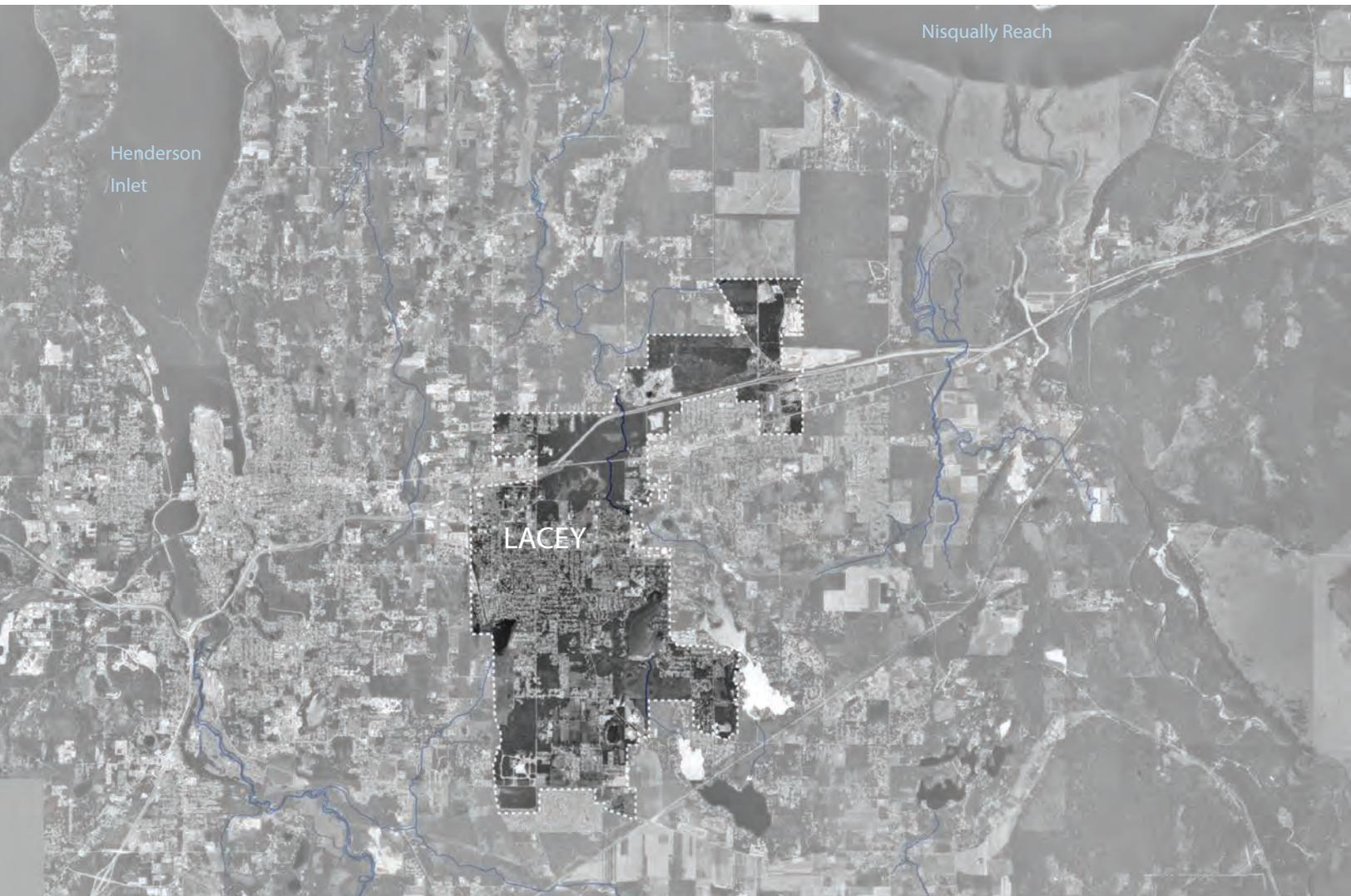
CENTRAL LACEY CIRCA 1963, PRIOR TO INCORPORATION AS A CITY

2.1

LAND USE IN LACEY

Land uses in Lacey reflect a small-town heritage modified by more recent residential and commercial development. City growth and changes in land use are guided by the City of Lacey Comprehensive Plan (Lacey 2016), which was developed to comply with the requirements of the Growth Management Act (GMA), though Lacey has been doing non-mandated planning since 1983. One of the goals of the GMA is to promote development inside the municipal Urban Growth Area (UGA), which was designated as part of the City's land use plan that was adopted in 1994, to eliminate costly and environmentally damaging urban sprawl. This means that within the city limits the focus will be on redevelopment and infill. Prime areas for redevelopment include the Woodland District (west of city hall), the Depot District (south of Saint Martin's University), and the area south of Pacific Avenue and west of College Street.

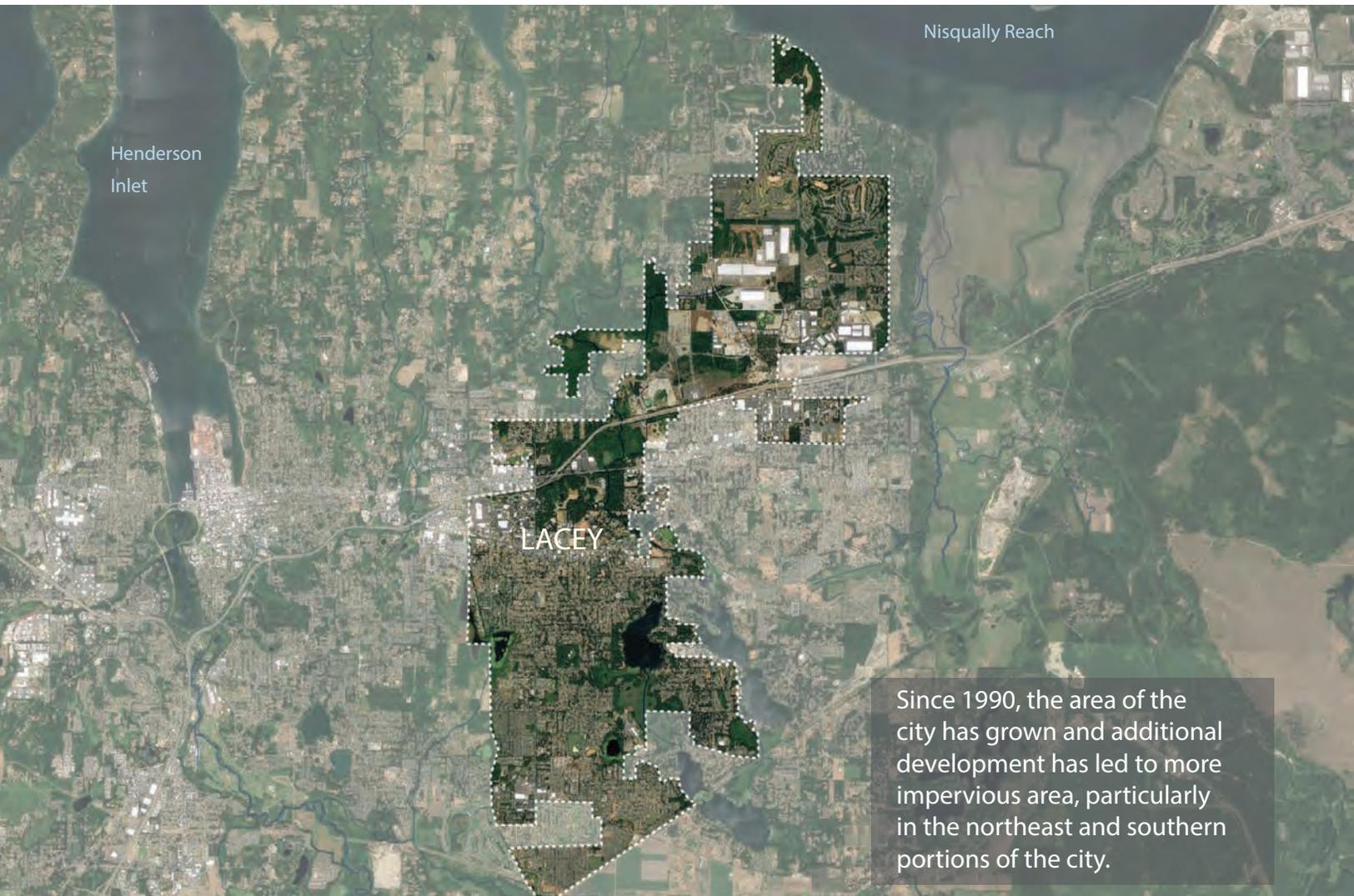
AERIAL SHOWING LACEY CITY LIMITS,
CIRCA 1990



As these development and redevelopment projects occur, they will be required to comply with the Lacey Municipal Code and Stormwater Design Manual (SDM), which include increasingly stringent standards for low impact development (LID) practices, on-site infiltration, stormwater treatment, and flow control. Therefore, it is expected that, over time, these new projects are likely to have a net benefit on stormwater management as more of the city is brought under the umbrella of contemporary stormwater management strategies.

Likewise, as the City annexes area inside the UGA, stormwater management services will need to be expanded to the new area to remain in compliance with the NPDES Phase II Permit. This, too, will result in more stormwater control, but will also increase the need for maintenance staff and equipment. Within the unincorporated UGA, development of undeveloped land will continue because the UGA still has large areas of undeveloped land (Lacey 2016). These greenfield developments will also be required to manage stormwater in accordance with City Code and the SDM. Since 2016, many of these greenfield properties have been developed, and the greenfield areas remaining typically have poor drainage which requires more technical expertise in hydrology during development review.

AERIAL SHOWING LACEY CITY LIMITS,
CIRCA 2019



2.2

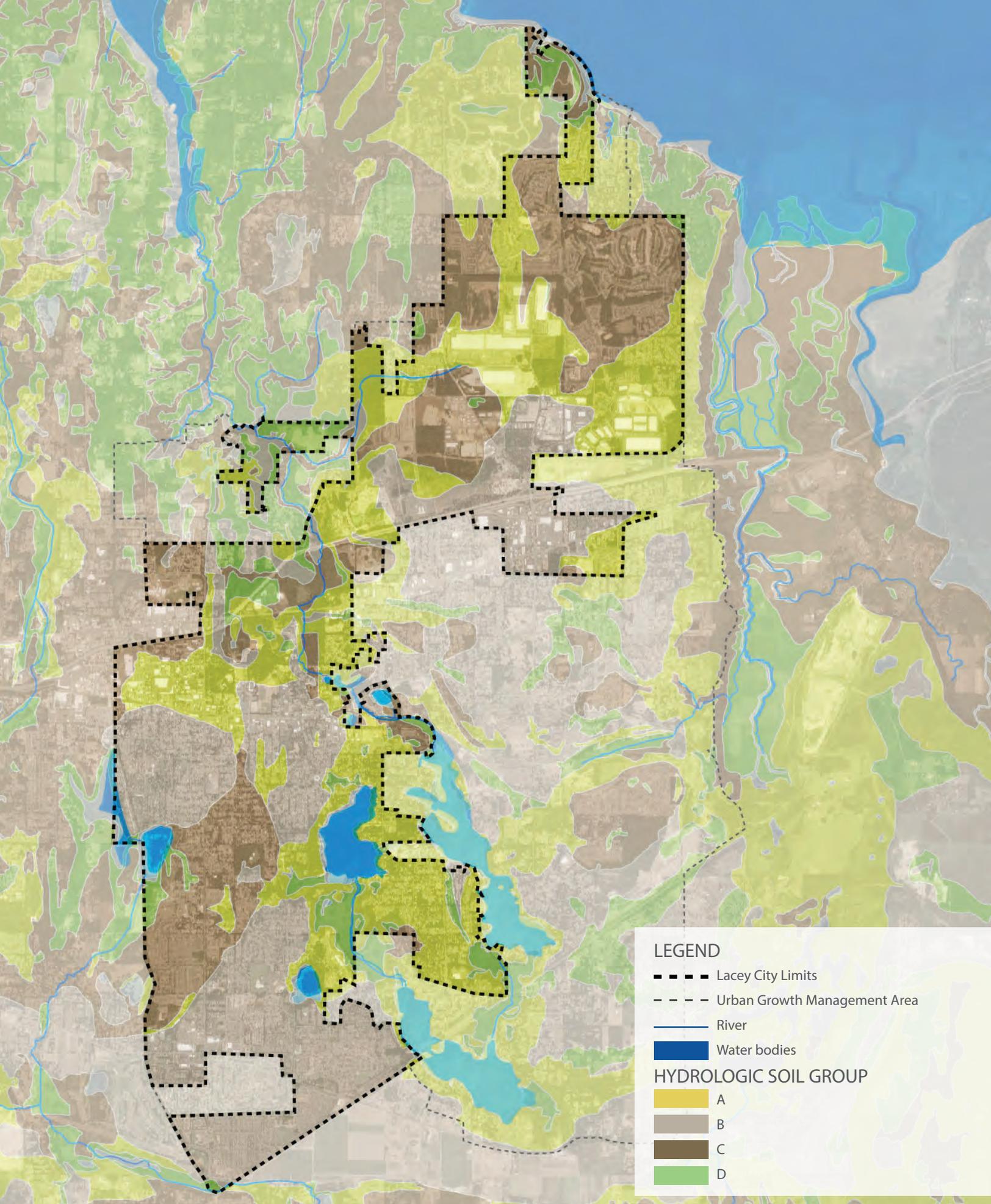
SOILS AND GROUNDWATER

Soils within Lacey are typical for the south Puget Sound Region, consisting of well-drained glacial outwash, intermixed with zones of glacial till and wetland peat bogs. The majority of the city is dominated by Hydrologic Soil Groups A and B, soils that generally have high infiltration capacities. These soils are generally most suitable for stormwater infiltration applications and constitute the following percentage of area in the city:

- Group A soils – 30 percent
- Group B soils – 37 percent

Hydrologic Soil Groups C and D are sandy or silty soils characterized by low permeability and relatively high runoff potential, making them less suitable for stormwater infiltration applications. A portion of the city is also occupied by wetlands and lakes. These soil groups constitute the following percentage of area in the city:

- Group C soils – 12 percent
- Group D soils – 15 percent
- Wetlands and lakes – 6 percent



LEGEND

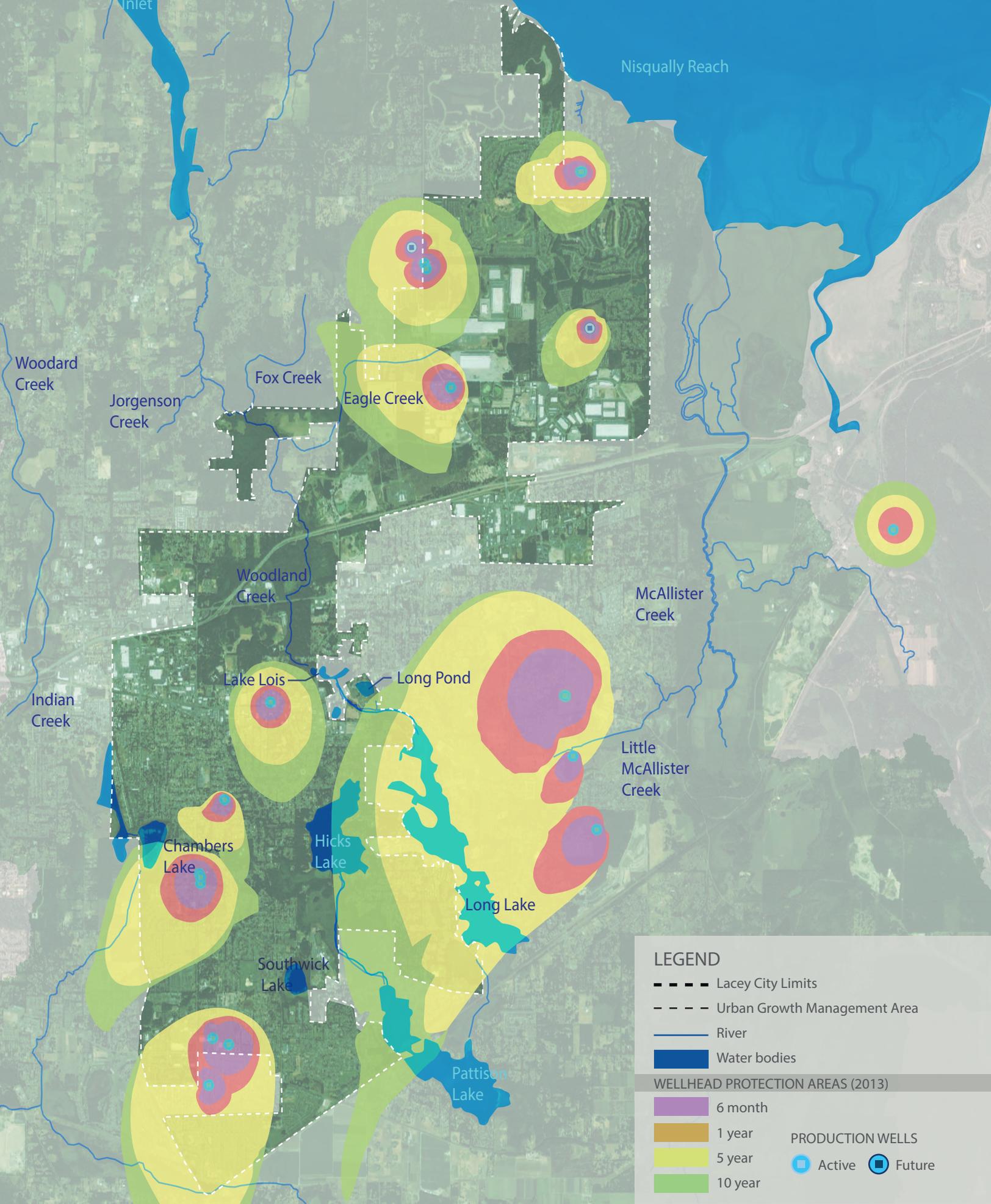
- Lacey City Limits
- - - Urban Growth Management Area
- River
- Water bodies

HYDROLOGIC SOIL GROUP

- A
- B
- C
- D

Sensitive groundwater areas in the city include Wellhead Protection Areas (WHPAs) and Critical Aquifer Recharge Areas (CARAs). WHPAs consist of a sanitary control area and time-based capture zones that are used to identify the area of influence around each drinking water well, and where land use management can help to reduce the risk of contamination (Lacey 2013). CARAs are defined as “areas with a critical recharging effect on aquifers used for potable water, including areas where an aquifer that is a source of drinking water is vulnerable to contamination that would affect the potability of the water, or is susceptible to reduced recharge” (WAC 365190030). Because WHPAs identify areas where land use is carefully regulated to avoid contamination of drinking water, groundwater in these areas should be protected. Heightened land use and infiltration regulations in these areas are governed through the City’s wellhead protection program (Environmental Element of the City of Lacey Water Comprehensive Plan) and the SDM to prevent contamination of drinking water. Future development in wellhead protection areas through land use and activity regulation is defined and enforced through the Lacey Municipal Code (LMC 14.36). These protected areas constitute the following percentage of the city:

- Wellhead Protection Areas (WHPAs) – 38 percent
- Critical Aquifer Recharge Areas (CARAs) – 100 percent



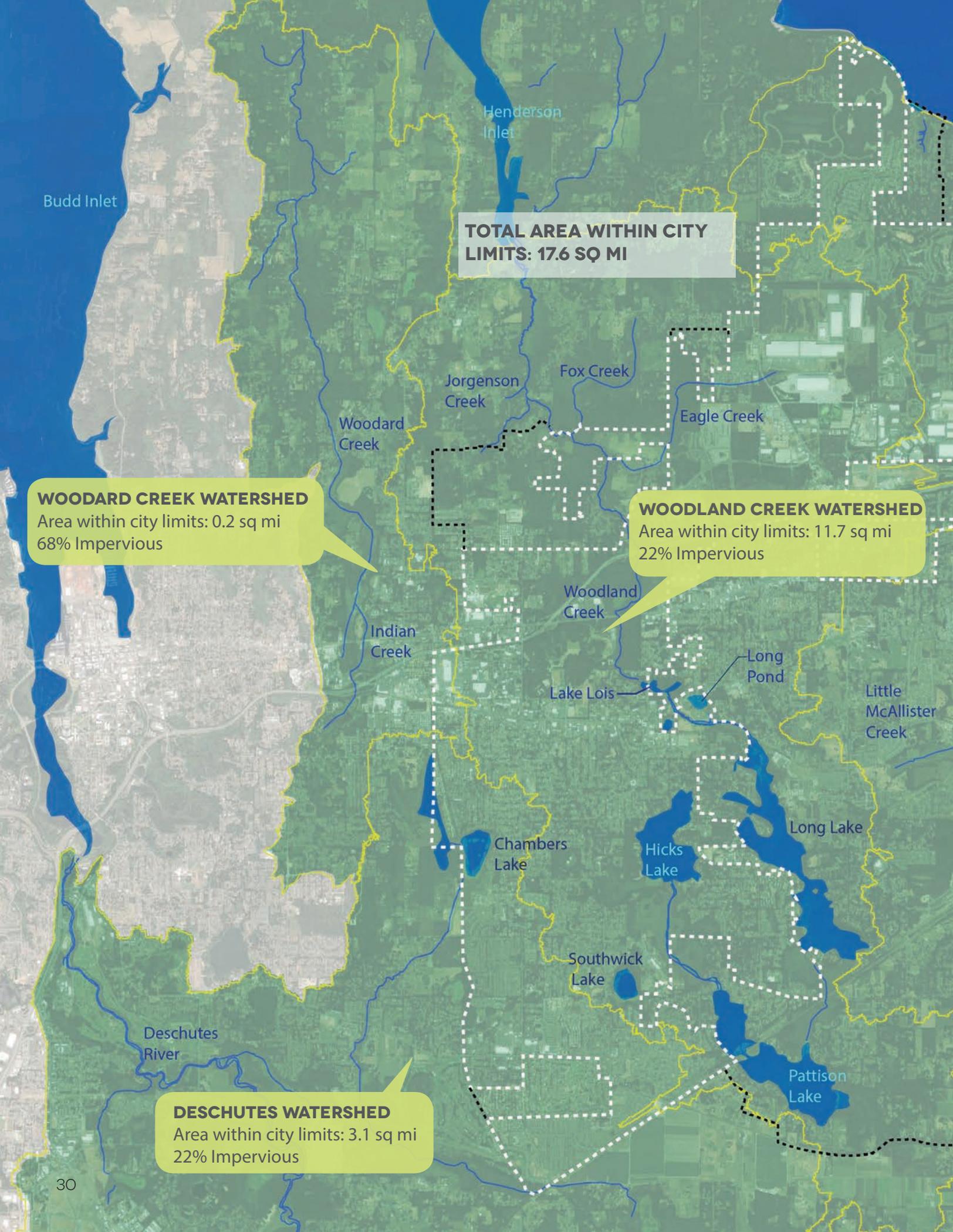
LEGEND

- Lacey City Limits
- - - Urban Growth Management Area
- River
- Water bodies

WELLHEAD PROTECTION AREAS (2013)

- 6 month
- 1 year
- 5 year
- 10 year

- PRODUCTION WELLS**
- Active
 - Future



Nisqually Reach

2.3

WATER BODIES AND INFRASTRUCTURE

Stormwater runoff within the city limits and the UGA drains to three watersheds along the Puget Sound: Henderson Inlet, the Deschutes River to Budd Inlet, and McAllister Creek to the Nisqually Reach. The Department of Ecology assesses the quality of all water bodies in the state to determine whether they are impaired by pollutants and require a water improvement project, or Total Maximum Daily Load (TMDL).

HENDERSON INLET

Tributaries to Henderson Inlet include Woodard Creek and Woodland Creek, which flows out of a chain of connected lakes: Hicks Lake, Pattison Lake, Long Lake, and Lake Lois. Other tributaries to Woodland Creek within the UGA include College Creek, Palm Creek, Eagle Creek, Fox Creek, and Jorgenson Creek. Henderson Inlet and its tributaries are subject to a TMDL for impairment due to fecal coliform bacteria and dissolved oxygen. Other concerns include high temperature and high peak flows in Woodland Creek and phosphorus and invasive vegetation in the four lakes.

NISQUALLY REACH

Runoff from the city flows east to the Nisqually Reach from Little McAllister Creek, which is a tributary of McAllister Creek. The Nisqually Reach and its tributaries are subject to a TMDL to address fecal coliform bacterial and dissolved oxygen impairment, though Little McAllister Creek and the City of Lacey are not specifically identified in this plan.

BUDD INLET

Runoff from the city flows northwest to Budd Inlet from Chambers Lake through the Deschutes River. Budd Inlet and its tributaries are subject to a TMDL for temperature impairment. In 2015, the City constructed the Chambers Lake Stormwater Treatment Facility to provide stormwater treatment for 187 acres that drain into Little Chambers Lake, and ultimately to the Deschutes River and Budd Inlet.

Additional information related to water bodies in the city and the specific activities required by the TMDLs can be found in Appendix B.

NISQUALLY REACH WATERSHED

Area within city limits:
2.6 sq mi
19% Impervious

LEGEND

--- City Limits

— Watershed Boundary

The City's Stormwater Utility manages a large and complex storm drainage system in the public right-of-way (Table 2-1). This storm drainage system is important to protecting public and private property, ensuring public safety, and providing flow control and water quality treatment to stormwater runoff before it discharges to receiving waters. A list of the City's stormwater facilities including information related to drainage area, function, and discharge waterbody is available in Appendix C.

TABLE 2-1. SUMMARY OF THE CITY OF LACEY STORMWATER SYSTEM.

ITEM	QUANTITY	UNITS
Catch basins and storm drains ^a	6,150	each
City Storm System pipe ^a	135	miles
Outfalls (discharging to surface water) ^a	83	each
Drywells (discharge via infiltration to groundwater) ^a	144	each
Water quality treatment facilities: Constructed Wetlands ^{a,b}	4	each
Water quality treatment facilities: Wet Ponds ^{a,b}	14	each
Water quality treatment facilities: Biofiltration Swales ^a	10	each
Retention/Detention Ponds and Infiltration Basins ^{a,c,d}	35	each
Regional Facilities primarily discharging to Groundwater ^{a,e}	44	each
Regional Facilities primarily discharging to Surface Water ^{a,e}	10	each
Municipal streets, centerline miles ^a	166.2	CL miles
Municipal streets, lane miles ^a	384	lane miles
Impervious surface area coverage in the City ^f	30.5	percent

^aBased on input from City staff and review of GIS data and files provided by the City.

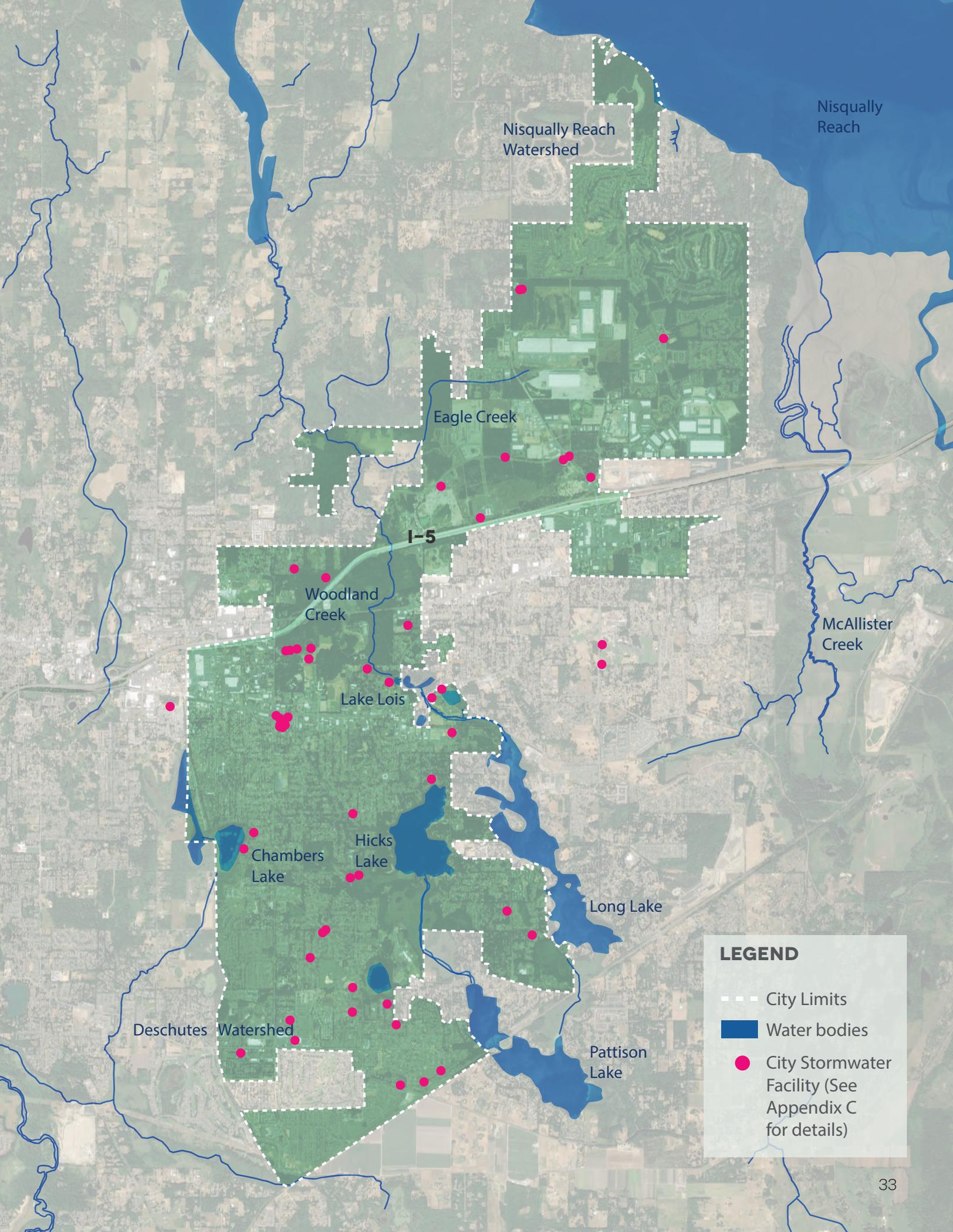
^bWater quality treatment facilities include wet ponds and constructed wetlands that are designed to remove pollutants from stormwater runoff.

^cDetention facilities include detention ponds that temporarily store stormwater runoff, reducing peak flows but eventually discharging the same volume. Detention facilities provide little or no infiltration of stored stormwater.

^dRetention facilities include retention ponds, swales and infiltration basins that are designed to hold stormwater runoff and release it by evaporation, plant transpiration, and/or infiltration into the ground, reducing peak flows and the volume discharged.

^eRegional facilities are large stormwater facilities (typically detention or retention ponds) that are designed to detain stormwater runoff from a number of new developments or areas within a drainage basin.

^fImpervious area calculated in 2013 and will be updated for the final version of this plan.



Nisqually Reach Watershed

Nisqually Reach

Eagle Creek

I-5

Woodland Creek

McAllister Creek

Lake Lois

Chambers Lake

Hicks Lake

Long Lake

Deschutes Watershed

Pattison Lake

LEGEND

- City Limits
- Water bodies
- City Stormwater Facility (See Appendix C for details)

2.4 CLIMATE CHANGE

Potential hydrologic changes associated with climate change increase the importance of stormwater management practices that control flows, promote infiltration, and preserve and enhance water quality. Table 2-2 illustrates how climate change is expected to affect stream flows, flood risk, water quality, and habitat. Increased winter precipitation will increase flood risk. The summertime increases in air temperature will result in an increase in evaporation and transpiration, exacerbating summer water deficits. Cold water fish using streams may be threatened by increased temperatures and reduced dissolved oxygen and flow. Coastal habitats are likely to be affected by sea level rise, increased eroding effects of waves and surge, and harmful algal blooms caused by warmer water temperatures. Specific climate change adaptation activities are discussed in Section 3.3.

TABLE 2-2. EXPECTED RESPONSES TO STORMWATER MANAGEMENT COMPONENTS FROM PREDICTED CLIMATE CHANGE EFFECTS. ^a

STORMWATER MANAGEMENT COMPONENT	PREDICTED RESPONSE TO CLIMATE CHANGE IN THE PUGET SOUND BASIN
Stream Flows	<ul style="list-style-type: none"> Increased winter flows Decreased summer flows Likely increased magnitude and frequency of peak events
Groundwater Supply	<ul style="list-style-type: none"> Decreased recharge during summer months Increased use during summer months
Flood Risk	<ul style="list-style-type: none"> Increased flood risk from rivers, streams, and stormwater conveyance system Possible increase in groundwater-induced flooding Increased flood risk along coastal areas due to sea level rise and increased surge height
Water Quality	<ul style="list-style-type: none"> Increased average and summer water temperature Increased erosion and suspended materials Lower dissolved oxygen Increased algal blooms
Habitat	<ul style="list-style-type: none"> Wetland conversion from perennial to seasonal Possible loss of streamside vegetation Decrease in cooler/oxygenated aquatic habitat Increased forest fire intensity

^aMauger 2017 and TRPC 2018.

2.5

STORMWATER UTILITY FUND

To meet the growing needs for stormwater management, the City created its Stormwater Utility Fund on January 24, 1985 under Ordinance No. 712. This new fund was established as an enterprise fund, similar to the City's sewer and water enterprise funds, with dedicated revenues and expenditures which made the stormwater utility self-supporting. The following year, Ordinance No. 794 established interim stormwater utility fees, which became effective on January 1, 1987. These were flat fees assessed to property owners on a per-parcel basis, which enabled the City to collect storm and surface water utility charges to provide services to residents, including operation of the stormwater utility, drainage basin analysis, and construction of facilities.

On April 26, 1990, LMC Chapter 13.70 was amended under Ordinance No. 886 to establish a more permanent rate structure, with a flat rate for single-family and two-family residential parcels and a seven-step sliding rate for commercial parcels. The new rate structure became effective on July 1, 1990, and is still in use today.

Funds received by the stormwater utility are used in the management and control of stormwater, operation and maintenance of the drainage system, and construction of stormwater facilities. Over the years, stormwater utility fees collected by the City have been used for an increasing number of purposes as stormwater issues and regulatory requirements have grown.

2.6

APPLICABLE REGULATIONS

The City's SWMP supports efforts to comply with the following local, state, and federal regulations and other requirements:



UIC in Seattle, WA



THE UNDERGROUND INJECTION CONTROL PROGRAM

The UIC program is a federal program intended to ensure that underground sources of drinking water are protected from surface discharges to the ground. In Washington, the UIC program is administered by Ecology through Chapter 173-218 of the Washington Administrative Code. The Guidance for UIC Wells that Manage Stormwater (Ecology 2006) lays out the requirements for UIC wells, and Ecology has included additional guidance in the latest update of the Stormwater Management Manual for Western Washington, released in 2019.

ECOLOGY TMDL IMPLEMENTATION PLANS

TMDL cleanup action is required for water bodies that have been identified as impaired on Ecology's Section 303(d) list due to poor water quality.



Photo Credit John Marshall

ACTION AGENDA FOR THE PUGET SOUND

The Puget Sound Partnership (PSP) is the regional organization that the Washington State Legislature established to coordinate and lead the effort to recover the Puget Sound (PSP 2018). The current action agenda implementation plan does not list any specific actions for Lacey at this time.



Photo Credit AP Images

THE FEDERAL ENDANGERED SPECIES ACT

The Federal Endangered Species Act (ESA) prohibits the take of all listed species, including a take that could result from the City's stormwater facility operations or private development stormwater management activities that are permitted by the City.



THE WASHINGTON STATE GROWTH MANAGEMENT ACT

The GMA requires the City to inventory and protect environmentally critical areas (such as steep slopes, wetlands, and streams) (Chapter 36.70A of the Revised Code of Washington). The GMA also requires the City to develop comprehensive plans in order to ensure environmentally responsible and economically sustainable development, including planning for stormwater-related capital facilities.



LACEY MUNICIPAL CODE

Several sections of the Lacey Municipal Code (LMC), including LMC 14.27 – Stormwater Management, govern aspects of stormwater management on new development and redevelopment project sites, as well as inspection and maintenance requirements for private stormwater facilities.



NPDES PHASE II MUNICIPAL STORMWATER PERMIT

The Phase II Permit (Ecology 2019b) has broad requirements associated with stormwater runoff and requires the City to develop several distinct SWMP components. The first Phase II Permit was issued by Ecology in 2007, reissued in 2012, and again in 2019. The requirements for the City's stormwater program have become more stringent with each new permit issuance. The permit requires that the City's SWMP meet requirements in 11 primary areas:

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

See the [Permit](#) online for a complete list of requirements.



NPDES PHASE II MUNICIPAL STORMWATER PERMIT (CONTINUED)

The latest Phase II Permit requires the City to take on several new activities between 2020 and 2024 in addition to the many ongoing requirements that carry over from the 2013-2019 Permit. The new activities listed below will have the greatest demand on staff time. Chapter 3 provides more detail on changes that will be needed to keep the City's SWMP in compliance with the evolving Phase II Permit requirements.

PUBLIC EDUCATION AND OUTREACH

Create a behavior change program that targets a local water quality issue using Community-Based Social Marketing (CBSM) by February 2021.



STORMWATER PLANNING

Convene an interdisciplinary team by August 2020.

Describe how stormwater management and protection of receiving waters are informing the planning process and influencing policies and strategies.

- Describe past actions in the Annual Report due March 2021
- Describe future actions by January 2023

Continue requiring LID principles and practices and assess and address barriers to LID implementation.

Complete Stormwater Management Action Planning (SMAP).

- Inventory and assess receiving waters by March 2022
- Prioritize watersheds in the city by June 2022
- Plan retrofits and actions for the highest-priority watershed by March 2023.



MUNICIPAL SEPARATE STORM SEWER SYSTEM PERMIT MAPPING AND DOCUMENTATION

Document size and material of storm system outfalls starting January 2020.

Complete mapping of all connections to privately-owned storm systems by August 2023.

Ensure that all stormwater mapping data is stored electronically with fully described mapping standards by August 2021.

Make storm system mapping available to Ecology, tribes, municipalities, and other permittees upon request.

SOURCE CONTROL PROGRAM FOR EXISTING DEVELOPMENT

Develop and implement a business inspection program with the following components:

- Adopt an ordinance requiring application of source control BMPs for pollutant-generating sources at existing land uses by August 2022.
- Develop an inventory of sites with the potential to generate pollutants by August 2022.
- Implement a business inspection program by January 2023.
- Implement a progressive enforcement policy by January 2023.
- Provide a training program for staff involved in these activities by January 2023.

CONTROLLING RUNOFF FROM NEW DEVELOPMENT, REDEVELOPMENT, AND CONSTRUCTION SITES

- Update local regulations and permitting processes to meet criteria specified in the Permit by June 2022.
- Update Lacey's 2016 Stormwater Design Manual

3 STORMWATER MANAGEMENT PROGRAM EVALUATION AND RECOMMENDATIONS

Chapter 3 of this plan summarizes the key SWMP recommendations for 2019–2024 Phase II Permit requirements. The recommendations were developed based on a gap analysis (comparison of the City’s present SWMP to the 2019–2024 Phase II Permit requirements) and a needs assessment conducted in 2018 and 2019 to evaluate specific components of the City’s SWMP with respect to Phase II Permit requirements. In addition to meeting permit requirements, Section 3.3 identifies climate change adaptation strategies and ways that the existing stormwater program builds climate change resiliency.



MAINTENANCE AT COLLEGE REGIONAL STORM FACILITY

3.1

LEVEL OF SERVICE

The City has identified activities to meet NPDES requirements and make cost-effective improvements in line with SWMP goals.



Recommended activities that address gaps between the existing program and the 2019 - 2024 Phase II Permit requirements are indicated with a blue and green circle and include due dates.

Other recommended activities will improve protection of critical groundwater resources, create a more effective stormwater submittal review process, and enable more proactive maintenance of the growing stormwater system.



PLANTING EVENT FOR MARTIN LUTER KING JR. DAY, JANUARY 2020

3.2

RECOMMENDATIONS

This section is generally organized by Phase II Permit components and includes summarized recommendations for the City's 2021 budget. A detailed list of recommendations with associated funding and staffing requirements, support for those requirements, and a proposed implementation schedule is provided in Appendix E.



SURFACE WATER QUALITY IMPROVEMENT: (SEE TABLE E-2)

Develop a Regional Water Quality Facility Program:

This purpose of this program will be to locate, design, and construct stormwater treatment facilities for existing untreated discharges. The first step will be conducting a study to map and prioritize areas without stormwater treatment so that water quality treatment facilities can be designed and constructed at the highest priority locations first.



GROUNDWATER QUALITY PROTECTION: (SEE TABLE E-3)

Develop stormwater infiltration policies.

These policies and regulations will aim to protect groundwater and specifically address UIC wells as part of the 2019 Stormwater Comprehensive Plan (SCP) update and 2021 SDM update.

Allocate 2 weeks of staff time each year to implement the Water Quality and Infiltration Retrofit Program of the CIP and hiring 1 Full Time Equivalent (FTE) staff person to enhance the regional groundwater monitoring program and an additional \$40,000 per year and 2 staff days per month to monitor groundwater in areas where deep UIC wells are proposed or existing.



PUBLIC PARTICIPATION: (SEE TABLE E-5)



Develop the following programs to satisfy Permit requirements in 2020 and 2021:

- Evaluate a behavior change resulting from an education program (July 2020)
- Community-based social marketing (CBSM) (February 2021)



POLLUTANT SOURCE CONTROL: (SEE TABLE E-6)



Increase staffing by 0.9 additional FTE to improve the commercial and residential facility inspection program and to satisfy permit requirements, starting in 2020:

Add auto accident tracking to the spill response plan (Expedite Implementation).

Map all MS4 outfalls (January 2020) and connections to the MS4 (August 2023).

Implement a source control program for existing development.

- Source control ordinance (August 2022)
- Enforcement policy (August 2022)
- Training program (January 2023)
- Inspection program (January 2023)

Increase staffing by 0.25 FTE to enhance the Stormwater Outfall Illicit Discharge screening program



INFRASTRUCTURE OPERATIONS AND MAINTENANCE:

(SEE TABLE E-7)



Contract approximately 200 hours of one-time outside support and add about 3 weeks of staff time each year to update Stormwater Pollution Prevention Plans (SWPPPs) to reflect changes at multiple City-owned facilities and record monitoring and inspections at these facilities.

Increase staffing by 200 hours per year to develop SOPs for facility operations and maintenance and other activities, as well as additional staff to account for the growing needs of the expanding system.



DEVELOPMENT PRACTICES: (SEE TABLE E-8)

- Hire one FTE to develop a framework and annually review new policies for LID principles, contribute to the SDM update in 2021 (included in the CIP), and improve site plan review, site inspections, and plan review checklists.

Contract approximately 430 hours of one-time outside support and add about 0.5 additional FTE to develop and implement policies for self-reporting from contractors and tenant improvements at non-residential sites, enhance inspector training and developer tools, and decrease stormwater submittal review time to 10 business days.



STORMWATER PLANNING, ADMINISTRATION, AND FUNDING: (SEE TABLE E-9)

- Contract approximately 1,100 hours of one-time outside support and staff support to update the Stormwater Comprehensive Plan 2026 and satisfy permit requirements, starting in 2020:
 - Summarize past coordination with long-range planning efforts.
 - Summarize planned coordination with long-range planning efforts.
 - Implement Stormwater Management Action Planning (SMAP) (March 2022 - March 2023).
 - Form an inter-disciplinary team to inform and assist with the development of the SWMP (starting by August 2020).

Contract approximately 80 hours of one-time outside support and add about 20 staff hours per year to update the stormwater rate structure to an impervious-area based structure and more efficiently integrate multiple types of software used by SWMP staff.



3.3

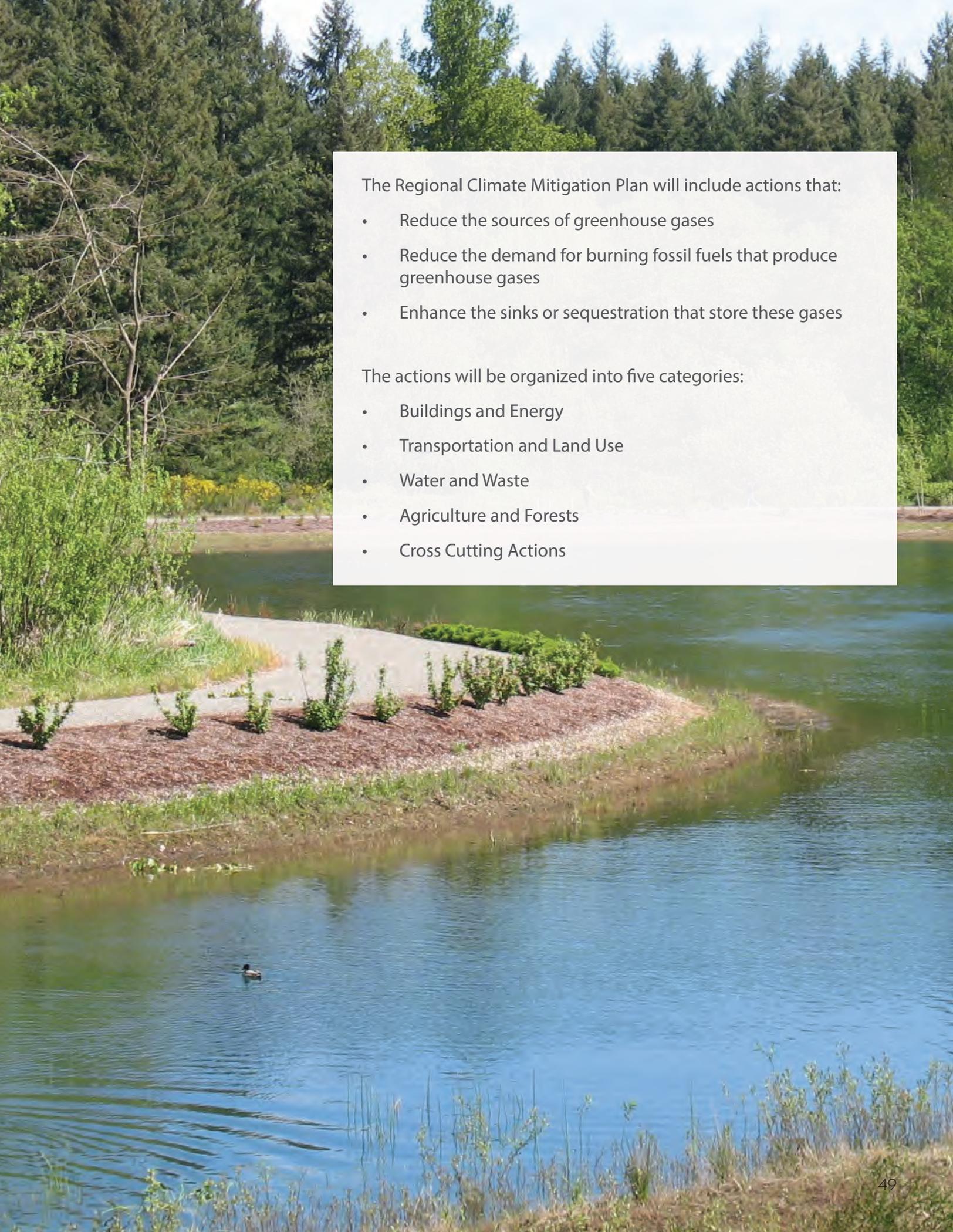
BUILDING CLIMATE CHANGE RESILIENCE THROUGH STORMWATER MANAGEMENT

Climate change is anticipated to have broad impacts on water resources in the City of Lacey (see Section 2.4). This section identifies which stormwater program activities have the greatest influence on building climate change resiliency. Many of these activities are part of the existing stormwater program. Activities that are not part of the program are identified with an asterisk.

STORMWATER MANAGEMENT ACTIVITIES ADDRESSING CLIMATE CHANGE IMPACTS	
CLIMATE CHANGE IMPACT	RESILIENCY-BUILDING ACTIVITY
PROGRAM ELEMENT: SURFACE WATER QUALITY IMPROVEMENT	
<ul style="list-style-type: none"> Increased erosion and suspended materials in water bodies Lower dissolved oxygen in receiving waters Increased algal blooms in receiving waters Increased average and summer water temperature 	Constructing stormwater quality retrofit projects and protecting and restoring riparian areas
PROGRAM ELEMENT: PUBLIC PARTICIPATION	
<ul style="list-style-type: none"> Lower dissolved oxygen in receiving waters Increased algal blooms in receiving waters 	Educational campaigns to encourage the public to decrease pollutant generation, such as by decreasing fertilizer use, particularly in lake watersheds
<ul style="list-style-type: none"> Wetland conversion from perennial to seasonal Possible loss of streamside vegetation Decrease in cooler/oxygenated aquatic habitat 	Public involvement in the stream team and other stewardship programs
PROGRAM ELEMENT: INFRASTRUCTURE OPERATIONS AND MAINTENANCE	
<ul style="list-style-type: none"> Increased flood risk from rivers, streams, and stormwater conveyance system 	Operations and maintenance activities including street sweeping and spot checks of inlets and other critical points in the stormwater conveyance system before storms

CLIMATE CHANGE IMPACT	RESILIENCY-BUILDING ACTIVITY
PROGRAM ELEMENT: DEVELOPMENT PRACTICES	
<ul style="list-style-type: none"> • Increased winter stream flows • Decreased summer stream flows • Likely increased magnitude and frequency of peak events in streams • Decreased groundwater recharge during summer months • Increased groundwater use during summer months • Increased flood risk from rivers, streams, and the stormwater conveyance system • Increased average and summer water temperature • Increased erosion and suspended materials in water bodies • Lower dissolved oxygen in receiving waters • Increased algal blooms in receiving waters 	<p>Continuing to require flow control on redevelopment projects and prioritizing infiltrating stormwater facilities; LID was the preferred approach.</p>
PROGRAM ELEMENT: STORMWATER PLANNING, ADMINISTRATION, AND FUNDING	
<ul style="list-style-type: none"> • Lower dissolved oxygen in receiving waters • Increased algal blooms in receiving waters 	<p>Reducing the amount of nutrients in stormwater through public education or regulations aimed at decreasing fertilizer use, particularly in lake watersheds.</p>
<ul style="list-style-type: none"> • Increased flood risk from rivers, streams, and stormwater conveyance system • Possible increase in groundwater-induced flooding • Increased flood risk along coastal areas due to sea level rise and increased surge height • Possible loss of streamside vegetation 	<p>Purchasing land for conservation purposes may offset loss of streamside vegetation and reduce flooding impacts by acquiring frequently-flooded properties *</p>
<ul style="list-style-type: none"> • Increased forest fire intensity 	<p>Developing a forest management plan with fire management strategies for vegetation in the City by coordinating with the Fire Department *</p>
<ul style="list-style-type: none"> • Increased flood risk from rivers, streams, and stormwater conveyance system 	<p>Revisiting flood reduction policies, design standards for new development, and priorities for retrofit projects</p>

In addition to adaptation measures listed on the prior pages, the City is taking planning actions that will mitigate climate change by reducing emissions and increasing sequestration of greenhouse gases. The Lacey City Council signed an interlocal agreement with Thurston County, Olympia, and Tumwater in April 2018 to complete Phase 1 of a Regional Climate Mitigation Plan. Phase 1 focused on assessing existing policies and targets of each jurisdiction for gaps and consistencies, recommending a regional emissions target, identifying each jurisdiction's implemented mitigation actions to date, and recommending a regional emissions reduction target. In addition, Phase 1 produced a recommended scope of work for Phase 2, with the ultimate deliverable being a Regional Climate Mitigation Plan and Implementation Strategy. The goal is to avoid significant human disruptions to the climate system to stabilize greenhouse gas levels in a timeframe sufficient to allow ecosystems to adapt naturally to climate change.

The background of the slide is a photograph of a natural landscape. In the foreground, there is a body of water, likely a lake or a wide river, with a concrete shoreline on the left. Several young, green trees are planted in a row along the concrete edge, with a bed of brown mulch around their bases. The water is calm, reflecting the sky. In the distance, a dense forest of tall evergreen trees covers a hillside under a clear blue sky. A small duck is visible swimming in the water in the lower-left quadrant.

The Regional Climate Mitigation Plan will include actions that:

- Reduce the sources of greenhouse gases
- Reduce the demand for burning fossil fuels that produce greenhouse gases
- Enhance the sinks or sequestration that store these gases

The actions will be organized into five categories:

- Buildings and Energy
- Transportation and Land Use
- Water and Waste
- Agriculture and Forests
- Cross Cutting Actions

4 CAPITAL IMPROVEMENT PROGRAM

This chapter summarizes the stormwater CIP. The purpose of the CIP is to define capital projects that make progress towards the City's long-term goals related to the following elements of the SWMP:



HOGUM BAY POND EXCAVATION



Flood Reduction



Surface Water Quality Improvement (retrofitting)



Ground Water Quality Protection



Public Participation



Habitat Improvement



Development Practices



Infrastructure Operations and Maintenance



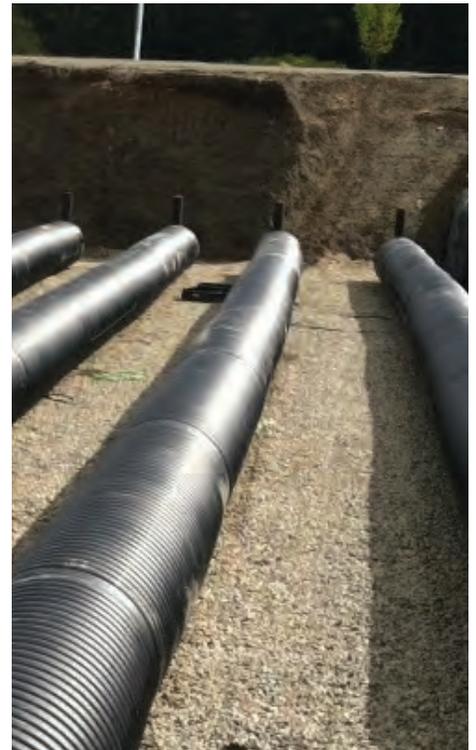
Stormwater Planning, Administration, and Funding

The City maintains and regularly updates a list of needed projects. The following section describes the process used to identify problems and develop and prioritize solutions. A map of stormwater CIP projects is included.

4.1

PROBLEM IDENTIFICATION AND SOLUTION DEVELOPMENT

The stormwater CIP from the 2013 SCP (Lacey 2013) was updated using input from City staff on completed projects and new problems. Problems were evaluated using desktop methods and field evaluation to assess site-specific opportunities and constraints. New project concepts were developed using desktop methods and an estimated cost was defined for each project. See Appendix D for more detailed information on CIP project design development.



INFILTRATION GALLERY

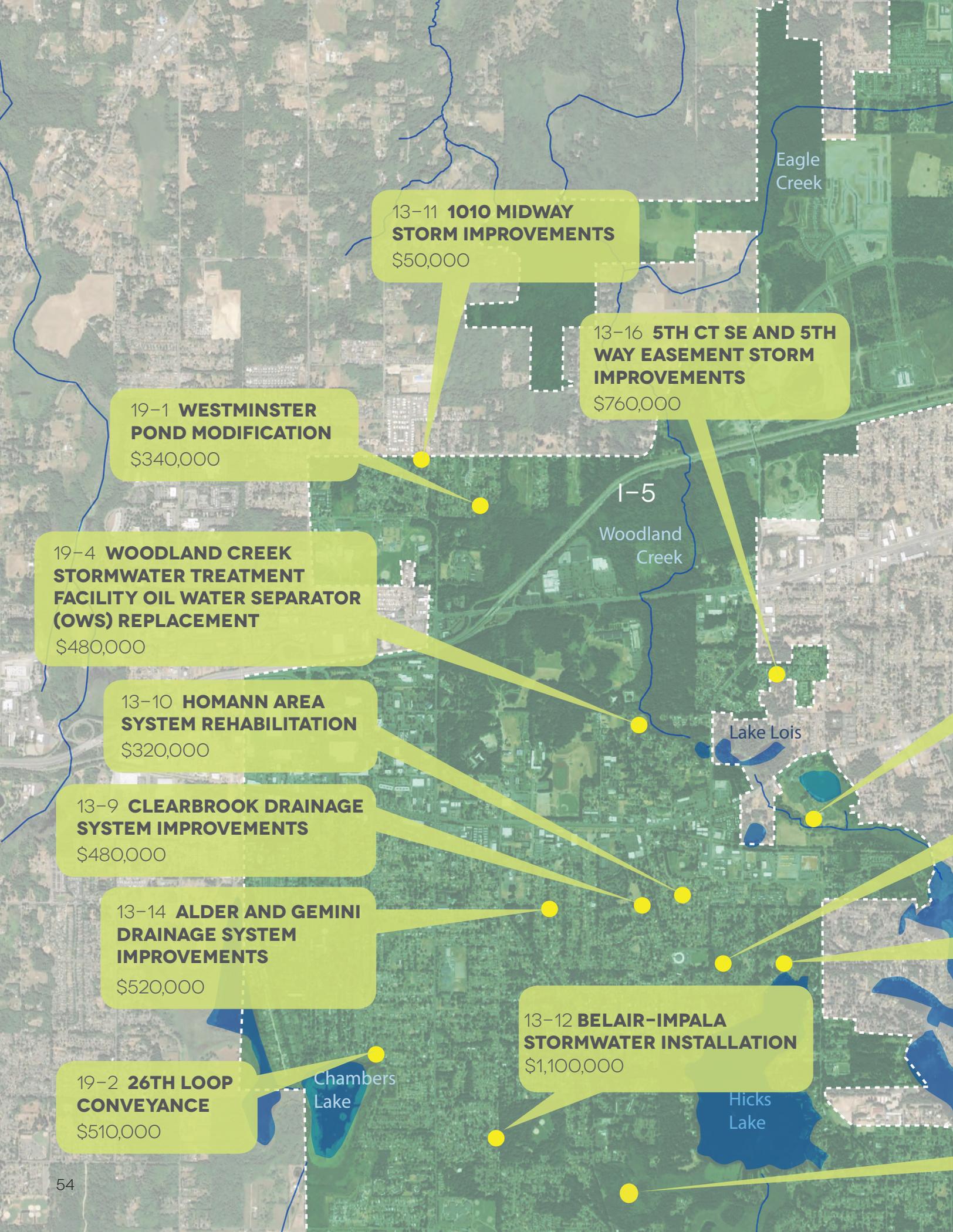
4.2

CIP PROJECT PRIORITIZATION

Stormwater problems and solutions were evaluated using a qualitative process, which considered input from City staff, review of background documents, and field reconnaissance of existing problems to prioritize a subset of CIP projects. This prioritization was then used to develop an implementation schedule that emphasized early completion of the projects providing the greatest benefit. Detailed prioritization results and project summary sheets are provided in Appendix D. The project implementation schedule is included in Chapter 5, Plan Implementation.



CHAMBERS LAKE STORMWATER TREATMENT WETLANDS



13-11 **1010 MIDWAY
STORM IMPROVEMENTS**
\$50,000

13-16 **5TH CT SE AND 5TH
WAY EASEMENT STORM
IMPROVEMENTS**
\$760,000

19-1 **WESTMINSTER
POND MODIFICATION**
\$340,000

19-4 **WOODLAND CREEK
STORMWATER TREATMENT
FACILITY OIL WATER SEPARATOR
(OWS) REPLACEMENT**
\$480,000

13-10 **HOMANN AREA
SYSTEM REHABILITATION**
\$320,000

13-9 **CLEARBROOK DRAINAGE
SYSTEM IMPROVEMENTS**
\$480,000

13-14 **ALDER AND GEMINI
DRAINAGE SYSTEM
IMPROVEMENTS**
\$520,000

13-12 **BELAIR-IMPALA
STORMWATER INSTALLATION**
\$1,100,000

19-2 **26TH LOOP
CONVEYANCE**
\$510,000

Eagle
Creek

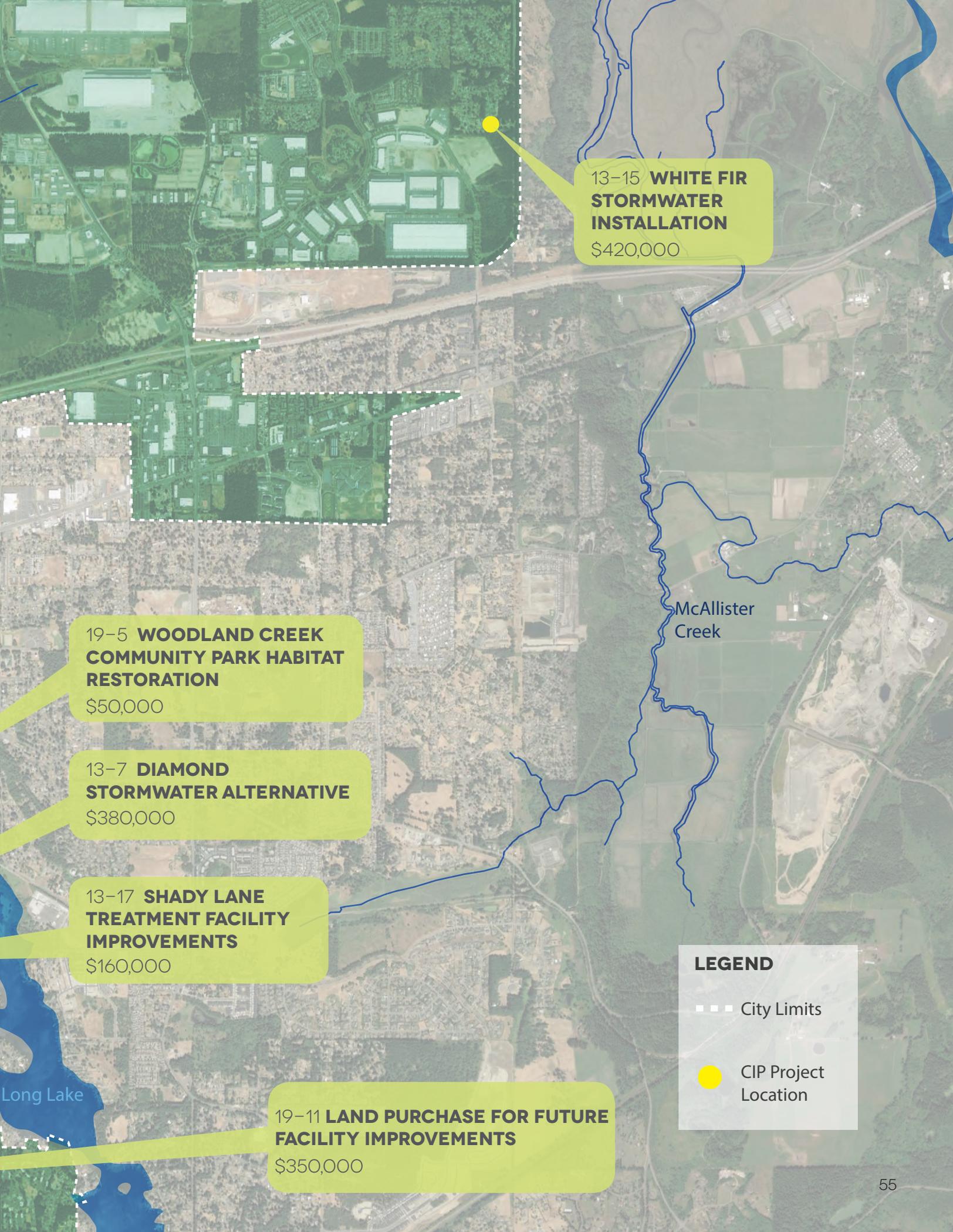
I-5

Woodland
Creek

Lake Lois

Chambers
Lake

Hicks
Lake



**13-15 WHITE FIR
STORMWATER
INSTALLATION**
\$420,000

**19-5 WOODLAND CREEK
COMMUNITY PARK HABITAT
RESTORATION**
\$50,000

**13-7 DIAMOND
STORMWATER ALTERNATIVE**
\$380,000

**13-17 SHADY LANE
TREATMENT FACILITY
IMPROVEMENTS**
\$160,000

**19-11 LAND PURCHASE FOR FUTURE
FACILITY IMPROVEMENTS**
\$350,000

LEGEND

- ▣ City Limits
- CIP Project Location

TABLE 4-1. CIP PROJECT TABLE.

#	ITEM	COST	GOALS IN PRIORITY ORDER
19-1	Westminster Pond Modification	\$340,000	
19-2	26th Loop Conveyance	\$510,000	
19-3*	Stormwater Design Manual Update (Mandated by NPDES Permit)	\$180,000	
19-4	Woodland Creek Stormwater Treatment Facility Oil Water Separator Replacement	\$480,000	
19-5	Woodland Creek Community Park Habitat Restoration	\$50,000	
19-6*	Stormwater Management Action Planning (Mandated by NPDES Permit)	\$100,000	
19-7*	Regional Water Quality Facility Program	\$100,000	
19-8*	Infiltration Retrofit Program	\$100,000	
19-9*	Miscellaneous Storm System Improvements	\$150,000	
19-10*	Stormwater Comprehensive Plan Update	\$250,000	
19-11	Land Purchase for Future Facility Improvements	\$350,000	

#	ITEM	COST	GOALS IN PRIORITY ORDER
13-7	Diamond Stormwater Alternative	\$380,000	
13-9	Clearbrook Drainage System Improvements	\$480,000	
13-10	Homann Area System Rehabilitation (Analysis/Design)	\$320,000	
13-11	1010 Midway Storm Improvements	\$50,000	
13-12	Belair-Impala Stormwater Installation	\$1,100,000	
13-14	Alder and Gemini Drainage System Improvements	\$520,000	
13-15	White Fir Stormwater Installation	\$420,000	
13-16	5th Ct SE and 5th Way Easement Storm Improvements	\$760,000	
13-17	Shady Lane Treatment Facility Improvements	\$160,000	

ICON KEY

- PUBLIC PARTICIPATION
- INFRASTRUCTURE OPERATIONS AND MAINTENANCE
- SURFACE WATER QUALITY IMPROVEMENT (RETROFITTING)
- STORMWATER PLANNING, ADMINISTRATION, AND FUNDING
- DEVELOPMENT PRACTICES
- GROUNDWATER QUALITY PROTECTION
- HABITAT IMPROVEMENT
- FLOOD REDUCTION

Notes.
 * = Projects are not location-specific and therefore not shown on the map.
 19-x = New CIP Projects for 2019 SCP.
 13-x ("Carryover" status) = Unaddressed Projects from 2013 CIP List.



5 PLAN IMPLEMENTATION

This chapter presents detailed information on implementing the recommended stormwater program activities presented in Chapter 3 and the capital projects described in Chapter 4. The major components of plan implementation include staffing needs, additional resource needs, completion of CIP projects that address existing stormwater issues, interdepartmental collaboration, interagency collaboration, and utility finances.



5.1

STORMWATER MANAGEMENT PROGRAM

ADDRESSING STAFFING NEEDS

Under the current level of staffing, City stormwater management personnel are able to address stormwater problems that arise on a daily basis and troubleshoot specific issues that arise with development project reviews, but they are not fully able to perform activities that would enable continual improvement of the City's stormwater system. Current staffing levels will not be adequate to meet the requirements of the 2019–2024 Phase II Permit and defined SWMP goals during future years. The activities listed in the table opposite will require additional staffing shown on page 62. Refer to Appendix E for a detailed estimate of staffing needs.

ACTIVITIES THAT WILL REQUIRE ADDITIONAL STAFF TIME	
 <p>Development Practices</p>	<p>Review new policies for LID principles</p> <p>Update the SDM</p> <p>Improve site plan review and site inspections</p> <p>Develop policies for self-reporting from contractors and tenant improvements</p>
 <p>Pollution Source Control</p>	<p>Improve the commercial and residential facility inspection program</p> <p>Map all MS4 outfalls (due January 2020) and connections (due August 2023) to the MS4</p> <p>Implement the Source Control Program for existing Development to begin by January 2023</p> <p>Enhance the Stormwater Outfall Illicit Discharge Screening Program</p>
 <p>Infrastructure Operations and Maintenance</p>	<p>Update SWPPPs</p> <p>Develop SOPs for facility operations and maintenance and other activities</p> <p>Expand the O&M program to account for the growing needs of the program</p>
 <p>Groundwater Quality Protection</p>	<p>Develop stormwater infiltration policies</p> <p>Implement the Enhanced Regional Groundwater Monitoring Program</p> <p>Monitor groundwater in areas where UICs are proposed or existing</p>
 <p>Surface Water Quality Improvement (retrofitting)</p>	<p>Implement the Regional Water Quality Facility Program</p>
 <p>Public Participation</p>	<p>Evaluate behavior change resulting from an education program</p> <p>Conduct CBSM by February 2021</p>
 <p>Stormwater Planning, Administration, and Funding</p>	<p>Summarize past and planned coordination with long-range planning efforts by January 2023</p> <p>Implement SMAP starting in March 2022</p> <p>Form an inter-disciplinary team to inform and assist with the development of the SWMP</p> <p>Update the stormwater rate structure</p> <p>Integrate multiple types of software used by SWMP staff</p>

In addition to the staffing requirements discussed in Chapter 3, the City will need staff to manage the construction management and project management aspects of proposed CIP projects. These costs are included in Appendix D. Additional staffing needs for the CIP will not be determined until the Water Utility has developed their CIP implementation schedule.

Given this list of new activities that staff will have to take on during the planning period (see page 61), the City's stormwater program would benefit from the following additional staff positions:

[A] 2021

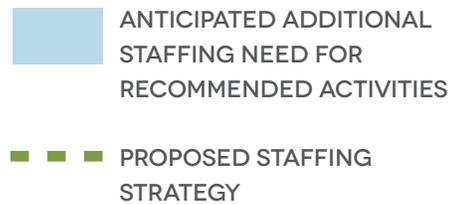
- Hire 1 full-time Engineering Technician III to support Development Practices activities by improving site plan review
- Replace one of the half-time O&M staff with a full-time Journeyman to account for growing O&M needs of the City's stormwater system
- Hire one full-time hydrogeologist to implement the Groundwater Monitoring Program, the UIC monitoring program, and the Regional Water Quality Facility Program. Funding for this position will be shared with the Water Utility.

[B] 2022

- Hire 1 full-time Stormwater Planner to implement the source control program for existing development and support stormwater planning activities

[C] 2023

- Hire 1 half-time journeyman to support the growing O&M needs of the City's stormwater system

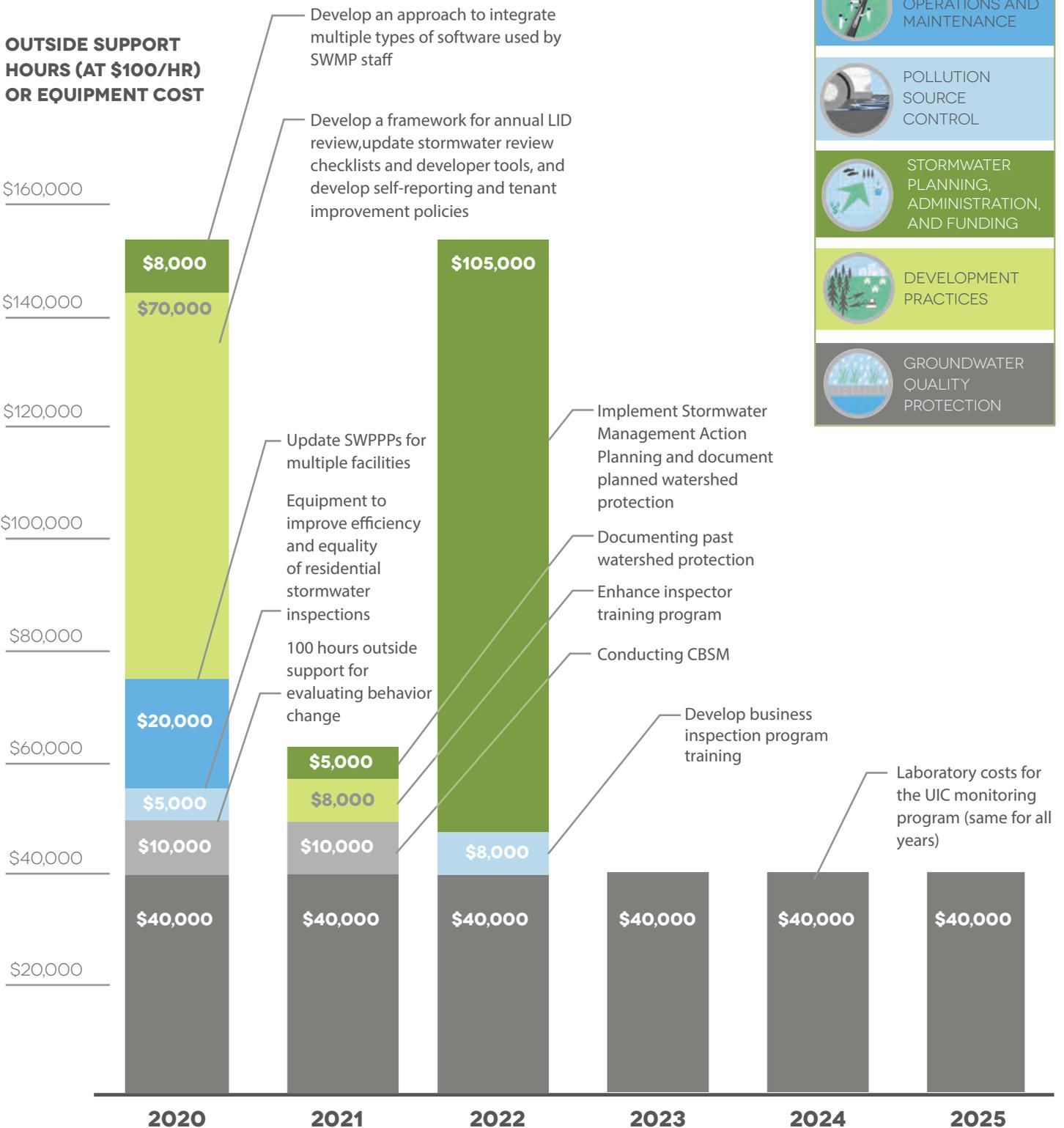


FULL-TIME EQUIVALENT STAFF



OUTSIDE SUPPORT

Refer to Chapter 3 for more details on these recommendations.



5.2

CAPITAL IMPROVEMENT PROGRAM

TABLE 5-1. CAPITAL IMPROVEMENT PROGRAM IMPLEMENTATION SCHEDULE.

#	PROJECT NAME	2020	2021	2022	2023	2024	2025	OUT YEARS**
19-1	Westminster Pond Modification			\$60,000	\$280,000			
19-2	26th Loop Conveyance				\$100,000	\$410,000		
19-3	Stormwater Design Manual Update (Mandated by NPDES Permit)	\$50,000	\$60,000	\$70,000				
19-4	Woodland Creek Stormwater Treatment Facility Oil-Water Separator Replacement		\$50,000	\$430,000				
19-5	Woodland Creek Community Park Habitat Restoration		\$50,000					
19-6	Stormwater Management Action Planning (Mandated by NPDES Permit)			\$100,000				
19-7	Regional Water Quality Facility Program				\$100,000	\$100,000		
19-8	Infiltration Retrofit Program					\$100,000	\$100,000	
19-9	Miscellaneous Storm System Improvements	\$150,000	\$150,000	\$150,000	\$150,000	\$150,000	\$150,000	
19-10	Stormwater Comprehensive Plan Update					\$80,000	\$170,000	
19-11	Land Purchase for Future Facility Improvements		\$350,000					
CARRYOVER CAPITAL PROJECTS FROM 2013 CIP								
13-7	Diamond Stormwater Alternative						\$80,000	\$300,000
13-9	Clearbrook Drainage System Improvements						\$80,000	\$400,000
13-10	Homann Area System Rehabilitation (analysis/design)					\$120,000	\$200,000	
13-11	1010 Midway Storm Improvements							\$50,000
13-12	Belair-Impala Stormwater Installation	\$100,000	\$1,000,000					
13-14	Alder and Gemini Drainage System Improvements					\$70,000	\$450,000	
13-15	White Fir Stormwater Installation							\$420,000
13-16	5th Ct SE and 5th Way Easement Storm Improvements							\$760,000
13-17	Shady Lane Treatment Facility Improvements					\$160,000		
TOTAL		\$300,000	\$1,660,000	\$810,000	\$630,000	\$1,190,000	\$1,230,000	\$1,930,000

**The projects listed in the 'out years' column have not been scheduled during the planning period and are not accounted for in the financial analysis

19-x = New CIP Projects for 2019 SCP. 13-x ("Carryover" status) = Unaddressed Projects from 2013 CIP List; cost estimate from 2013 projected at +4% per annum. All costs in 2019 dollars.



CIP projects were developed for known problems that include issues like neighborhood-scale flooding, poor water quality, failing infrastructure, and projects that address NPDES permit requirements.

The City will implement stormwater CIP projects in the order shown in Table 5-1. In addition to implementation of the CIP projects listed in Table 5-1, the City should take the following steps to ensure an effective stormwater CIP:

- Annually meet with all Public Works Operations staff to evaluate the risk of known problems and identify new problems
- Annually review the data contained in CIP and Non-CIP related tables contained in this plan and add any new information that is collected regarding each problem and solution
- Annually add new potential projects to the CIP and Non-CIP project lists during the development of the SWMP Annual Report in March
- Maintain a stormwater problem and CIP project file with all information that will be useful for updating the CIP
- Review the CIP chapter when the City's Stormwater Comprehensive Plan is updated every 6 years

There are some known issues that are not being addressed by the CIP due to lack of public support, political barriers, or coordination with other projects with uncertain timing; however, these problems are expected to persist and potentially worsen during the planning period. As the City revisits its CIP priorities, several such issues should be considered:

- Nuisance flooding caused by ditches that have been filled in by adjacent property owners
- Corrosion of the Hicks-Pattison culvert just outside the city limits
- Corrosion of pipes along Martin Way and untreated discharge to Woodland Creek near the city limits
- Future need to upsize the College Regional Storm Facility outfall pipe under I-5

5.3

INTERDEPARTMENTAL COLLABORATION

The stormwater management program is led by stormwater staff in the Water Resources Division of the Public Works Department. The Water Resources Division works closely with other City departments and divisions, including the Public Works Operations Division, Parks and Recreation, and Community and Economic Development. The list below indicates Departments in the City which work closely with Water Resources on various program elements.



Flood Reduction

- ENGINEERING DIVISION (PUBLIC WORKS DEPARTMENT)



Habitat Improvement

- PARKS MAINTENANCE DIVISION (PUBLIC WORKS DEPARTMENT)



Public Participation

- PUBLIC AFFAIRS DEPARTMENT
- PARKS MAINTENANCE DIVISION (PUBLIC WORKS DEPARTMENT)



Development Practices

- ENGINEERING DIVISION (PUBLIC WORKS DEPARTMENT)
- COMMUNITY AND ECONOMIC DEVELOPMENT DEPARTMENT



Infrastructure Operations and Maintenance

- PARKS MAINTENANCE DIVISION (PUBLIC WORKS DEPARTMENT)
- OPERATIONS DIVISION (PUBLIC WORKS DEPARTMENT)



Stormwater Planning, Administration, and Funding

- COMMUNITY AND ECONOMIC DEVELOPMENT DEPARTMENT
- FINANCE DEPARTMENT
- PUBLIC WORKS DEPARTMENT

5.4

INTERAGENCY COLLABORATION

To address ongoing regional coordination needs, the City should continue to work with regional stakeholder groups and other local governments in shared drainage basins to protect groundwater and surface water quality and to manage and treat stormwater effectively. The list below indicates agencies and regional programs related to Lacey's stormwater program elements.



Flood Reduction

- THE FUTURE HICKS LAKE TO PATTISON LAKE CONVEYANCE REPLACEMENT PROJECT AND THE FUTURE MARTIN WAY PIPE REPLACEMENT PROJECT WILL REQUIRE COORDINATION WITH THURSTON COUNTY



Surface Water Quality Improvement (Retrofitting)

- THE FUTURE COLLEGE REGIONAL STORM FACILITY OUTFLOW SYSTEM PROJECT WILL REQUIRE COORDINATION WITH WASHINGTON STATE DEPARTMENT OF TRANSPORTATION (WSDOT)
- THE FUTURE WOODLAND CREEK/MARTIN WAY WQ RETROFIT MAY REQUIRE COORDINATION WITH THURSTON COUNTY



Ground Water Quality Protection

- THURSTON COUNTY PUBLIC HEALTH AND SOCIAL SERVICES DEPARTMENT
- THURSTON REGIONAL PLANNING COUNCIL



Public Participation

- REGIONAL ENVIRONMENTAL EDUCATION PROGRAM (REEP)
- NORTH THURSTON PUBLIC SCHOOLS



Stormwater Planning, Administration, and Funding

- HENDERSON INLET TMDL – COORDINATION WITH THE CITY OF OLYMPIA
- SMAP – POSSIBLE COORDINATION WITH NEIGHBORING JURISDICTIONS INCLUDING THE CITY OF TUMWATER, THE CITY OF OLYMPIA, AND THURSTON COUNTY, THOUGH THIS IS NOT REQUIRED

5.5

STORMWATER UTILITY FINANCES

The activities and projects listed in this plan are funded by revenue from the stormwater utility. A financial analysis will be conducted to define utility rate adjustments that are necessary to implement this plan. This plan presents a recommended level of service for SWMP activities and CIP projects. This will allow the City to maintain compliance with regulations, correct the most significant stormwater system problems, and make progress towards the City's long-term stormwater goals while keeping rates competitive with neighboring jurisdictions and avoiding large rate increases. The required rates for 2021 through 2026 will be incorporated into this plan prior to City Council approval and a detailed financial analysis will be attached to this plan as an appendix.



DRAINAGE SWALE AND FALL COLOR



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APPENDIX A

Detailed Stormwater Goals and Policies

DETAILED STORMWATER GOALS AND POLICIES

City staff developed long-term goals for each SWMP program element below. Program elements are a comprehensive list of functions performed or influenced by the SWMP. This Appendix lists policies from the previous Stormwater Comprehensive Plan developed in 2013 (SCP 2013) related to each long-term goal. Policies that apply to multiple program elements are indicated with an asterisk.

- **Flood Reduction:** There is no flooding of the public stormwater system due to large storm events.
 - FC1. Comply with all applicable requirements from federal, state, Thurston County, and City of Lacey related to flood protection
 - FC2. Develop new drainage projects for the CIP plan to address flooding problems when these problems cannot be addressed through maintenance of the existing infrastructure
 - FC3. Continue to encourage and allow the use of LID stormwater Best Management Practices for flow control for new development and redevelopment in accordance with current regulations *
 - FC4. Provide adequate stormwater conveyance in the public storm drain system as follows:
 - Accommodate the 10-year 24-hour event from existing development within the public storm drain system, except as noted in the three bullets below
 - Accommodate the 25-year 24-hour event from existing development for storm drains and culverts that pass under public roads
 - Accommodate the 25-year 24-hour event from existing development within the long term UGA boundary public right-of-way without having water over more than 50 percent of the driving lane
 - Accommodate the 100-year 24-hour event from existing development for culverts and bridges that convey natural channels
- **Surface Water Quality Improvement:** All surface water bodies in Lacey meet water quality criteria for designated recreation and fish uses.

WQ1. Comply with all applicable requirements from federal, state, and local governments related to water quality *

WQ2. Develop new stormwater treatment projects for the CIP plan when these problems cannot be addressed through source control or maintenance of the existing infrastructure *

WQ3. When practicable, add or improve water quality treatment whenever constructing new stormwater infrastructure or conducting maintenance, repair, rehabilitation, or replacement of aging City stormwater infrastructure *

WQ4. Protect surface water quality by addressing potential nutrient loading from stormwater *

- **Ground Water Quality Protection:** Groundwater quality is not negatively affected (quantity or quality) by stormwater practices.

WQ5. Protect groundwater resources by regulating land use activities, such as requiring a higher level of stormwater treatment within wellhead protection areas, and encouraging practices that minimize impacts to groundwater, such as preserving native vegetation or planting low-input vegetation

- **Habitat Improvement:** Aquatic species thrive in surface water bodies in Lacey.

G2. Improve public knowledge of stormwater runoff issues, encourage public involvement in stewardship activities, and encourage public support for the City's stormwater management program *

G3. Ensure that new development, redevelopment, and City projects are in conformance with the City's adopted stormwater requirements *

G4. Analyze proposed new development and redevelopment for potential impacts on the downstream storm drainage system and water quality as part of the stormwater plan review process *

G10. Oversee construction and maintenance of privately owned stormwater facilities to ensure that they function as designed to protect private property, public property, and the environment *

FC3. Continue to encourage and allow the use of LID stormwater Best Management Practices for flow control for new development and redevelopment in accordance with current regulations *

WQ1. Comply with all applicable requirements from federal, state, and local governments related to water quality *

WQ2. Develop new stormwater treatment projects for the CIP plan when these problems cannot be addressed through source control or maintenance of the existing infrastructure *

WQ3. When practicable, add or improve water quality treatment whenever constructing new stormwater facilities or conducting maintenance, repair, rehabilitation, or replacement of aging City stormwater facilities *

WQ4. Protect surface water quality by addressing potential nutrient loading from stormwater *

- **Public Participation (education, outreach, and involvement):** The public understands how their actions and choices affect stormwater and acts in ways that reduce stormwater flow rates and improve water quality and aquatic habitat.

G2. Improve public knowledge of stormwater runoff issues, encourage public involvement in stewardship activities, and encourage public support for the City's stormwater management program *

- **Pollutant Source Control:** Pollutants do not enter stormwater.

G2. Improve public knowledge of stormwater runoff issues, encourage public involvement in stewardship activities, and encourage public support for the City's stormwater management program *

G3. Ensure that new development, redevelopment, and City projects are in conformance with the City's adopted stormwater requirements *

G4. Analyze proposed new development and redevelopment for potential impacts on the downstream storm drainage system and water quality as part of the stormwater plan review process *

G10. Oversee construction and maintenance of privately owned stormwater facilities to ensure that they function as designed to protect private property, public property, and the environment *

FC4. Continue to encourage and allow the use of LID stormwater Best Management Practices for flow control for new development and redevelopment in accordance with current regulations *

- **Infrastructure Operations and Maintenance:** All stormwater infrastructure operates as intended.

G6. Construct new or improved stormwater facilities in accordance with the current CIP plan

- G11. Proactively maintain, repair, rehabilitate, and replace aging City stormwater facilities and minimize the need for costly and disruptive emergency repairs
- **Development Practices:** Runoff from developed areas mimics forested hydrology and water quality.
- G3. Ensure that new development, redevelopment, and City projects are in conformance with the City's adopted stormwater requirements *
- G4. Analyze proposed new development and redevelopment for potential impacts on the downstream storm drainage system and water quality as part of the stormwater plan review process *
- G10. Oversee construction and maintenance of privately owned stormwater facilities to ensure that they function as designed to protect private property, public property, and the environment *
- FC5. Continue to encourage and allow the use of LID stormwater Best Management Practices for flow control for new development and redevelopment in accordance with current regulations *
- **Comprehensive Planning, Administration, and Funding:** Revenue is wisely invested and produces measurable positive outcomes, including regulatory compliance. Utility rates are fair and equitable.
- G1. Continue to develop and implement a comprehensive stormwater management program consistent with requirements of the federal Clean Water Act, the Phase II Permit issued by the Washington State Department of Ecology, the state Growth Management Act, and the Puget Sound Action Agenda
- G5. Coordinate with other departments throughout the stormwater plan review, permitting, and project approval process to ensure that the process results in a functional stormwater system
- G7. Review the CIP list annually to identify new projects, remove completed projects, refine planned projects, and reevaluate project prioritization
- G8. Participate in the development and implementation of regional water quality management plans, groundwater management plans, stormwater management plans, lake management plans, drainage basin plans, watershed action plans, and wellhead protection plans to ensure that Lacey's water resources are protected
- G9. Continue to work cooperatively with other local governments through joint basin planning in shared drainage basins to provide regionally coordinated planning, construction, and maintenance for regional stormwater facilities.

- G12. Revise this Stormwater Comprehensive Plan every 6 years, or sooner if needed, to ensure that it provides for effective long-term stormwater project planning, system maintenance, response to mandates, and program funding
- M1. Prioritize the most beneficial and cost-effective projects and programs to ensure that available resources are used efficiently
- M2. Implement an equitable and logical stormwater utility rate structure
- M3. Review the rate structure and projected future rates and expenses on a regular basis to ensure that utility rates will adequately fund implementation of this plan
- M4. Actively seek outside funding to leverage or complement utility funds in order to implement this plan

APPENDIX B

Surface Water Bodies that Receive Stormwater Runoff

SURFACE WATER BODIES THAT RECEIVE STORMWATER RUNOFF

The City has an abundance of natural water resources that includes a chain of connected lakes that flow from one to another through wetlands, culminating in Woodland Creek, which drains to Henderson Inlet on Puget Sound. This chain begins with Hicks Lake, which flows into Pattison Lake, which in turn flows into Long Lake. The outflow from Long Lake forms Woodland Creek which then flows through Lake Lois, turns north, flows out of Lacey and enters the southern end of Henderson Inlet.

During the development of the 2013 SCP, all drainage basin boundaries within the City limits and the UGA were delineated using digital elevation data (PSLC 2002) and the City's storm drain system GIS data (City of Lacey 2011). In addition, the City developed a comprehensive GIS-based dataset of all impervious surfaces inside the City limits that delineates five surface types within the City limits based on aerial photography (Lacey 2009):

- Building footprints
- Roadways
- Parking lots
- Sidewalks
- Driveways

The impervious surface delineation is in the process of being updated. Finally, drainage basins were delineated for 53 stormwater facilities. The regional stormwater pond drainage basins include all area that is immediately tributary to the pond, excluding upstream areas that are managed by other stormwater facilities.

Figure B-1 displays the water bodies and major drainage basins within the city limits and the UGA. Figure B-2 displays the impervious surface distribution within the City limits and Table B-1 displays the percent of impervious surface within each basin. A stormwater system atlas was developed in 2013 that displays the storm drain system, the impervious surface data set, and the regional stormwater pond drainage basins.

Table B-1. Drainage Basin Impervious Area.					
Receiving Waterbody	Drainage Basin	Total Basin Area (ac)	Basin Area within the City Limits (ac)	Percent of Basin within the City Limits (%)	Percent Impervious within the City Limits and UGA ^a
Woodard Creek to Henderson Inlet	Indian Creek	893	128	14	65
	Woodard Creek Outlet	4,966	20	0.4	82
Deschutes River	Chambers Lake	947	601	63	31
	Deschutes River	18,565	1,387	7	41
Woodland Creek to Henderson Inlet	College Regional Stormwater Facility	424	424	100	43
	Eagle Creek	1,919	1,348	70	16
	Fox Creek	1,097	3	0.3	7
	Long's Pond	50	27	54	10
	Hicks Lake	1012	951	94	39
	Lake Lois	572	215	38	39
	Long Lake	2,160	432	20	24
	Pattison Lake	2,187	393	18	20
	Ruddell Road Stormwater Treatment Facility	114	113	99	35
	Southwick Lake	236	216	92	29
	Woodland Creek Outlet	5,878	2,321	39	36
Henderson Inlet	Henderson Inlet	15,423	989	6	15
McAllister Creek to Nisqually Reach	Little McAllister Creek	2,169	42	2	40
	McAllister Creek	16,574	627	4	21

Notes:

^a Percent impervious calculations are based on drainage basin areas within the City limits and the UGA only

This section is divided into three subsections summarizing background information on the following groups of waterbodies:

- Waterbodies within the City limits
- Waterbodies within the UGA
- Waterbodies outside of the City limits and the UGA that receive drainage from tributaries or stormwater facilities within the City limits

Each section includes a description of the larger watershed (Henderson Inlet, Deschutes, or Nisqually) that the waterbody is located in, the size and land use in the drainage basin, a

summary of basic waterbody information, a brief description of the results of prior studies, and water quality issues (as determined by Ecology's water quality assessment).

Ecology groups waterbodies into five categories as part of the state water quality assessment. Category 1 (meets tested standards for clean waters), Category 2 (waters of concern), and Category 3 (insufficient data) are not described in this section since the available data does not demonstrate that there is water quality impairment. Category 4 includes three subcategories: Category 4a (has a TMDL), Category 4b (has a pollution control program), and Category 4c (is impaired by a non-pollutant). These subcategories are highlighted in the waterbody descriptions if applicable since waterbodies in this category either have water quality issues that the City is aware of and taking steps to address (Category 4a and 4b) or the impairment is due to a non-pollutant (Category 4c), such as instream flow, that is not regulated by a TMDL process. Category 5 is also known as the 303(d) list and identifies impaired waterbodies that have exceeded water quality standards for one or more pollutants. The most recent 303(d) list is the 2012 list developed by Ecology in 2015 and approved by the U.S. Environmental Protection Agency in 2016. The EPA approved the list as the 2012 303(d) list rather than the 2014 list Ecology originally designated because the assessment includes freshwater data collected through May 1, 2011. While in the past, Ecology assessed either fresh water or marine water, future biennial 303(d) list reviews aim to address all waters of the state, including fresh water and marine water. TMDLs, or water cleanup plans, are established for parameters identified on the 303(d) list. The status of the TMDL implementation plans for each waterbody is also summarized below.

1 Waterbodies within the City Limit

Four lakes and one major stream system are located within the City limits. With one exception, these waterbodies are all part of the Henderson Inlet Watershed; Chambers Lake is part of the Deschutes Watershed. The following waterbodies are summarized below:

Henderson Inlet Watershed

- Woodland Creek
- Hicks Lake
- Southwick Lake
- Long's Pond

Deschutes Watershed

- Chambers Lake

1.1 Woodland Creek

Woodland Creek originates in a horseshoe-shaped chain of lakes connected by extensive wetlands in southeast Lacey. Hicks Lake flows into Pattison Lake, which then flows into Long Lake. From the north end of Long Lake, Woodland Creek flows through Woodland Creek Community Park, past Long's Pond to Lake Lois. From Lake Lois, the creek carves a narrow ravine through forest land, crosses Martin Way and Interstate 5, and then flows through rolling hills and wetlands before ultimately discharging to the southern tip of Henderson Inlet. A total of 2.4 miles of the creek lies within the City limits, and a total of 1.9 miles of the creek lies within City-owned parcels (within the UGA). The contributing basin area is 16,560 acres, 79 percent of which is within the Lacey city limits and UGA. The basin consists primarily of urban and rural residential areas as well as commercial areas, and suburban residential development is rapidly increasing in the headwater areas near the mouth of the basin. The stream portion between lake Lois and the springs north of Martin Way usually dries up during the summer months, significantly reducing fish habitat and productivity in the upper reach of the stream.

Pollutants from urban stormwater runoff have contributed to declining water quality in Woodland Creek. Pet wastes and failing septic systems were identified as common sources of bacteria in stormwater runoff in residential settings and rural settings in the previous water quality assessment (Thurston County 2007). Despite continued efforts to improve water quality, Woodland Creek has consistently failed to meet water quality standards for fecal coliform bacteria and currently has a TMDL (Category 4A) for fecal coliform bacteria along with several tributaries located in the UGA (described in the following section) (Ecology 2019). Bacterial pollution, largely from Woodland Creek, affects shellfish harvests in Henderson Inlet. Much of the pollution in the rural area was historically caused by failing on-site sewer systems and agricultural practices (Thurston County 2010). In 2001, Thurston County responded by establishing the Henderson Shellfish Protection District (Thurston County 2010). In 2005, the Thurston County Board of Health created the Henderson Watershed Protection Area, which requires inspection of all on-site sewage systems in the Henderson Watershed area. Additional measures to reduce pollutant loads in the stream include implementation of agricultural BMPs, new stormwater treatment facilities and improved farm planning and public education. These pollution reduction efforts have shown positive results, and in 2010, commercial shellfish harvest area increased by 240 acres due to improving water quality (Thurston County 2010). In June 2012, the Washington State Department of Health announced that 100 acres of commercial shellfish harvest area have also reopened to harvest (WADOH 2012), though 26 acres were classified as 'restricted' in 2018 (WADOH 2018).

Woodland Creek is included on Ecology's 303(d) list as part of the Henderson Inlet Total Maximum Daily Load (TMDL) for fecal coliform bacteria, dissolved oxygen, and pH impairment (Ecology 2019). Under the Henderson Inlet TMDL, the Cities of Lacey and Olympia have a coordinated plan to monitor and reduce fecal coliform bacteria discharged from the Fones Road Stormwater Treatment facility which drains to Woodland Creek via the Taylor wetland. The construction of the facility led to a reduction in fecal coliform bacteria loading to Woodland

Creek. Lacey also implements a wet weather sampling program for fecal coliform bacteria discharging from the College Regional Stormwater Facility and conducts re-vegetation and nuisance vegetation management along woodland creek and its tributaries.

The stream also exhibits high concentrations of total phosphorus and nitrate (Thurston County 2010) and high temperatures (Ecology 2019). The lower reach of Woodland Creek is also listed as Category 4C for instream flow (“intensified peak flows” from stormwater runoff), though recent flow control improvements in the basin are expected to reduce these peak flows. Other projects to improve water quality in Woodland Creek include the septic to sewer conversions in Woodland Creek Estates and the raingarden improvements done by Thurston County in the Tanglewilde Neighborhood (City of Lacey staff, personal communication).

1.1.1 College Creek

College Creek is a 1-mile long tributary to Woodland Creek and enters the stream from the west just downstream of I-5. College Creek is part of the Henderson Inlet TMDL (Category 4A) for fecal coliform bacteria, dissolved oxygen, and pH (Ecology 2019).

1.2 Hicks Lake

Hicks Lake is the first in a series of four lakes (Hicks, Pattison, and Long lakes, and Lake Lois) that comprise the Woodland Creek subbasin and flow to Henderson Inlet. Hicks Lake is the only one of the four lakes that is located inside the City limits; the other three lakes are located within the UGA. Hicks Lake has a drainage area of 1,010 acres, comprised primarily of urban and suburban residential areas with a small portion of undeveloped forest. Discharge from Hicks Lake flows to Pattison Lake through an outlet channel located on private property.

The mean depth of Hicks Lake is 18 feet, and the deepest portion of the lake extends to 35 feet (Ecology 1997). Flooding has been observed in the past during extreme storm events (Thurston County 2010).

The average 2018 trophic state index (TSI) is within the mesotrophic range (Thurston County 2018a). Based on the concentration of chlorophyll-a, Hicks Lake was classified as eutrophic in 17 out of 23 sample seasons since 1995 (Thurston County 2018a). In 2008, the nutrient (i.e., phosphorus) concentration in the lake was in the eutrophic range and the water clarity was lower than it was in the previous years (Thurston County 2010). This may in part be due to runoff from a high-density urban area that has become increasingly developed. Despite this, the total phosphorus concentration remains below state water quality standards (Thurston County 2018). The lake continues to be listed by Ecology as Category 4C due to the presence of swollen bladderwort (*Utricularia inflata*), an invasive exotic species (Ecology 2019).

Land use around the lake is primarily urban and suburban residential with a small percentage in undeveloped forest cover. Hicks Lake is a popular recreational lake, accessed through Wanschers Community Park on the lake’s western shore and the adjacent boat launch.

1.3 Southwick Lake

Southwick Lake is a 36-acre lake, located to the west of Pattison Lake and south of Hicks Lake in the Henderson Inlet Watershed. The lake has no apparent inlets or outlets, and collects runoff from a drainage area of 260 acres. Most of the shoreline is under private ownership. Land use along the lake's shoreline is a combination of low to moderate density urban residential areas and open spaces. Lacustrine wetlands are located along the vegetated northern shoreline of Southwick Lake. Southwick Lake does not have any known water quality issues. Southwick Lake is located within the 100-year floodplain, thus the water level in the lake has the potential to rise significantly during large storm events (ESA Adolfson 2008).

1.4 Long's Pond

Long's Pond, also referred to as Goose Lake, is a 12-acre lake located in the Henderson Inlet Watershed that receives flow from Long Lake through Woodland Creek and a series of wetlands (ESA Adolfson 2008). Himes Creek flows in or out of Long's Pond to Woodland Creek depending on water elevations. Long's Pond, which has a drainage area of 50 acres, does not have any known water quality issues. Woodland Creek Community Park comprises much of the lake's shoreline. Long's Pond is most popular for its youth fishing program (Lacey 2012a).

1.5 Chambers Lake

Chambers Lake is part of the Chambers Basin in the Deschutes Watershed. Little and Big Chambers Lake, previously one large lake, were separated into two lakes after the construction of the Chehalis Western Railroad in 1927, and are now connected with a 500-foot long channel (Thurston County 1995). The boundary that separates the City of Lacey from the City of Olympia lies between the two lakes therefore, Big Chambers Lake is primarily within the City of Olympia while Little Chambers is located in the City of Lacey. The Chambers Basin also includes Chambers Ditch, South Tributary and Chambers Creek.

Lacey and Olympia share jurisdiction of Big Chambers Lake, while the City of Lacey alone has jurisdiction of Little Chambers Lake. The drainage basin contributing to both lakes is 950 acres. Discharge from Big Chambers Lake flows through Little Chambers Lake, which discharges to the Deschutes River via Chambers Ditch and Chambers Creek. The shoreline of both lakes includes a variety of wetland habitats (ESA Adolfson 2008).

Big Chambers and Little Chambers Lakes are similar in size and depth, with areas of 68 and 58 acres and maximum depths of 5 and 7 feet, respectively. Big Chambers Lake has no inlets and is fed only by groundwater and stormwater runoff. The water level tends to fluctuate with the seasons (Thurston County 1995). The areas to the south and southwest of the lake have experienced flooding related to groundwater and surface water that has deemed it unsuitable for development (ESA Adolfson 2008).

Both Little and Big Chambers Lakes are classified as eutrophic and have dense populations of aquatic plants, despite efforts to reduce plant growth with the introduction of grass carp in 1990 (Thurston County 1995). Historically, many species of fish inhabit this lake, including cutthroat trout, bass, perch, catfish, crappie and spiny ray; however, over the years, cutthroat trout population has greatly declined (Thurston County 1995). In 2015, the City constructed the Chambers Lake Stormwater Treatment Facility to provide stormwater treatment for 187 acres that drain into Little Chambers Lake.

2 Waterbodies within the Urban Growth Area

Five streams are located within the UGA; four of these streams are part of the Henderson Inlet Basin and one is part of the Nisqually Basin. The following waterbodies are summarized below:

Henderson Inlet Watershed

- Eagle Creek
- Fox Creek
- Jorgenson Creek
- Palm Creek

Nisqually Watershed

- Little McAllister Creek

2.1 Eagle Creek

Eagle Creek is a 2-mile long tributary to Woodland Creek, entering the stream along its eastern bank near river mile 2.25 (Thurston County 2004a). Eagle Creek has a drainage area of 1,920 acres and is currently included in the Henderson Inlet TMDL (Category 4A) for fecal coliform bacteria (Ecology 2019). Recommendations for managing sources of bacteria in the watershed TMDL include controlling domestic animal access to Eagle Creek and continuing monthly water quality monitoring.

2.2 Fox Creek

Fox Creek is a 1.2-mile long tributary to Woodland Creek and enters the stream along its northern bank near river mile 1.9 (Thurston County 2004a). Fox Creek has a drainage area of 1,100 acres and is currently included in the Henderson Inlet TMDL (Category 4A) for fecal coliform bacteria and dissolved oxygen (Ecology 2019).

2.3 Jorgenson Creek

Jorgenson Creek is a 1.0-mile long tributary of Woodland Creek, and flows into the stream along its southwest bank around river mile 1.2 (Thurston County 2004a). Jorgenson Creek has a drainage area of 510 acres and is currently included in the Henderson Inlet TMDL (Category 4A) for fecal coliform bacteria (Ecology 2019).

2.4 Palm Creek

Palm Creek is a 1-mile long tributary to Woodland Creek and enters the stream from the west between Hawks Prairie Rd NW and I-5. Palm Creek is part of the Henderson Inlet TMDL (Category 4A) for fecal coliform bacteria and dissolved oxygen (Ecology 2019).

2.5 Little McAllister Creek

Little McAllister Creek, located within the McAllister/Eaton Creek Basin and the Nisqually Watershed, originates in the spring-fed wetlands. The stream loses a total of 180 feet in elevation over 2 miles as it flows through a steep ravine, and ultimately discharges into agricultural ditches. The stream forks into two branches that flow to the south and to the west (Thurston County 2004b). The Little McAllister sub-basin is 2,170 acres and accounts for seven percent of the total McAllister/Eaton Creek Basin. A TMDL study of dissolved oxygen and bacteria in McAllister Creek and the Nisqually Watershed was conducted in 2005 and determined that a 74 percent reduction in fecal coliform bacteria in Little McAllister Creek was needed to meet water quality standards (Ecology 2005), though Lacey is not part of the current TMDL implementation plan.

3 Waterbodies Receiving Surface Water or Stormwater from Within the City Limits

The following waterbodies receiving surface water or stormwater discharges from within the City limits are summarized below:

Henderson Inlet Watershed

- Henderson Inlet
- Lake Lois
- Long Lake
- Pattison Lake
- Woodard Creek

Deschutes Watershed

- Deschutes River

Nisqually Watershed

- Puget Sound (Nisqually Reach)

3.1 Henderson Inlet

Bound on the east and west by the Nisqually Reach of Puget Sound and Budd Inlet, respectively, Henderson Inlet is one of five inlets that contribute to South Puget Sound. The drainage basin area of Henderson Inlet is approximately 1,190 acres within the city limits and UGA. Woodland and Woodard Creek drain 80 percent of the inlet; while Dobbs Creek (East Creek), Meyer Creek (Snug Creek), and Sleepy Creek (Libby Creek), and several other small streams account for the remaining 20 percent.

High levels of fecal coliform bacteria in the lower portion of Henderson Inlet have prohibited commercial shellfish harvesting since the 1980s. In 2001, the Thurston County Commissioners created the Henderson Inlet shellfish protection district. The district is composed of an appointed local stakeholder group, who develop water quality restoration recommendations. The district stakeholders currently meet every other month to discuss water clean-up plans for the area (Thurston County 2012).

Henderson Inlet is on Ecology's 303(d) list (Category 5) for dissolved oxygen and has a TMDL (Category 4A) for fecal coliform bacteria, dissolved oxygen, temperature, and pH (Ecology 2019). Several of its tributaries, including Dobbs Creek, Sleepy Creek, Woodland Creek, Woodard Creek, College Creek, Jorgenson Creek, Eagle Creek, Fox Creek, and Palm Creek are also on Ecology's 303(d) list (Category A4 or 5) for one or more violations of fecal coliform bacteria, temperature, dissolved oxygen, or pH.

3.2 Lake Lois

Lake Lois is last in the series of four lakes (Hicks, Pattison, and Long lakes, and Lake Lois) that make up Woodland Creek drainage system, which is part of the Henderson Inlet Watershed. The lake, which has a maximum depth of 10.5 feet, is separated into three lobes and spans a total area of just under 13 acres with a drainage area of 570 acres. The lower two lobes are bisected by the berm of Carpenter Road, but remain connected with culverts. Recent construction of Carpenter Road has increased the size of the culverts connecting the lower two lobes. A narrow, shallow channel connects the upper two lobes. The southern lobe of Lake Lois receives flow from Long Lake via Woodland Creek.

Located in the center of Lacey and partially inside the City Limits, Lake Lois is the main attraction of Lake Lois Park and Habitat Reserve, which is comprised of land purchased by the City of Lacey over a period of 30 years (Lacey 2012b). Lake Lois Park and Habitat Reserve (located to the west and east of Carpenter Road, respectively) were included in the Woodland Creek/Lake Lois Enhancement Project conducted by the City of Lacey in 1994 (Skillings-Connolly and FishPro 1995). This project was initiated in 1992 with the goal of improving the water quality over a 3-mile stretch of Woodland Creek, extending from the outlet of Long Lake to Draham Road. A major water quality concern leading to the development of the Enhancement Project was the presence of Eurasian watermilfoil (*Myriophyllum spicatum*), an invasive exotic species that has persisted in both Long Lake and Lake Lois since the late 1980s (Lacey and Ecology 1995) and has resulted in a Category 4A listing for Lake Lois for Eurasian water-milfoil (Ecology 2019). In 1978, Lake Lois was described as extremely eutrophic. As Lake Lois is very shallow, its water quality is largely influenced by the high nutrient loading from Long Lake.

A number of field surveys conducted between 1970 and 1992 suggest that the majority of fish activity in Lake Lois occurs in December and January, and that the coho salmon population greatly outnumbers the chum salmon population. City staff have noted that anadromous fish have not been seen in Lake Lois in recent years (Lacey City Staff, personal communication). The Enhancement Project suggested that reducing nutrients and dissolved pollutants in Lake Lois could be achieved by treating stormwater runoff in a stormwater treatment facility and bioswales prior to entering the southern lobe of the lake. The installation of a control structure at the outlet of Lake Lois was also suggested, which would regulate flow downstream and reduce peak flows during large storm events (Lacey and Ecology 1995).

3.3 Long Lake

Long Lake, located along the east boundary of Lacey in Thurston County, is comprised of two basins connected by a narrow channel. A small part of the south basin is located within the City Limits. The south basin is fed by Pattison Lake and a small stream, and the north basin flows to the north to the Henderson Inlet via Woodland Creek and Lake Lois. This 320-acre lake has a maximum depth of 21 feet and drainage area of 2,160 acres. It collects runoff from urban and suburban residential areas as well as a small percentage of agricultural and forested areas (Thurston County 2010). Most of the shoreline is surrounded by dense residential development and Long Lake Park, one of the most used parks in the City, lies on the West bank of the Northern basin (Lacey 2012b).

The lake experiences nuisance blue-green algae blooms and emergent aquatic plants that frequently interfere with recreational activities. The lake is on the Ecology's 303(d) list (Category 5) for total phosphorus, PCB (tissue), Dieldrin (tissue), and 2,3,7,8-TCDD (tissue) (Ecology 2019). In 2008, the south basin was treated with aluminum sulfate (alum) to reduce total phosphorus concentrations and decrease blue-green algae blooms. Though total phosphorus concentrations are lower in the south basin due to the alum treatment, phosphorus concentrations have been increasing since 2016 (Thurston County 2018b). Long Lake is also

listed under Category 4C for Eurasian watermilfoil (*Myriophyllum spicatum*), an invasive aquatic species (Ecology 2019), which has been controlled by the Long Lake Management District (LLMD) since the late 1980s. The LLMD has been actively controlling nuisance invasive and native plants in the lake using approved control methods, including aquatic herbicide treatments, bottom barriers, mechanical harvesting, and diver surveys.

3.4 Pattison Lake

Pattison Lake, also referred to as Patterson Lake, is part of the Henderson Inlet Watershed. This 271-acre lake, with a maximum depth of 22 feet, was separated decades ago into two basins to the north (81 acres) and south (190 acres) through placement of excavated railroad fill (Thurston County 2010). The edge of the northern basin borders the City Limits to the east. Pattison Lake is the second in the series of four lakes beginning with Hicks Lake that ultimately drain north to Henderson Inlet. Hicks Lake flows directly to Pattison Lake, which in turn flows into the south basin of Long Lake. The lake's drainage area is 2,190 acres and is comprised primarily of suburban residential areas and some undeveloped forested wetland areas (Thurston County 2010).

Both basins of Pattison Lake experience harmful algae blooms that decrease water clarity and have adverse effects on water quality. The south basin in particular experiences severe algae blooms and filamentous algae that cause problems with recreational activities such as boating and fishing. The south basin of Pattison Lake is categorized as a highly productive eutrophic lake, and is on Ecology's 303(d) list (Category 5) for total phosphorus (Ecology 2019). A series of treatments and water quality improvement efforts were conducted on Pattison Lake from the late 1970s to the early 1990s, including alum treatment and aquatic plant harvesting. The water level in the lake has slowly risen due to unintentional blockage of the outlet channel to Long Lake (Thurston County 2010).

Fishing, swimming and boating are popular recreational activities on Pattison Lake.

3.5 Woodard Creek

Woodard Creek, part of the Henderson Inlet Watershed, flows 7.5 miles along the outskirts of the City. Woodard Creek drains a basin of 4,910 acres, comprised of urban and rural residential as well as commercial areas (Thurston County 2010). Wetlands are located along the depressions and hills following the length of the stream, and collect runoff from high-density commercial areas in Lacey and Olympia. The wetland at the headwaters of the stream is surrounded by industrial and commercial development, and the estuarine wetland located at the stream's mouth is currently protected from development by the Washington State Department of Natural Resources.

The water quality of Woodard Creek has been impaired over the years due to harmful pollutants in urban runoff and rural activities (Thurston County 2010). The inlet of Woodard Creek, located

in the center of the City, is polluted mainly by stormwater runoff. The middle section of the stream is surrounded by more urban areas, and has a higher potential for pollution from agriculture, livestock, and septic systems. Woodard Creek has a TMDL for fecal coliform bacteria and dissolved oxygen (Category 4A) (Ecology 2019). The TMDL study conducted in 2006 determined that reduction of fecal coliform bacteria is necessary to meet water quality standards. Efforts to improve the water quality of the stream and reduce pollution have been made over the years by targeting these point sources and implementing agricultural BMPs in the surrounding area (Thurston County 2010).

3.6 Deschutes River

The Deschutes River is home to many fish species including Coho, Chinook, and chum salmon and flows 57 miles from the Gifford Pinchot National Forest in Lewis County to Budd Inlet in Olympia. The Deschutes River has a total basin area of 162 square miles. The upper and mid-watershed is comprised of forested, rural residential and agricultural areas; the lower watershed consists of primarily urban areas from the surrounding cities of Tumwater, Olympia, and Lacey (Thurston County 2010). Discharge from Big Chambers Lake flows through Little Chambers Lake (located in the City of Lacey), which discharges to the Deschutes River via Chambers Ditch and Chambers Creek. The lower reach of the Deschutes River discharges to South Puget Sound through Capitol Lake and Budd Inlet.

The Deschutes River enters Capitol Lake from the south. Capitol Lake was created in 1951 as a reflecting pool for the Capitol Building in Olympia and is separated into three basins. These basins are bound by Interstate 5 and railroad bridges, with depths varying from an average of 9 feet to maximum of 20 feet (Thurston County 2010). Capitol Lake has a drainage basin of 185 square miles, collecting runoff from commercial forestry, agriculture, and rural residential areas. Urban land uses from areas of the City of Olympia and Tumwater contribute to the lower portion of the watershed. Several public parks and walking trails run along the shore of the lake, making it a popular destination for boating, jogging, and bird watching (Thurston County 2010).

In 1998, the Deschutes River was placed on Ecology's 303(d) list for temperature, fecal coliform bacteria, dissolved oxygen, and fine sediment. Since then, efforts have been made to identify pollution sources, and in 2008, Ecology conducted a TMDL study of the river. Low dissolved oxygen levels in the river have been caused by excess nutrients and algae growth (Roberts and Pelletier 2007). One study by Ecology suggests that increasing riparian shade along the river could potentially decrease river temperatures and increase dissolved oxygen levels however, a decrease in nutrient levels in the river would be required for any observable increase in dissolved oxygen levels (Roberts and Pelletier 2007). The Deschutes River is currently listed on Ecology's 303(d) list for fine sediment, temperature, pH, bacteria, and dissolved oxygen (Ecology 2019).

The nutrient concentrations decrease as water flows from the Lower Deschutes River to Capitol Lake, indicating that during certain times of year the lake may buffer nutrient loading from the

Deschutes River to Budd Inlet (Roberts and Pelletier 2007). Capitol Lake experiences blue-green algae blooms in the summer, contributing to high loading of organic matter, and further decreasing dissolved oxygen into Budd Inlet. Capitol Lake is on Ecology's 303(d) list (Category 5) for total phosphorus and fecal coliform bacteria (Ecology 2019). The lake is also listed under Category 4C for Eurasian watermilfoil (*Myriophyllum spicatum*), an invasive exotic species (Ecology 2019). Capitol Lake is also infested by New Zealand mudsnails (*Potamopyrgus antipodarum*) (Deixis 2010).

The Deschutes River, Capitol Lake, and Budd Inlet TMDL Technical Report (Ecology 2012) published in June 2012 presents the loading capacity for fecal coliform, temperature, DO, pH, and fine sediment in portions of the watershed, and recommends loading reductions to meet water quality standards. This report recommends "zero" waste load targets (or allowable pollutant load) for fine sediment for any NPDES permitted entities (including Phase II Permittees) within the Deschutes watershed. The report recommends actions for decreasing concentrations of fecal coliform bacteria and improving levels of temperature, dissolved oxygen, and pH. Load allocations for each pollutant will be identified in the Water Quality Improvement Report that is being developed by Ecology. Ecology will work with the Deschutes Advisory Group to establish specific details for implementation actions that will be compiled into a Water Quality Implementation Plan.

3.7 Puget Sound (Nisqually Reach)

Puget Sound is the largest fjord-like estuary in the continental United States. Located between the Cascade and Olympic mountain ranges in Washington State, the Puget Sound basin covers more than 16,800 square miles of land and water (Hart Crowser et al. 2007). The basin is made up of a series of interconnected underwater basins, separated by shallow ridges or sills. The drainage basins in the City primarily discharge to Henderson Inlet; however, some surface water discharges to Budd Inlet and directly to Puget Sound (in the Nisqually Reach). The Nisqually Reach section of Puget Sound is fed by the Nisqually River. The City's contribution to water quality in the Nisqually Reach is primarily due to stormwater and surface water flows from Little McAllister Creek.

Over the past 150 years, human activity has introduced a wide range of toxic chemicals in the Puget Sound ecosystem at levels that are harmful to aquatic life (Puget Sound Partnership 2006). Despite a ban on some harmful chemicals in the 1970s and numerous cleanup efforts, toxic chemicals continue to persist and circulate throughout the Puget Sound ecosystem and are still being introduced via stormwater runoff, municipal sewage treatment plants, and atmospheric deposition. These toxic chemicals can have acute and chronic effects on nearshore organisms. Once in the food web, certain toxic chemicals can also be concentrated in larger predatory animals, ultimately affecting marine fish and mammals. These contaminants are also a significant concern for human health, especially for those who frequently consume fish with high contaminant levels.

Budd Inlet, one of the five inlets that comprise South Puget Sound, is on Ecology's 303(d) list (Category 5) for dissolved oxygen and various toxic compounds. While dissolved oxygen

levels are low in several South Puget Sound inlets, Budd Inlet consistently experiences the lowest levels each year (Roberts and Pelletier 2007). Excess nutrients (such as nitrogen and phosphorus) from point or non-point sources cause low dissolved oxygen levels in waterbodies, inhibiting the growth and survival of many aquatic species. The largest sources of nutrients to South Puget Sound include the effluent from the Lacey Olympia Tumwater Thurston County (LOTT) Clean Water Alliance wastewater treatment plant, and discharge from the Deschutes River and Capitol Lake, which both contain high levels of dissolved inorganic nitrogen. In 1994, the LOTT Clean Water Alliance began including denitrification in the wastewater treatment process in attempts to reduce nutrient loading into the Puget Sound (Roberts and Pelletier 2007). In 2001, The Thurston County Commissioners created the Nisqually Reach shellfish protection district. The district is composed of a local stakeholder group who develop water quality restoration recommendations. The district stakeholders currently meet every other month to discuss water clean-up plans for the area (Thurston County 2012). The Nisqually Reach section of Puget Sound is on Ecology's 303(d) list (Category 5) for fecal coliform bacteria.

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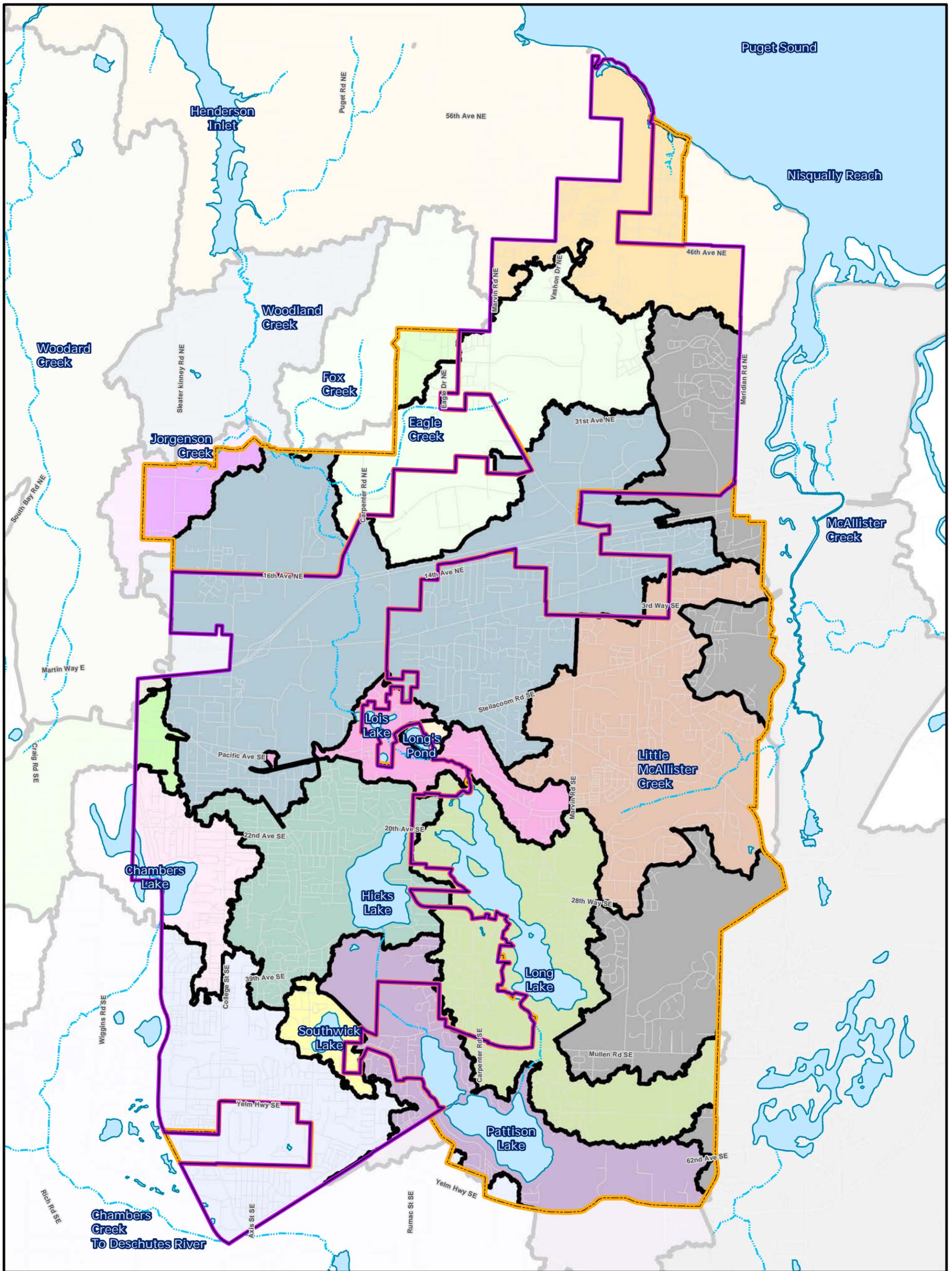
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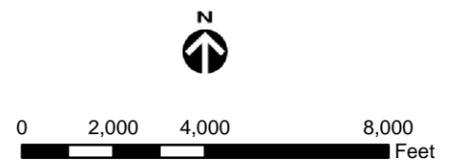
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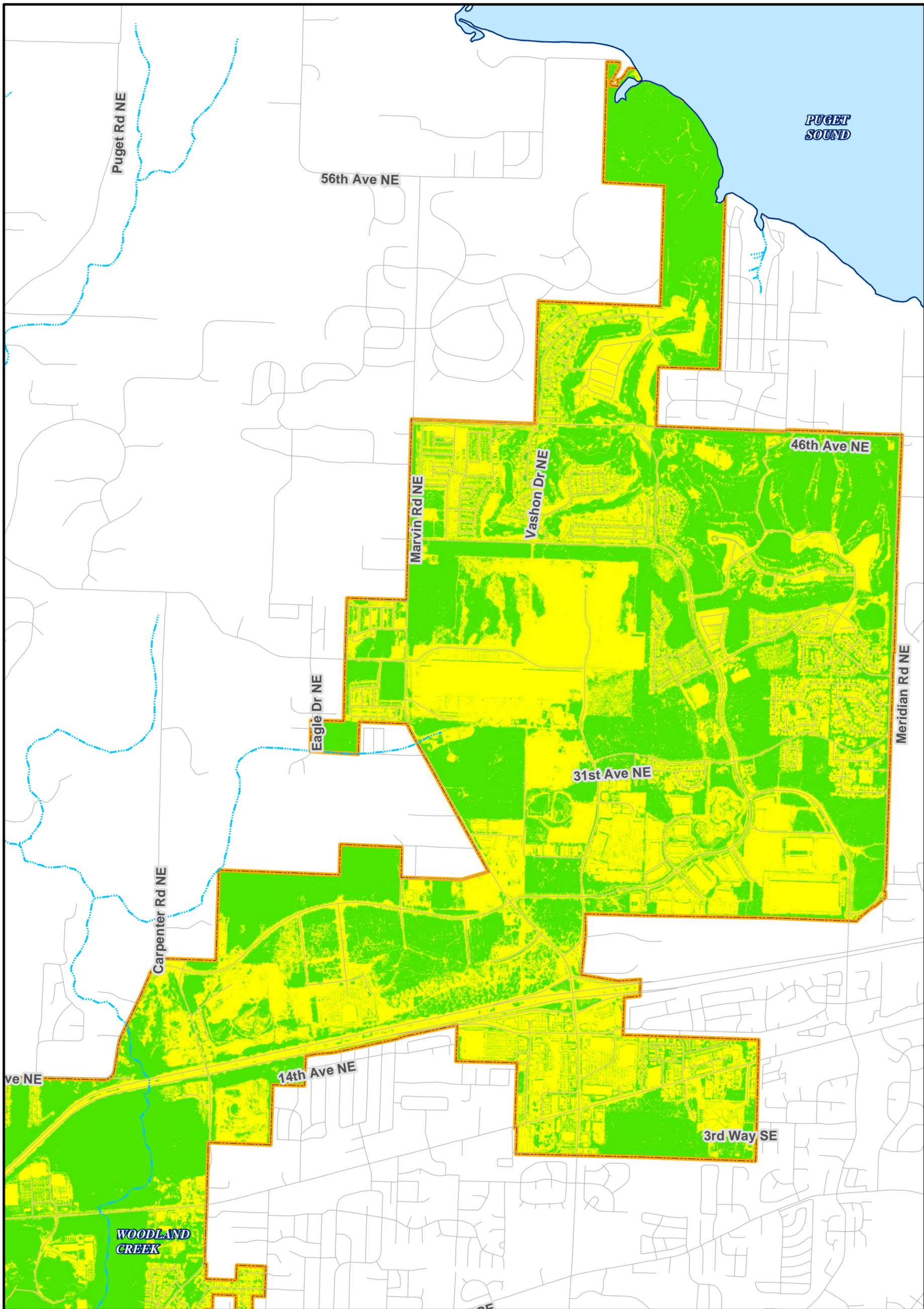
Legend

- | | | |
|-----------------------|-------------------------|-----------------------|
| City of Lacey | Fox Creek | Long Lake |
| Urban growth boundary | Long's Pond | McAllister Creek |
| Waterbody | Henderson Inlet | Pattison Lake |
| Stream | Hicks Lake | Southwick Lake |
| Basins | Indian Creek | Woodard Creek Outlet |
| Chambers Lake | Jorgenson Creek | Woodland Creek Outlet |
| Deschutes River | Lake Lois | |
| Eagle Creek | Little McAllister Creek | |

Figure 2-4. Drainage basins within the City of Lacey.



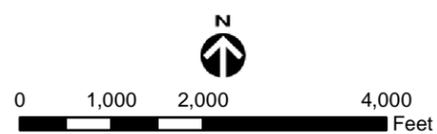
City of Lacey, Waterbody, Stream, UGB (City of Lacey)



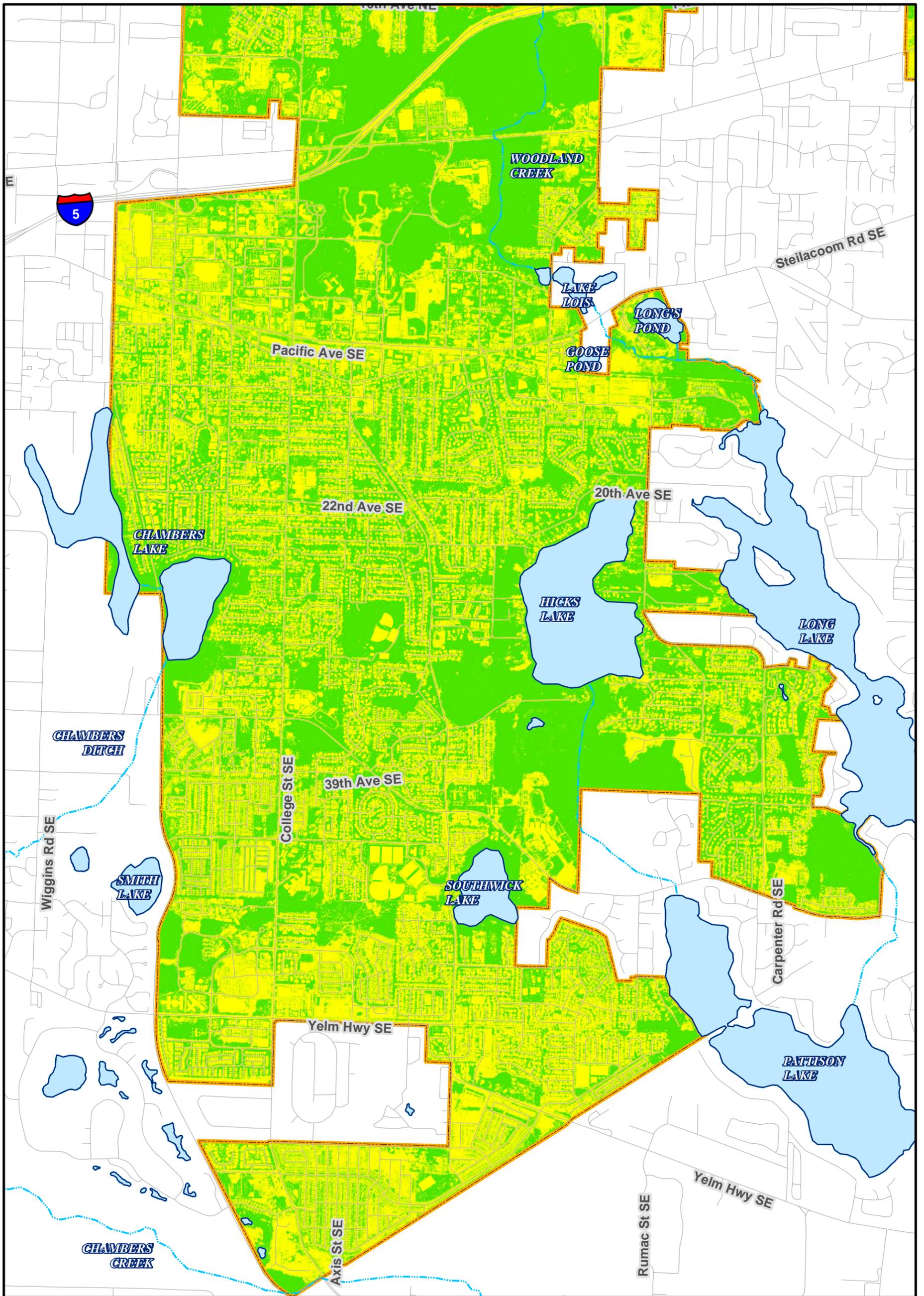
Legend

- Waterbody
- Stream
- City of Lacey
- Pervious area
- Impervious area

Figure B-2.
Impervious Area in the City of Lacey
 (Sheet 1 of 2).



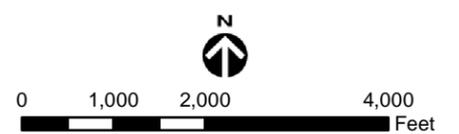
Aerial: City of Lacey (2009)



Legend

- Waterbody
- Stream
- City of Lacey
- Pervious area
- Impervious area

Figure B-2.
Impervious Area in the City of Lacey
 (Sheet 2 of 2).



Aerial: City of Lacey (2009)

APPENDIX C

Lacey Stormwater Facilities

City of Lacey Stormwater Treatment & Flow Control Facilities

No.	Facility ID	Facility Description in HTE	Facility Reference Name ("Alias")	Facility Type/Function (main elements)	Address	General Location	Year Built	WRIA	Basin Area (acres)	Primary Discharge to	Overflow/Outfall (Watershed)
1	PD0001	Storm Pond - Yelm Highway SE	Yelm Highway/Bush Park Pond	Constructed Wetland & Infiltration Basin	4500 Yelm Highway SE	Bush Park, Yelm Hwy & Rainier Loop	1991	13-Deschutes	110	GW	Deschutes River
2	PD0002	Storm Pond - Ruddell Road SE	Ruddell Road SE Stormwater Facility	Wet Pond & Infiltration Basin	4701 Ruddell Road SE	SE corner of Rainier Vista Park	1991	13-Deschutes	114	GW	Southwick Lake
3	PD0003	Storm Pond - Lakehills	Lakehills Pond	Retention Pond	5280 Lakehills Street SE	S. of Southwick Lake, N. end Lakehills off 54th	1991	13-Deschutes	6	GW	Southwick Lake
4	PD0004	Storm Pond - City Hall Pond A	City Hall Pond A	Retention Pond	420 College Street SE	City Hall Parking Area, closest to main entry	1994	13-Deschutes	4.2	GW	Woodland Creek
5	PD0004-B	Storm Pond - City Hall Pond B	City Hall Pond B	Wet Pond & Infiltration Basin/Gallery	420 College Street SE	City Hall Parking Area, east side of Infiltration Basin	1994	13-Deschutes	3	GW	Woodland Creek
6	PD0005	Storm Pond - Westminster	Westminster Pond	Sedimentation/Detention Pond	4711 8th Ave NE	E. of College Street, S. side of 8th Avenue NE	2000	13-Deschutes	34	wetlands	Woodland Creek
7	PD0008	Storm Pond - Lakecrest	Lakecrest Pond	Sedimentation/Detention Pond	2900 Lakeview Dr SE	E. side of Chambers Lake at 29th Ave SE	1978	13-Deschutes	18	Chambers Lake	Chambers Lake
8	PD0010	Storm Pond - Mt. Tahoma	Mt. Tahoma Pond	Retention Pond	5600 - 54th Ave SE	N. of 54th, W. of Ruddell, E. of Mt. Tahoma Dr.	1979	13-Deschutes	27	GW	Deschutes River
9	PD0011	Storm Pond - College SE Pnd A	College & 53rd SE Pond	Wet Pond & Infiltration Basin	5300 - 53rd Ave SE	E. of College St. on S. side of 53rd Ave SE	1991	13-Deschutes	51	GW	Deschutes River
10	PD0012	Storm Pond - Lacey Shop #1	Lacey Shop Pond #1	Wet Pond	1200 College St SE	front (NW corner) of City Maintenance Shop		13-Deschutes	2	GW	Woodland Creek
11	PD0014	Storm Pond - WCSTF	Woodland Creek Stormwater Facility	Constructed Wetland & Infiltration Basin	5736 - 7th Ave SE	N. end of Lacey Street SE	1992	13-Deschutes	299	GW	Woodland Creek
12	PD0020	Storm Pond - Shady Lane	Shady Lane Pond	Wet Pond	6401 Shady Lane SE	Shady Lane at Sierra Dr, N. end of Hicks Lake	2000	13-Deschutes	12	Hicks Lake	Woodland Creek
13	PD0022	Storm Pond - Hogum Bay	Hogum Bay Pond	Wet Pond, to Perforated Pipe	2140 Marvin Rd NE	NE corner of Hogum Bay Rd & Marvin Rd NE	1998	13-Deschutes	34	GW	Woodland Creek
14	PD0023	Storm Pond - Willamette	Willamette Pond	Wet Pond	2500 Marvin Rd NE	SE cor. Marvin & Willamette, at roundabout	1998	13-Deschutes	8	GW	Woodland Creek
15	PD0024	Storm Pond - Britton Prkwy #4	Britton Parkway #4 Pond	Wet Ponds	2425 Marvin Rd NE	S. side Britton (within proposed Lacey Town Center)	1998	13-Deschutes	41	GW	Woodland Creek
16	PD0029	Storm Pond - Callison	Callison Pond	Infiltration Pond with Infiltration Trenches	7505 Britton Parkway NE	N. side of Britton Pkwy, W. of Callison Rd	1999	13-Deschutes	27	GW	Eagle Creek
17	PD0032	Storm Pond - Britton Prkwy #9	Britton Parkway #9 Pond	Infiltration Pond with Infiltration Trenches	6300 Britton Parkway NE	Just E. of Carpenter Road	1999	13-Deschutes	14	GW	Eagle Creek
18	PD0034	Storm Pond - 7th Ave SE	7th Avenue Stormwater Facility	Retention Pond	6022 - 7th Avenue SE	W. of Carpenter Rd near Lake Lois outlet	2001	13-Deschutes	36	GW	Woodland Creek
19	PD0035	Storm Pond - Stockton St SE	Stockton Pond (Lakepointe Park Ponds)	Wet Pond & Retention Pond	6100 Stockton St SE	SW corner of Lakepointe Park, Stockton & Compton	1991	13-Deschutes	37	GW	Deschutes River
20	PD0036	Storm Pond - Compton Blvd SE	Compton Pond (Lakepointe Park Ponds)	Wet Pond & Retention Pond	6600 Compton Blvd SE	E. end of Lakepointe Park, Compton & 60th Ave SE	1991	13-Deschutes	37	GW	Pattison Lake
21	PD0037	Storm Pond - 25th Ave Swales	25th Avenue Swales	Series of 6-7 Biofilter Swales	5400-5900 25th Avenue SE	N. side of 25th Ave. from Ruddell Road to Lilac St.	1995	13-Deschutes	41	GW	Hicks Lake
22	PD0038	Storm Pond - Eastwood Estates	Eastwood Estates Pond	Infiltration Pond	7407 - 38th Drive SE	W. side Carpenter Road at 38th Loop SE		13-Deschutes	5	GW	Long Lake
23	PD0039	Storm Pond - Lacey Shop #2	Lacey Shop Pond #2	Swale (horseshoe-shaped)	1200 College St SE	behind Shop building, in O&M backlot		13-Deschutes	0.6	GW	Woodland Creek
24	PD0040	Storm Pond - Lacey Shop #3	Lacey Shop Pond #3	Swale	1200 College St SE	along S. side Pacific Ave. at NE cor. of Shop backlot		13-Deschutes	3	GW	Woodland Creek
25	PD0041	Storm Pond - Ruddell/32nd Fac.	Ruddell & 32nd Facility	Pre-treatment Pond	3411 Ruddell Road SE	E. side of Ruddell to Hicks Lake	1999	13-Deschutes	436	wetlands	Hicks Lake
26	PD0041-A	Storm Pond - Ruddell/32nd Pd A	Ruddell & 32nd Facility	Wetland Pond enhancement	3411 Ruddell Road SE	E. side of Ruddell to Hicks Lake	1999	13-Deschutes		wetlands	Hicks Lake
27	PD0042	Storm Pond - Quail Dr	Quail Pond	Wet Pond	4708 Quail Dr SE	N. side of 45th Avenue SE, E. of Quail Drive	1993	13-Deschutes	14	GW	Hicks Lake
28	PD0045	Storm Pond - Lacey Shop #4	Lacey Shop Pond #4	Retention Pond	1200 College St SE	NW corner of City parking lot, N. side of Lacey Blvd.		13-Deschutes	0.1	GW	Woodland Creek
29	PD0046	Storm Pond - Lacey Shop #5	Lacey Shop Pond #5	Retention Pond	1200 College St SE	SW corner of City parking lot, N. side of Lacey Blvd.		13-Deschutes	0.3	GW	Woodland Creek
30	PD0047	Storm Pond - Lacey Shop #6	Lacey Shop Pond #6	Retention Pond	1200 College St SE	S. side of City parking lot, N. side of Lacey Blvd.		13-Deschutes	1	GW	Woodland Creek
31	PD0048	Storm Pond - Lacey Shop #7	Lacey Shop Pond #7	Retention Pond	1200 College St SE	E. side of City parking lot, N. side of Lacey Blvd.		13-Deschutes	0.8	GW	Woodland Creek
32	PD0049	Storm Pond - Employee Lot	Employee Lot Swale	Swale ("L"-shaped)	1200 College St SE	N. side of City parking lot, N. side of Lacey Blvd.		13-Deschutes	0.7	GW	Woodland Creek
33	PD0050	Storm Pond - Century Ct	Century Court	Storage Reservoir	701 Century Court NE	S. end of Century Court, off 15th Ave. NE	1978	13-Deschutes	4	wetlands	Woodland Creek
34	PD0051	Storm Pond - Fones Rd Pond	Fones Road Ditch Stormwater Facility (upper)	Wet Pond & Infiltration Basin	3700 - 14th Ave SE	E. of Fones Road at 12th Ave SE	2004	13-Deschutes	97	GW	Woodard Creek
35	PD0052-A	Storm Pond - College Reg Fac-A	College Regional Stormwater Facility	Primary Wetpond	5800 Abbey Way SE	Saint Martin's University, N. side of Abbey Way SE	2008	13-Deschutes	424	GW	Woodland Creek
36	PD0052-B	Storm Pond - College Reg Fac-B	College Regional Stormwater Facility	East Retention Pond	5800 Abbey Way SE	Saint Martin's University, N. side of Abbey Way SE	2008	13-Deschutes		GW	Woodland Creek
37	PD0052-C	Storm Pond - College Reg Fac-C	College Regional Stormwater Facility	West Retention Pond	5800 Abbey Way SE	Saint Martin's University, N. side of Abbey Way SE	2008	13-Deschutes		GW	Woodland Creek
38	PD0054	Storm Pond - Mills Landing	Mills Landing	Swale	1330 Carpenter Road SE	E. of NTPS bus lot, N. side Mills Landing Ct. SE	2009	13-Deschutes	4	wetlands	Woodland Creek
39	PD0055	Storm Pond - RAC #1	RAC Pond #1 (Regional Athletic Complex)	Retention Pond	8245 Steilacoom Road SE	NW corner of baseball fields, E. side of Marvin Rd	2007	11-Nisqually	18	GW	Little McAllister Cr.
40	PD0056	Storm Pond - RAC #2	RAC Pond #2 (Regional Athletic Complex)	Retention Pond	8245 Steilacoom Road SE	SW corner of baseball fields, E. side of Marvin Rd	2007	11-Nisqually	2	GW	Little McAllister Cr.
41	PD0057	Storm Pond - Cabela's	Gateway (Cabela's)	Constructed Wetland and Infiltration Trench	1600 Gateway Blvd. NE	S. side of Cabela's store	2008	13-Deschutes	156	GW	Eagle Creek
42	PD0058	Storm Pond - Arbors 1	Arbors Pond 1	Retention Pond	7644 - 41st Avenue SE	NW corner of 41st Avenue SE & Arbor Drive	1992	13-Deschutes	59	wetlands	Long Lake
43	PD0059	Storm Pond - Thornbury	Thornbury Pond	Retention Pond, Oil-Water Separator	5400 Thornbury Drive	SE cor. 54th Ave & Thornbury Dr, E. of Ruddell	1990	13-Deschutes	29	GW	Southwick Lake
44	PD0060	Storm Pond - Community Center	Lacey Community Center	Pond	6729 Pacific Avenue SE	behind Community & Senior Ctrs, along Goose Lk	2002	13-Deschutes	2.2	Goose Lake	Woodland Creek
45	PD0061	Storm Pond - Senior Center	Lacey Senior Center	Pond	6757 Pacific Avenue SE	NE end of parking lot	2002	13-Deschutes	1.2	GW	Woodland Creek
46	PD0062	Storm Pond - Meridian Park	Meridian Park	Retention Pond	8855 Campus Glen Dr NE	SE corner of Willamette Dr. & Campus Glen Dr. NE	2006	11-Nisqually	1	GW	McAllister Cr.
47	PD0063	Storm Pond - Summerwalk	Summerwalk Pond	Retention Pond	4900 Yelm Highway SE	E. of Little Prairie Ctr, in SW part of Summerwalk	2005	13-Deschutes	9	GW	Deschutes River
48	PD0064	Storm Pond - Hks H2O Plnt	Hawks Prairie Water Treatment Facility	Retention Pond (main pond)	4040 Marvin Road NE	SE of booster pump station	2009	13-Deschutes	5.4	GW	Eagle Creek
49	PD0064A	Storm Pond - Hks H2O Plnt A	Hawks Prairie Water Treatment Facility	Infiltration Basin (high flow bypass pond)	4040 Marvin Road NE	SE of booster pump station	2009	13-Deschutes	2	GW	Eagle Creek
50	PD0065	Storm Pond - Mullen West Pnd A	Mullen Road West Pond A	Wet Pond	5400 Mullen Road SE	Ponds on both sides of Mullen, near Park Place Loop	2010	13-Deschutes	13	GW	Hicks Lake
51	PD0066	Storm Pond - Mullen West Pnd B	Mullen Road West Pond B	Infiltration Basin	5400 Mullen Road SE	Ponds on both sides of Mullen, near Park Place Loop	2010	13-Deschutes	15	GW	Hicks Lake
52	PD0067	Storm Pond - Yelm Hwy East	Yelm Highway East	Retention & Infiltration Basins	6130 Yelm Highway SE	N. side Yelm Hwy, W. of Compton/Balustrade Blvd.	2010	13-Deschutes	1	GW	Deschutes River
53	PD0068	Storm Pond - City Pit	City Pit (Decant Facility)	Retention Pond	6245 Martin Way East	South of Martin Way, West of Carpenter Road	2011	13-Deschutes	11	GW	Woodland Creek
54			Chambers Lake Stormwater Treatment Facility	Constructed Wetlands	2750 Lakeview Drive SE	Lakeview Drive between 26th Loop SE & 29th Ave. SE	2015	13-Deschutes	187	Chambers Lake	Chambers Lake

- Notes: 1. Facility ID Number and Facility Description are per PW Operations' records in HTE. 5. Basin Area excludes areas upstream that are managed by other ponds.
 2. Facility ID numbers have gaps due to some facilities having been retired/eliminated, with no renumbering. Basin Area data per GIS mapping compiled by Herrera for 2013 SCP.
 3. Reference Name ("Alias") is staff's commonly-used name, to be used for GIS mapping of Lacey's storm system. 6. WRIA = Water Resource Inventory Area
 4. List is not all-inclusive; these are the main, larger storm facilities listed in HTE as "Storm Ponds" and maintained by PW-Operations Stormwater Dep't. GW = Groundwater (infiltration)

APPENDIX D

Capital Improvement Program Appendix

CAPITAL IMPROVEMENT PROGRAM APPENDIX

Solution Development

The stormwater CIP from the 2013 Stormwater Comprehensive Plan (2013 Plan) was updated using input from City staff on completed projects and new problems. Problems were evaluated using desktop methods and field evaluation to assess site-specific opportunities and constraints. New project concepts were developed using desktop methods and an estimated cost was defined for each project using a combination of parametric and analogous cost estimating techniques.

Conceptual Designs

Sites associated with stormwater problems were visited by Herrera staff to determine the potential cause(s) of the problems. Engineering judgment was then used to identify appropriate capital projects to address each stormwater problem, factoring in constraints and opportunities at each site. For some projects, multiple alternatives were considered.

Conceptual designs were developed for each project, using sound engineering judgement and desktop and field assessment. Each conceptual design includes a project summary sheet (problem description, and a list of the primary project components), a plan view figure of the stormwater facilities with dimensions (when applicable), and an itemized planning-level cost estimate (when applicable). Summary sheets and cost estimates are available at the end of this appendix.

Conceptual Cost Estimates

Costs for capital projects were estimated in different ways, depending on the type of project and project development history.

- Five projects were carried forward from the 2013 plan without major modification. Costs were converted to June 2019 dollars.
- Four projects from the 2013 plan received major updates and new cost estimates were developed using the methodology described below.
- Three new location-specific (i.e. construction) project concepts were developed and new cost estimates were developed using the methodology described below.

- Seven new projects were defined that are not location specific (i.e. not construction projects). These projects include annual programs and stormwater planning projects. Costs for these projects were developed based on City experience with the programs in the past and Herrera's experience with similar stormwater planning projects.

Cost estimates were prepared for location-specific (i.e. construction) projects based upon Herrera's experience in designing projects of a similar scale and in similar settings. Unless otherwise noted in the cost estimates, the following assumptions were applied:

- Construction bid items were based on WSDOT standard specifications where applicable, including material, construction requirements, measurement, and payment.
- Line item unit prices used in the construction cost estimates were derived from a combination of applicable sources, including contractor bid tabs from similar past projects, prices compiled by WSDOT, quotes from vendors, a cost estimating guide (The Guide 2018), site-specific understanding of probable contractor staging, access, and other project-specific requirements and constraints that would affect contractor bids for the project.
- Allied costs (project management, survey, geotechnical analyses, design, permitting, and construction management) were included for each project, as appropriate.
- The City would hire a consultant to perform the geotechnical analysis, design, and permitting.
- The City would perform the survey in-hours
- The City would manage the project for a cost equal to 20 percent of the construction cost and would perform construction management for a cost equal to 15 percent of the construction cost.
- Costs for survey, geotechnical analyses, design, and permitting were based on experience with design and permitting for similar projects and knowledge of site-specific job complexities and challenges. In some cases, professional judgment was used to estimate allied costs as a percentage of construction costs.
- A design contingency was applied to the cost to reflect the level of uncertainty associated with the project scope and potential risks. Contingency values are in line with recommendations by the Association for the Advancement of Cost Engineering (AACE 2005; Rothwell 2005).
- Property acquisition costs were not considered and may affect actual costs for some projects.
- An additional local cost adjustment factor of 10 percent was applied to construction costs to account for higher-than-expected costs for recent projects in the City.

Project Prioritization

The stormwater CIP problems and solutions were prioritized using a qualitative process and considering input from City staff, review of background documents, and field reconnaissance of existing problems. Each project was evaluated against the following primary and secondary prioritization criteria to assign project priority.

Primary Prioritization Criteria

The primary prioritization criteria are related to the risk associated with the problem that is being solved: likelihood of the problem occurring (i.e., probability) and the potential losses resulting from the problem (i.e. severity). Projects that address frequent problems with major potential losses have higher risk reduction benefit, and thus are typically assigned a higher priority. Projects that address less frequent problems with minor potential losses have lower risk, and thus are typically assigned a lower priority.

Probability: Probability of the problem occurring was evaluated qualitatively, based on the perceptions of City staff. Problems that occur more frequently were assigned a higher priority.

Severity: Consideration of severity involved qualitatively assessing the potential losses associated with the problem. Problems with greater potential losses were assigned a higher priority.

Relating Project Benefits to Program Elements and Goals. Probability and severity were considered in the context of the following program elements:

- **Flood Reduction:** How much does the project reduce flooding? (e.g., reduce frequency, extents, hazards, health risks, property damage)
- **Surface Water Quality Improvement:** How much does the project improve surface water quality? (e.g., decrease pollutant loading, provide source control)
- **Ground Water Quality Protection:** Does the project contribute to the protection of ground water quality? (e.g., improve groundwater recharge, remove pollutants from surface water prior to infiltration)
- **Habitat Improvement:** How much does the project improve habitat? (e.g., improve the function of existing natural areas, create new habitat)
- **Infrastructure Operations and Maintenance:** Is the project necessary for existing stormwater infrastructure to operate as intended? (e.g., rehabilitate existing infrastructure, increase service life of infrastructure)

Each project was assigned a score of high, medium, or low based on the primary prioritization criteria.

Secondary Prioritization Criteria

Secondary prioritization criteria were used to refine project prioritization and develop the implementation schedule through qualitative examination of the program elements of Public Participation and Comprehensive Planning, Administration, and Funding:

- **Public Participation:**
 - Will the project educate public about storm water?
 - Will the project provide an opportunity for stewardship activities?
- **Comprehensive Planning, Administration, and Funding:**
 - Are there other project benefits to the community? (e.g., enhance open space, connect greenways, improve walkability, provide wildlife corridors)
 - Will the project enhance social equity?
 - Can the project be scheduled to coincide with other City projects such that the total cost of both projects is reduced? (e.g., scheduling a drainage improvement project before an overlay project)
 - Is the project a candidate for outside grant funding that will magnify the benefits of utility funds?
 - Do we understand the problem well enough to design and implement an effective solution?

Results

The results of the prioritization process are shown in the Prioritization Matrix below. Projects that are required by regulations, such as updating the Stormwater Design Manual, were considered exempt from the prioritization process and assigned a priority of "Required".

REFERENCES

AACE. 2005. Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries, AACE International Recommended Practice No. 18R-97, TCM Framework: 7.3 – Cost Estimating and Budgeting. Association for the Advancement of Cost Engineering (AACE) International. February 2, 2005.

Rothwell, G. 2005. Contingency in Levelized Capital Cost Estimation. 2005 Association for the Advancement of Cost Engineering (AACE) International Transactions.

The Guide. Building Construction Material Prices for use in Alaska, Oregon and Washington since 1984. January 2018.

Prioritization Matrix

Proj. No.	Project Name	Primary Criteria Notes	Primary Criteria Score	Secondary Criteria Notes	Influence of Secondary Criteria	Overall Score
19-1	Westminster Pond Modification	<p>Surface Water Quality The current pond is clogged with sediment, so flow from the pond is discharging to College Creek without treatment. Rehabilitating the pond will improve water quality treatment function.</p>	High	<p>Public Participation Some opportunity for public education through educational signage at the site.</p> <p>Comprehensive Planning, Administration, and Funding This project may be eligible for a water quality grant to support the addition of a pretreatment BMP, but may not be a strong candidate because much of the work could be considered required maintenance.</p>	No change	High
19-2	26th Loop Conveyance	<p>Flood Reduction Minor nuisance flooding is impacting several yards.</p> <p>Surface Water Quality Runoff from Golf Club Rd. SE is entering Chambers Lake without treatment, potentially impairing water quality in the lake.</p>	High	<p>Public Participation Limited opportunity for education and stewardship</p> <p>Comprehensive Planning, Administration, and Funding No cost sharing opportunities.</p>	No change	High
19-3	2021 Stormwater Design Manual (SDM) Update	<p>This project is required by regulations and is exempt from the prioritization process.</p> <p>This project provides guidance for developers to more effectively and efficiently improve the following program elements:</p> <ul style="list-style-type: none"> • Flood Reduction • Surface Water Quality • Ground Water Quality • Infrastructure Operations and Maintenance 	Required	<p>Public Participation Opportunities for stakeholder involvement during development of the updated manual.</p> <p>Comprehensive Planning, Administration, and Funding Opportunities for coordination with other development documents to align the SDM with City-wide development goals.</p>	No change	Required

Prioritization Matrix						
Proj. No.	Project Name	Primary Criteria Notes	Primary Criteria Score	Secondary Criteria Notes	Influence of Secondary Criteria	Overall Score
19-4	Woodland Creek Stormwater Treatment Facility Oil Water Separator (OWS) Replacement	<p>Surface Water Quality The current OWS at this location is frequently clogged by sediment and is providing little water quality treatment.</p> <p>Infrastructure Operations and Maintenance The current OWS contains plates which frequency break during replacement. Maintenance is costly and difficult.</p>	High	<p>Public Participation Limited opportunity for education and stewardship</p> <p>Comprehensive Planning, Administration, and Funding No cost sharing opportunities.</p>	No change	High
19-5	Woodland Creek Community Park Habitat Restoration	<p>Habitat Improvement Invasive species are out-competing native species and degrading habitat quality in Woodland Creek.</p>	Low	<p>Public Participation Excellent opportunity for stewardship by engaging volunteers to replant native species</p> <p>Comprehensive Planning, Administration, and Funding No cost sharing opportunities.</p>	Increase (opportunity for community engagement)	High
19-6	Stormwater Management Action Planning (SMAP)	This project is required by regulations and is exempt from the prioritization process.	Required	<p>Public Participation Opportunities for stakeholder involvement during SMAP process.</p> <p>Comprehensive Planning, Administration, and Funding Opportunity to direct stormwater funds towards the most impactful program activities and projects.</p>	No change	Required
19-7	Regional Water Quality Facility Program	<p>Surface Water Quality Untreated and partially-treated runoff decreases the quality of surface water</p>	Medium	<p>Public Participation Opportunity for education and stewardship</p> <p>Comprehensive Planning, Administration, and Funding Excellent opportunity for grant funding. A portion of the funding for this project is to apply for grant funding and the rest is intended as matching funds for a surface water grant.</p>	No change	Medium

Prioritization Matrix

Proj. No.	Project Name	Primary Criteria Notes	Primary Criteria Score	Secondary Criteria Notes	Influence of Secondary Criteria	Overall Score
19-8	Infiltration Retrofit Program	Groundwater Quality Untreated infiltration can degrade groundwater quality	Medium	Public Participation Limited opportunity for education and stewardship Comprehensive Planning, Administration, and Funding No cost sharing opportunities.	No change	Medium
19-9	Miscellaneous Storm System Improvements	This annual program will improve the following program elements: <ul style="list-style-type: none"> • Flood Reduction • Surface Water Quality • Ground Water Quality • Infrastructure Operations and Maintenance 	Medium	Public Participation Limited opportunity for education and stewardship Comprehensive Planning, Administration, and Funding This program will increase efficiency and reduce costs by identifying opportunities for cost sharing with projects led by other utilities and jurisdictions and addressing infrastructure repair and replacement needs before they become an emergency repair situation	No change	Medium
19-10	Stormwater Comprehensive Plan Update	This project will provide guidance for the City to more effectively and efficiently improve the following program elements: <ul style="list-style-type: none"> • Flood Reduction • Surface Water Quality • Ground Water Quality • Infrastructure Operations and Maintenance 	Required	Public Participation Opportunities for stakeholder involvement during development of the updated comprehensive plan Comprehensive Planning, Administration, and Funding Provides comprehensive planning for the stormwater program	Increase	Required
13-7	Diamond Stormwater Alternative	Flood Reduction Low frequency flooding with the potential to affect private properties. This project would reduce flood severity and frequency.	Medium	Public Participation Limited opportunity for education and stewardship. Comprehensive Planning, Administration, and Funding No opportunity for cost sharing.	No change	Medium

Prioritization Matrix

Proj. No.	Project Name	Primary Criteria Notes	Primary Criteria Score	Secondary Criteria Notes	Influence of Secondary Criteria	Overall Score
13-9	Clearbrook Drainage System Improvements	<p>Flood Reduction Surface ponding threatens one home. Flooding in multiple streets. This project would reduce flood severity and frequency.</p>	Medium	<p>Public Participation Opportunity for public involvement with Parks project; project will be visible</p> <p>Comprehensive Planning, Administration, and Funding Potential integration and cost sharing with parks project and coordination with Homann Area System Rehabilitation. The facility is currently privately owned; the City could assume responsibility for the private system.</p>	No change	Medium
13-10	Homann Area System Rehabilitation (Option 1)	<p>Flood Reduction The current system of gutters and infiltration galleries still results in high frequency, minor nuisance flooding. The proposed conveyance system will provide more effective flood control.</p>	Medium	<p>Public Participation Limited opportunity for education and stewardship</p> <p>Comprehensive Planning, Administration, and Funding Feasibility and effectiveness is not well known. May coordinate with future sewer expansion and the Clearbrook Project.</p>	Reduce	Low (Conduct infiltration study during planning period.)
13-10	Homann Area System Rehabilitation (Option 2)	<p>Flood Reduction The proposed solution will reduce minor nuisance flooding.</p> <p>Surface Water Quality and Ground Water Quality The proposed solution will treat stormwater prior to infiltration or discharge.</p>	Medium	<p>Public Participation Visibility of bioretention facilities in the neighborhood provides an opportunity for education about stormwater.</p> <p>Comprehensive Planning, Administration, and Funding Feasibility and effectiveness is not well known.</p>	Reduce	Low (Conduct infiltration study during planning period.)

Prioritization Matrix

Proj. No.	Project Name	Primary Criteria Notes	Primary Criteria Score	Secondary Criteria Notes	Influence of Secondary Criteria	Overall Score
13-11	1010 Midway Storm Improvements	Flood Reduction Flooding impacts a multifamily residential development.	Medium	Public Participation Limited opportunity for education and stewardship Comprehensive Planning, Administration, and Funding Interjurisdictional cooperation is needed with Thurston County to schedule and fund this project.	No change	Medium
13-12	Belair-Impala Stormwater Installation	Flood Reduction Significant nuisance flooding affecting a large geographic area with at least one private property. Frequency of flooding is high. This project would reduce flood severity and frequency.	Medium	Public Participation Limited opportunity for education and stewardship. Comprehensive Planning, Administration, and Funding Schedule to occur with the next overlay in this area. No outside funding potential.	No change	Medium
13-14	Alder and Gemini Drainage System Improvements	Flood Reduction Minor nuisance flooding.	Low	Public Participation Limited opportunity for education and stewardship Comprehensive Planning, Administration, and Funding No cost sharing opportunities.	No change	Low (Coordinate with Homann Infiltration Study)
13-15	White Fir Stormwater Installation	Flood Reduction High frequency, minor nuisance flooding. The City has received drainage complaints from the community. This project would reduce flood severity and frequency.	Low	Public Participation Limited opportunity for education and stewardship. Comprehensive Planning, Administration, and Funding Potential to coordinate with future sewer expansion project.	No change	Low

Prioritization Matrix

Proj. No.	Project Name	Primary Criteria Notes	Primary Criteria Score	Secondary Criteria Notes	Influence of Secondary Criteria	Overall Score
13-16	5th Ct SE and 5th Way Easement Storm Improvements	<p>Flood Reduction Potential minor impacts if structures are not maintained.</p> <p>Infrastructure Operations and Maintenance Maintenance is currently difficult due to the location of the conveyance system in a narrow easement between houses. Equipment does not fit in this space.</p>	Low	<p>Public Participation Limited opportunity for education and stewardship</p> <p>Comprehensive Planning, Administration, and Funding No cost sharing opportunities.</p>	No change	Low
13-17	Shady Lane Treatment Facility Improvements	<p>Surface Water Quality The facilities water quality treatment performance is limited by the unmaintained state. Improving the facility will enhance water quality.</p>	Medium	<p>Public Participation Limited opportunity for education and stewardship due to low-visibility site.</p> <p>Comprehensive Planning, Administration, and Funding No opportunity for cost sharing.</p>	No change	Medium



**Capital Improvement Program Project
Summary Sheet**

**Westminster Pond
Modification**

Location: South side 8th Ave. NE
just east of Westminster
Drive NE

Number: 19-1 **Priority:** High

Estimated Cost: \$340,000

ENR CCI 11,268.48 (June 2019)

Problem Description:

Existing facility needs rehabilitation as the pond has become laden with sediment. Project may include a retrofit to improve performance / expand drainage area. Potentially manage flow from 6th Ave and College Street system. Existing wetlands may limit ability to expand facility.

Project Solution:

Rehabilitate the existing facility. Restore pond bottom to design elevation and establish new wet pond vegetation around the perimeter. Relocate existing south inlet location closer to north inlet via pipe extension. Intercept north inlet pipe upstream of pond inlet with pre-treatment device sized adequately for flows.

Cost Estimate Assumptions:

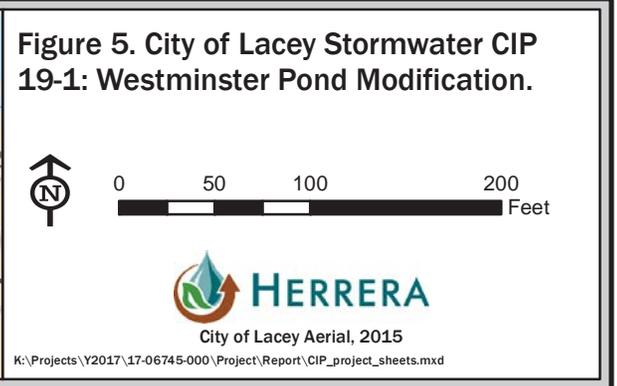
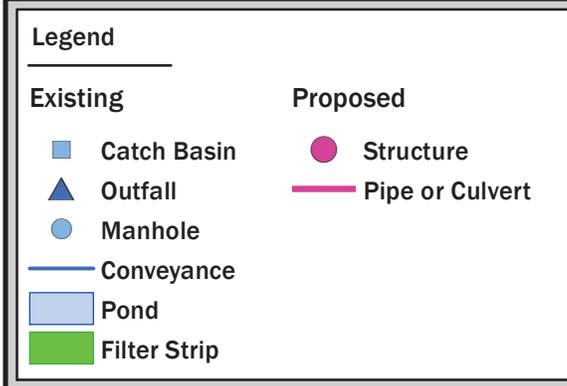
A 40% contingency has been added to the project cost to account for the uncertainty related to outlet relocation regarding required piping and berming, and to account for unknown inverts for the pretreatment device.



Existing stormwater pond, looking north



Existing stormwater pond, looking south



Engineering Construction Cost Estimate for Conceptual Design - DRAFT

Project Name: Westminster Pond Modification
Project Number: 17-06745-000
Client: City of Lacey Stormwater Comprehensive Plan Update



QA Review

Completed/Updated By: Meghan Mullen and Trae Yang
 Last Updated On: 6/11/2019
 Reviewed By: Matt Fontaine
 Reviewed On: 6/11/2019
 Approved By: Matt Fontaine
 Approved On: 6/11/2019

Item No.	Spec Division	Item Description	Qty	Unit	Unit Cost	Total Cost	
Div 1 General Requirements							
1		Mobilization	1	L.S.	10%	\$ 9,467	
2		Erosion/Water Pollution Control	1	L.S.	5%	\$ 4,734	
3		Temporary Dewatering	1	L.S.	10%	\$ 9,467	
4		Utility Protection and Relocation	1	L.S.	0%	\$ -	
5		Project Temporary Traffic Control	1	L.S.	0%	\$ -	
Div 2 Earthwork							
6		Pond Excavation, Incl. Haul	580	C.Y.	\$ 25	\$ 14,500	
7		Clearing and Grubbing	0.17	Acre	\$ 8,800	\$ 1,454	
Div 7 Drainage Structures, Storm Sewers, Sanitary Sewers, Water Mains, and Conduits							
8		GULD pretreatment device with installation	1	L.S.	\$ 63,000	\$ 63,000	
9		Schedule A Storm Sewer Pipe 12 In. Diameter	100	L.F.	\$ 50	\$ 5,000	
Div 8 Miscellaneous Construction							
10		Planting -- Shrubs and Seeding Mix	0.1	Acre	\$ 5,200	\$ 716	
11		Maintenance access	1	L.S.	\$ 10,000	\$ 10,000	
Construction Subtotal						\$ 118,338	
Contingency						40%	\$ 47,335.08
Lacey Cost Adjustment Factor						10%	\$ 11,833.77
Subtotal (with Contingency and Lacey Cost Adj. Factor)						\$ 177,507	
Tax						9.3%	\$ 16,508
Construction Total (with Contingency and Tax)						\$ 194,015	
Survey				L.S.		\$ 10,000	
Geotechnical / Infiltration Evaluation				L.S.		\$ -	
Predesign				L.S.		\$ 10,000	
Design				15%		\$ 29,000	
Permitting				L.S.		\$ 30,000	
Construction Management				15%		\$ 29,102.20	
City of Lacey Project Management				20%		\$ 38,802.93	
Estimated Project Total (rounded to 2 significant figures)						\$ 340,000	



Capital Improvement Program Project
Summary Sheet

26th Loop Conveyance

Location: 26th Loop SE and 26th Ave
SE from Golf Club Road
SE to Lakeside Dr SE

Number: 19-2 Priority: High

Estimated Cost: \$510,000

ENR CCI 11,268.48 (June 2019)

Problem Description:

Inadequate conveyance between College St. & Golf Club Rd. causes flooding of crawl spaces. Conveyance is hindered by sediment in ditches and a water main thrust block that limits ability to make the ditch deeper.

Project Solution:

Tightline all flows from Chambers Lake Drive, Golf Club Road, and 26th Ave SE to the connection with Chambers Lake SDMH at the intersection of Lakeside and 26th Loop. New storm roadway crossings will be low to avoid existing water main and will continuously hold water. New piping along south and west side of roadways may impact existing mature trees and must be considered as a potential challenge. Additionally, existing connection elevation constraints require minimal (0.5%) slope throughout the system.

Cost Estimate Assumptions:

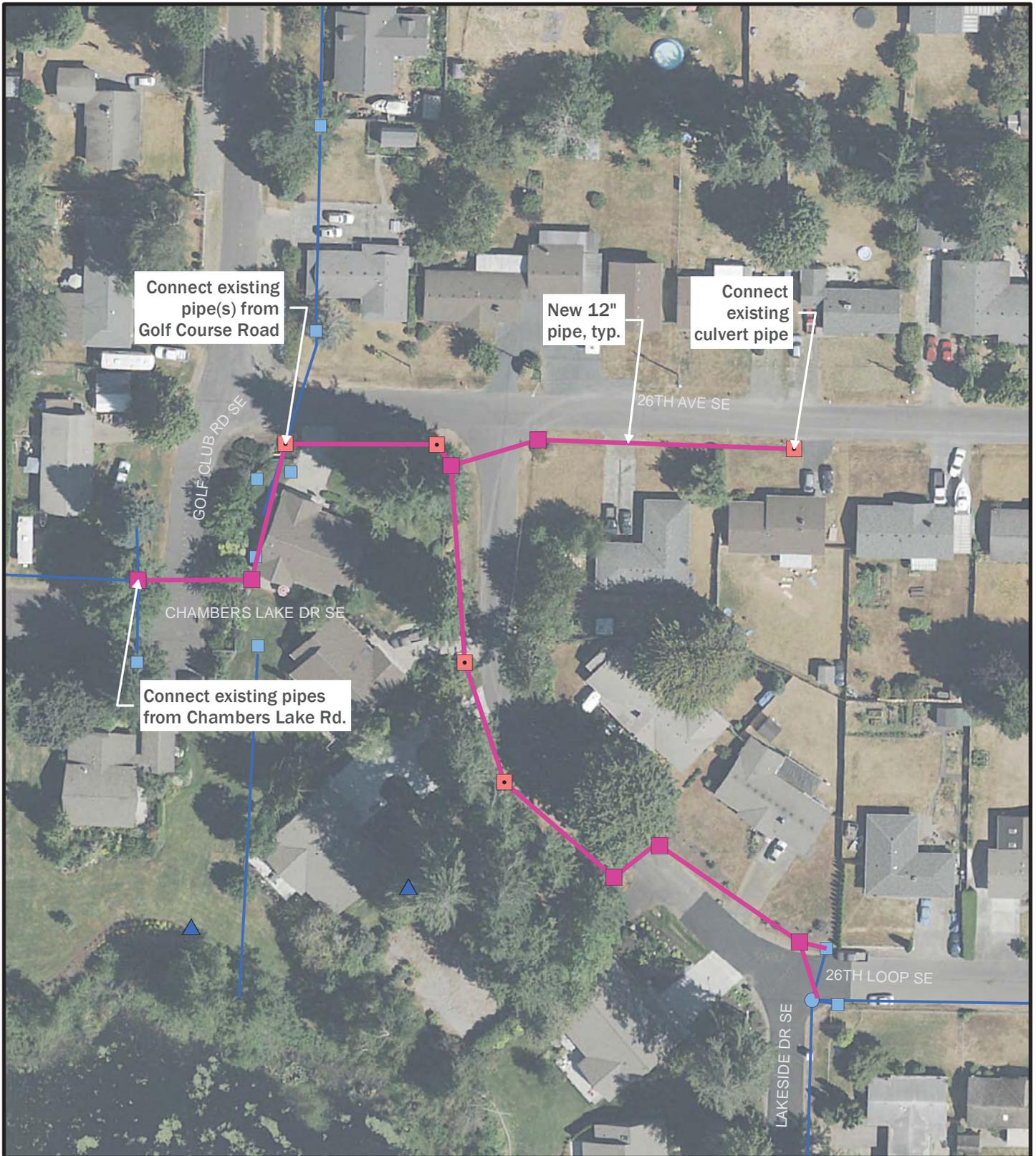
Assumes 50% contingency due to higher uncertainty of design. Assumes existing 12" pipes are adequate for flows.



Corner with thrust block preventing conveyance through existing ditch



Outlet of proposed conveyance extends to the Chambers Treatment Facility



Legend

Existing

- Catch Basin
- ▲ Outfall
- Junction Box
- Manhole
- Conveyance

Proposed

- Type 1 CB
- Type 2 CB
- Pipe or Culvert

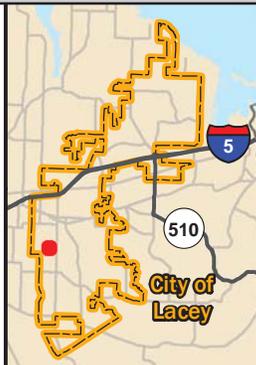


Figure 2. City of Lacey Stormwater CIP 19-2: 26th Loop Conveyance.



City of Lacey Aerial, 2015

Engineering Construction Cost Estimate for Conceptual Design - DRAFT

Project Name: 26th Loop
Project Number: 17-06745-000
Client: City of Lacey Stormwater Comprehensive Plan Update



QA Review

Completed/Updated By: Trae Yang
 Last Updated On: 6/12/2019
 Reviewed By: Matt Fontaine
 Reviewed On: 6/12/2019
 Approved By: Matt Fontaine
 Approved On: 6/12/2019

Item No.	Spec Division	Item Description	Qty	Unit	Unit Cost	Total Cost
Div 1 General Requirements						
1		Mobilization	1	L.S.	10%	\$ 13,425.49
2		Erosion/Water Pollution Control	1	L.S.	5%	\$ 6,712.75
3		Temporary Dewatering	1	L.S.	2%	\$ 2,685.10
4		Utility Protection and Relocation	1	L.S.	20%	\$ 26,850.99
5		Project Temporary Traffic Control	1	L.S.	10%	\$ 13,425.49
Div 2 Earthwork						
6		Clearing and Grubbing	1	L.S.	\$ 2,000	\$ 2,000
7		Structure Excavation, Incl. Haul	161	C.Y.	\$ 30	\$ 4,832
8		Removal of Structures and Obstructions	1	L.S.	\$ 5,000	\$ 5,000
9		CDF	111	C.Y.	\$ 185	\$ 20,444
10		Ditch excavation, incl haul	33	C.Y.	\$ 30	\$ 993
11		Ditch fill	116	C.Y.	\$ 40	\$ 4,634
Div 5 Surface Treatments and Pavements						
12		HMA for pavement Repair	19	Ton	\$ 300	\$ 5,576
13		CSBC	20	Ton	\$ 75	\$ 1,526
Div 7 Drainage Structures, Storm Sewers, Sanitary Sewers, Water Mains, and Conduits						
14		Schedule A Storm Sewer Pipe, 12 In. Diameter	745	L.F.	\$ 50	\$ 37,250
15		Type 1 Catch Basin	5	Each	\$ 2,600	\$ 13,000
16		Type 2 Catch Basin	7	Each	\$ 5,000	\$ 35,000
Div 8 Miscellaneous Construction						
17		Planting and seeding	1	Acre	\$ 4,000.00	\$ 4,000.00
Construction Subtotal						\$ 197,355
Contingency			50%			\$ 98,677.39
Lacey Cost Adjustment Factor			10%			\$ 19,735.48
Subtotal (with Contingency and Lacey Cost Adj. Factor)						\$ 315,768
Tax			9.3%			\$ 29,366
Construction Total (with Contingency and Tax)						\$ 345,134
Survey				L.S.		\$ 5,000
Geotechnical / Infiltration Evaluation				L.S.		\$ -
Predesign				L.S.		\$ -
Design			10%			\$ 35,000
Permitting				L.S.		\$ 5,000
Construction Management			15%			\$ 51,770.10
City of Lacey Project Management			20%			\$ 69,026.81
Estimated Project Total (rounded to 2 significant figures)						\$ 510,000



Capital Improvement Program Project
Summary Sheet

Location: Citywide

Stormwater Design Manual (SDM) Update

Number: 19-3 Priority: High

Estimated Cost: \$180,000

ENR CCI 11,268.48 (June 2019)

Problem Description:

The Stormwater Design Manual (SDM) will need to be updated for consistency with Ecology's 2019 Stormwater Management Manual for Western Washington, to better address the groundwater threat posed by deep underground infiltration (UIC) wells, and to create additional tools for SDM implementation.

Project Solution:

Create 2021 edition of Lacey's SDM for equivalency with Ecology's 2019 SWMMWW and include policies for deep UIC wells. Create additional tools that are needed for manual implementation, such as drainage control plan templates.

Cost Estimate Assumptions:

Experience with stormwater manual updates that are currently underway for other jurisdictions.



Construction site



Workshop and training opportunities



Capital Improvement Program Project
Summary Sheet

Woodland Creek Stormwater Treatment Facility Oil Water Separator Replacement

Location: Bowker St SE at Woodland
Creek Stormwater
Treatment Facility

Number: 19-4 Priority: High

Estimated Cost: \$480,000

ENR CCI 11,268.48 (June 2019)

Problem Description:

The current oil-water separator (OWS) is not functioning. The plates clog quickly, are difficult to maintain, and break during maintenance.

Project Solution:

Hydrologic analysis of the basin determined a much higher flow rate than is feasible to manage using an API style OWS. Replace the existing OWS with a new GULD pretreatment device that is sized to manage 2- to 3-cfs, which is approximately 25 percent of the offline water quality treatment flow rate. This configuration will improve sediment removal upstream of the WCSTF and reduce the maintenance burden.

Cost Estimate Assumptions:

Assumes total replacement of existing OWS and addition of a new flow splitter and bypass pipes within footprint that is similar to the existing facility. Assumes 6" HMA over 6" CSTC for surface restoration. If flow splitter and bypass piping can be reused there would be a cost savings relative to this estimate.



Existing facility location



Existing OWS



Woodland Creek Facility

New Type 1 SDMH

New stormwater pretreatment device

New high flow bypass structure

New Type 1 SDMH

Legend

Existing

- Manhole
- Conveyance

Proposed

- Manhole
- Pipe or Culvert
- Facility



Figure 8. City of Lacey Stormwater CIP : OWS Retrofit for WCSTF.



City of Lacey Aerial, 2015

K:\Projects\Y2017\17-06745-000\Project\Report\CIP_project_sheets.mxd

Engineering Construction Cost Estimate for Conceptual Design - DRAFT

Project Name: Woodland Creek Oil Water Separator Replacement
Project Number: 17-06745-000
Client: City of Lacey Stormwater Comprehensive Plan Update



QA Review

Completed/Updated By: Trae Yang
 Last Updated On: 6/12/2019
 Reviewed By: Matt Fontaine
 Reviewed On: 6/12/2019
 Approved By: Matt Fontaine
 Approved On: 6/12/2019

Item No.	Spec Division	Item Description	Qty	Unit	Unit Cost	Total Cost
Div 1 General Requirements						
1		Mobilization	1	L.S.	10%	\$ 19,177.51
2		Erosion/Water Pollution Control	1	L.S.	5%	\$ 9,588.75
3		Temporary Dewatering	1	L.S.	2%	\$ 3,835.50
4		Utility Protection and Relocation	1	L.S.	1%	\$ 1,917.75
5		Project Temporary Traffic Control	1	L.S.	0%	\$ -
Div 2 Earthwork						
6		Clearing and Grubbing	0.02	Acre	\$ 8,800	\$ 176
7		Roadway Excavation, Incl. Haul	67	S.Y.	\$ 20	\$ 1,333
8		Structure Excavation Class B	103	C.Y.	\$ 10	\$ 1,025
Div 5 Surface Treatments and Pavements						
9		HMA for pavement Repair	23	Ton	\$ 150	\$ 3,375
10		CSBC	21	Ton	\$ 28	\$ 576
Div 7 Drainage Structures, Storm Sewers, Sanitary Sewers, Water Mains, and Conduits						
11		Sediment vault, installation, and pipe connections	1	L.S.	\$ 169,000	\$ 169,000
12		Schedule A Storm Sewer Pipe, 24 In. Diameter	54	L.F.	\$ 85	\$ 4,590
13		Flow Splitter manhole	1	Each	\$ 6,500	\$ 6,500
14		Type 1 Catch Basin	2	Each	\$ 2,600	\$ 5,200
Div 8 Miscellaneous Construction						
Construction Subtotal						\$ 226,295
Contingency			20%			\$ 45,258.92
Lacey Cost Adjustment Factor			10%			\$ 22,629.46
Subtotal (with Contingency and Lacey Cost Adj. Factor)						\$ 294,183
Tax			9.3%			\$ 27,359
Construction Total (with Contingency and Tax)						\$ 321,542
Survey				L.S.		\$ 5,000
Geotechnical / Infiltration Evaluation				L.S.		\$ -
Predesign				L.S.		\$ -
Design			10%			\$ 32,000
Permitting				L.S.		\$ 5,000
Construction Management			15%			\$ 48,231
City of Lacey Project Management			20%			\$ 64,308
Estimated Project Total (rounded to 2 significant figures)						\$ 480,000



Capital Improvement Program Project
Summary Sheet

Woodland Creek Community Park Habitat Restoration

Location: Woodland Creek
Community Park

Number: 19-5 Priority: High

Estimated Cost: \$50,000

ENR CCI 11,268.48 (June 2019)

Problem Description:

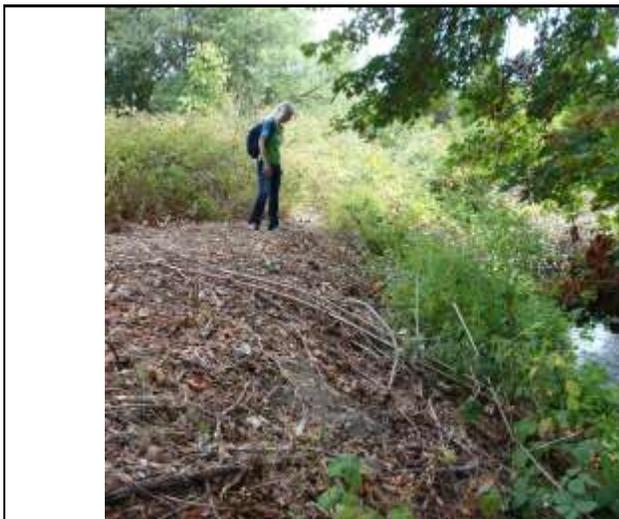
Invasive species are impairing habitat at Woodland Creek Community Park.

Project Solution:

Remove invasive species from the Woodland Creek Community Park so that volunteers can replant the area with native species to restore habitat.

Cost Estimate Assumptions:

Invasive species removal here and potentially at other priority locations would be packaged together to create a \$50,000 contract.



Woodland Creek bank



Park boundary



Capital Improvement Program Project
Summary Sheet

Location: Citywide

Stormwater Management
Action Planning (SMAP)

Number: 19-6 Priority: High

Estimated Cost: \$100,000

ENR CCI 11,268.48 (June 2019)

Problem Description:

The draft 2019 NPDES Phase II Permit requires permittees to identify, characterize, and prioritize basins for basin-specific Stormwater Management Action Planning (SMAP). SMAP will identify short-term and long-term actions for improving receiving water quality, including programs, policies, and projects. Initially, SMAP may outline data collection strategies to improve the City's understanding of hydrology, water quality, and associated problems and opportunities in each basin.

Project Solution:

Conduct Stormwater management action planning (SMAP) to meet NPDES requirements. The project will prioritize water bodies and basins within the City and develop a Stormwater Management Action Plan for at least 1 priority basin, which will include programmatic activities and stormwater facilities to improve stormwater management. The elements of the plan will be dictated by the goals of the City and stakeholders within the priority basin(s) and the work needs to be complete by the end of 2022.

Cost Estimate Assumptions:

Assumes \$100,000 planning effort with consultant support and one-time City staff time estimated at 0.25 FTE.



"No dumping" educational campaign



Stormwater treatment facility



Capital Improvement Program Project
Summary Sheet

Location: Citywide

Regional Water Quality Facility Program

Number: 19-7 Priority: Medium

Estimated Cost: \$200,000

ENR CCI 11,268.48 (June 2019)

Problem Description:

Many drainage basins in the city discharge to receiving waters without treatment.

Project Solution:

Conduct study in conjunction with SMAP to locate priority areas for construction of stormwater treatment facilities for existing untreated discharges.

Cost Estimate Assumptions:

The \$200,000 total cost includes funding to prepare grant application(s) to construct stormwater facilities and assumes that these facilities will be partially grant funded. The annual cost to the City will be \$100,000 for two years.



Infiltration gallery construction



Facility under construction



Capital Improvement Program Project
Summary Sheet

Infiltration Retrofit Program

Location: Citywide

Number: 19-8 Priority: Medium

Estimated Cost: \$200,000

ENR CCI 11,268.48 (June 2019)

Problem Description:

The City is responsible for maintaining a number of corrugated metal pipe (CMP) or concrete galleries throughout the city. Over time, these galleries fail so that routine maintenance is no longer adequate to restore function. Many of these galleries do not provide water quality treatment, which endangers groundwater, and may be opportunities for improved infiltration to reduce flow to the stormwater conveyance system.

Project Solution:

Construct water quality facilities and infiltration improvement at CMP gallery locations. These facilities will improve groundwater protection and extend the functional life of infiltration facilities by removing sediment that would clog the facility.

Cost Estimate Assumptions:

The annual allotment of \$100,000 is based on City expertise. The program is expected to continue for two years, resulting in a total cost of \$200,000.



Infiltration gallery construction



Rain garden



Capital Improvement Program Project
Summary Sheet

**Miscellaneous Storm System
Improvements**

Location: Citywide

Number: 19-9 Priority: Medium

Estimated Cost: \$900,000

ENR CCI 11,268.48 (June 2019)

Problem Description:

Development within the City frequently provides time-sensitive opportunities to improve the stormwater management system without identified budgetary sources. Miscellaneous Storm System Improvements include funding for infrastructure investment such as property acquisition for future stormwater management projects or partnering opportunities that arise, often requiring relatively quick funding decisions to leverage the City's limited funds.

Project Solution:

Construct stormwater improvements in conjunction with street, water, and/or wastewater projects.

Cost Estimate Assumptions:

The annual allotment of \$150,000 is based on City expertise. The program is expected to continue for six years, resulting in a total cost of \$900,000.



Catch basin cleaning



Facility maintenance



Capital Improvement Program Project
Summary Sheet

Stormwater Comprehensive Plan Update

Location: Citywide

Number: 19-10 Priority: Medium

Estimated Cost: \$250,000

ENR CCI 11,268.48 (June 2019)

Problem Description:

The City regularly updates their Stormwater Comprehensive Plan.

Project Solution:

2025 update to the SCP, including CIP and Stormwater Utility Financial Plan.

Cost Estimate Assumptions:

Cost estimate is based on City experience with past comprehensive plan updates.



Stormwater facility tour



Public involvement



**Capital Improvement Program Project
Summary Sheet**

**Land Purchase for Future
Facility Improvements**

Location: Southwest side of Hicks
Lake

Number: 19-11 **Priority:** Medium

Estimated Cost: \$350,000

ENR CCI 11,268.48 (June 2019)

Problem Description:

The Ruddell Road Stormwater Treatment facility was constructed in 1999 as a flow-through wetland. Flows to this facility have increased due to drainage system improvements in the Brentwood area to expand the stormwater conveyance system. The facility should be enlarged and improved to meet current standards. Additionally, the facility is difficult to access and the inlet pipe is a safety concern.

Project Solution:

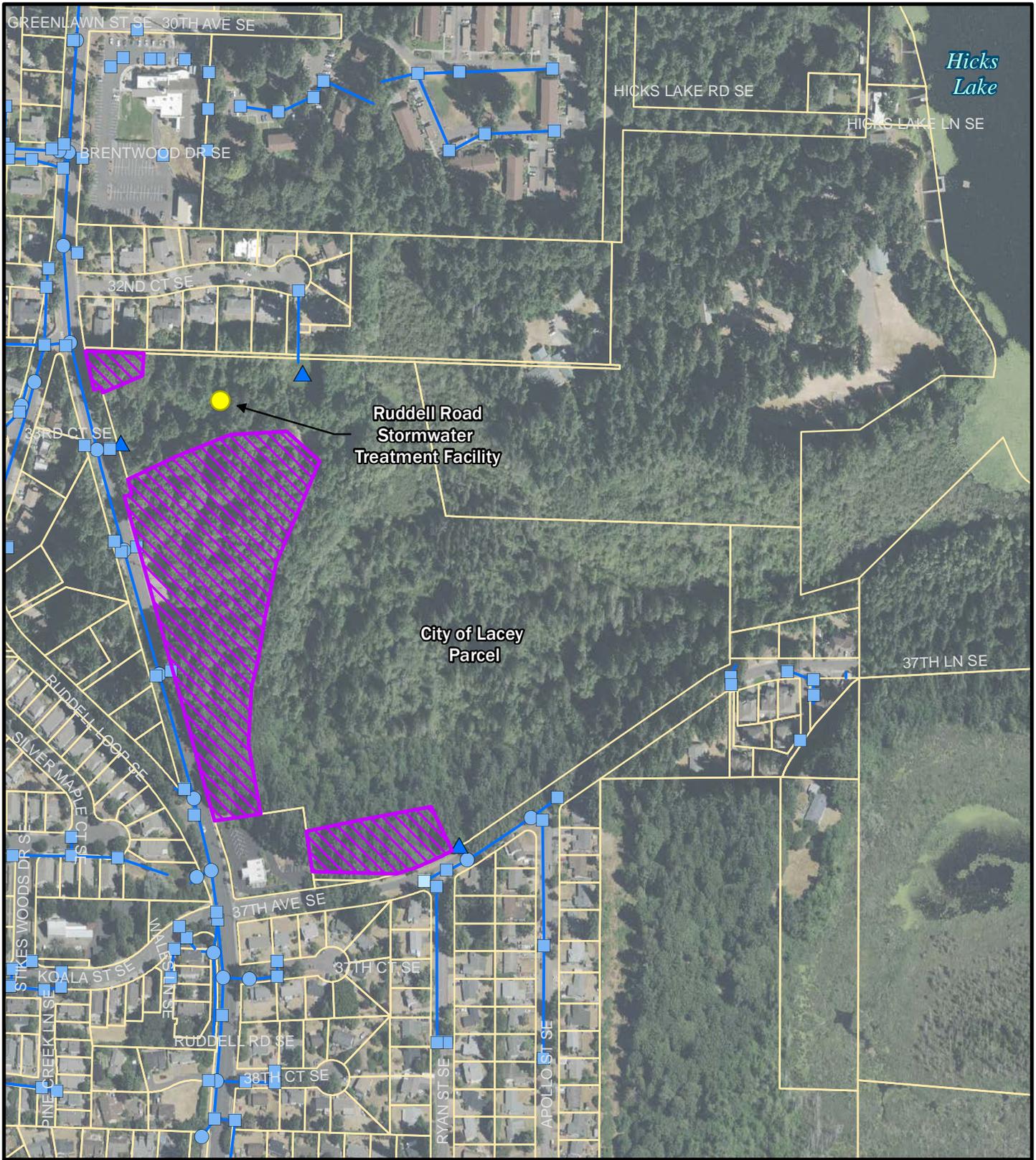
Water Resources and the Stormwater Utility see long-term value in the acquisition of three undeveloped parcels adjacent to City property containing the existing Ruddell Road Stormwater Treatment Facility and wetlands southwest of Hicks Lake. The three parcels are expected to be used to expand or improve the safety and performance of the existing facility, locate a new facility to provide treatment for existing untreated discharge, and provide habitat and wetland buffer preservation.

Cost Estimate Assumptions:

The cost for acquiring these parcels is based on an appraisal in June 2019.

**NO IMAGE
AVAILABLE**

**NO IMAGE
AVAILABLE**



Hicks Lake

Ruddell Road Stormwater Treatment Facility

City of Lacey Parcel

Legend

-  Ruddell Road Stormwater Treatment Facility
-  Catch Basin
-  Outfall
-  Junction Box
-  Manhole
-  Conveyance
-  Parcels for Acquisition

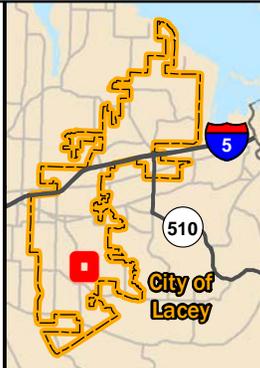


Figure 20.
Land Purchase for Future Facility Improvements.



City of Lacey Aerial, 2015



**Capital Improvement Program Project
Summary Sheet**

**Diamond Stormwater
Alternative**

Location: Diamond Road SE,
between intersections with
Diamond Loop SE

Number: 13-7 **Priority:** Medium

Estimated Cost: \$380,000

ENR CCI 11,268.48 (June 2019)

Problem Description:

Stormwater at this location is pumped away during extreme storm events (i.e. every couple years). An alternative solution is needed that would manage stormwater without pumping it away.

Project Solution:

Install backflow preventers on 2 existing storm drain outfalls to pond. Install a new storm pump station adjacent to the sanitary sewer pump station on Diamond Loop SE, a force main to convey flow to the stormwater outfalls, and a filtration system at the pump station inlet to provide water quality treatment.

Cost Estimate Assumptions:

24 In Tideflex valve, 18 In Tideflex valve, 350 gpm submersible pump station, 170LF 4 In Dia force main discharging adjacent to existing outfall pipe. The cost has been increased from the original 2013 estimate.



Stormwater pond



Existing inlet



Legend

Existing

- Catch Basin
- Junction Box
- Manhole
- Conveyance

Proposed

- Structure
- Pipe or Culvert

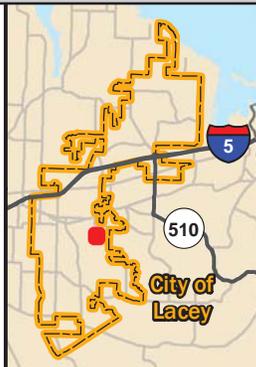


Figure 19. City of Lacey Stormwater CIP 13-7: Diamond Stormwater Alternative.



City of Lacey Aerial, 2015

CLIENT: City of Lacey

PROJECT: Stormwater Comprehensive Plan - CIP Cost Estimates

PROJECT 7 - Diamond Stormwater Alternative

Prepared by: M. Fontaine
 Checked by: M. Brennan
 Reversed by: M. Fontaine

Table 1. Conceptual Cost Estimate

Item	Quantity	Unit	Unit Cost	Amount	Notes
Pump Station					
					WSDOT UBA and City of Lacey recent bids. High end for small qty. Pump station and force main outfall.
Structure Excavation Class B, Incl. Haul	336	CY	\$20	\$6,720	
Bank Run Gravel for Trench Backfill	265	CY	\$5	\$1,325	City of Lacey recent bids.
Crushed Surfacing, Base Course	4	TN	\$100	\$400	Restore easement. City of Lacey recent bids. High end for small qty.
Pump Station	1	EA	\$62,000	\$62,000	Assumes 350 gpm duplex pump station. 5' ID x 8' deep wetwell. Valves in H-20 rated wetwell. Control panel on post with autodialer telemetry. Includes wet well piping and appurtenance. Based on estimate from Romtec, Mark Sheldon, msheldon@romtecutilities.com, 541-496-9676.
Labor for Pump Station Installation	40	HRS	\$70	\$2,800	Based on Romtec estimate - see above. Labor rates based on The Guide Winter 2010.
4 In. HDPE SDR 11 Force Main, Outfall Segment	175	LF	\$10	\$1,750	Force main outfall segment from downstream-most manhole structure to outfall in wetland. Based on material cost from HD Fowler, includes 50% markup for provision and installation.
Phone Line to Site	1	LS	\$2,000	\$2,000	Phone line for telemetry equipment. Engineers estimate.
Electric to Site	1	LS	\$5,000	\$5,000	Provide 3-phase power. Engineers estimate.
Backflow Prevention Valves					
Tideflex Valve - TF1 - 24" w/ Bands	1	EA	\$8,200	\$8,200	Based on price quote from ANTEC CORP - Matthew Davidson - 425-888-9090. Includes shipping and 30% markup for overhead and installation.
Tideflex Valve - TF1 - 18" w/ Bands	1	EA	\$5,500	\$5,500	Based on price quote from ANTEC CORP - same assumptions as above.
TOTAL DIRECT COSTS:				\$96,000	
MARKUPS					
Mobilization			8%	\$7,680	Not applied to force main in SSP.
Temporary Erosion and Sediment Control			2%	\$1,920	Manage stockpiles and protect inlets.
Temporary Dewatering			5%	\$4,800	Dewatering and treatment likely required.
Traffic Control			3%	\$2,880	Signs and flaggers for a couple days.
Contingency			60%	\$57,600	
Sales Tax			8.7%	\$8,352	
Total Construction Cost:				\$180,000	
PREDESIGN COSTS					
Survey			LS	\$5,000	Base mapping.
Geotechnical Evaluation			LS	\$0	
Pre-design			LS	\$20,000	Assumes additional alternatives assessment, basic wetland hydroperiod assessment, agency consultation, and brief memo.
OTHER PROJECT COSTS					
Total Pre-design (Survey, Geotech, Pre-design)				\$25,000	
Design			LS	\$15,000	Pump station design provided by vendor.
Permitting			LS	\$50,000	Assumes Clearing and Grading Permit, SEPA Checklist, JARPA, Critical Areas Report, and Biological Assessment.
Construction Management			15%	\$27,000	
City of Lacey Project Management			5%	\$9,000	
Total Estimated Project Cost:				\$306,000	



Capital Improvement Program Project
Summary Sheet

**Clearbrook Drainage System
Improvements**

Location: South of Lacey Blvd
between Clearbrook Dr SE
and Yonkers Dr SE

Number: 13-9 Priority: Medium

Estimated Cost: \$480,000

ENR CCI 11,268.48 (June 2019)

Problem Description:

The aging storm drain in this area has limited slope and there is no fall between the storm drain outlets and Clearbrook Pond. The system frequently gets backwatered, causes street flooding, and threatens to flood one house during any significant rain event.

Project Solution:

Lower invert of pond outlet and increase pipe size (larger pipe at reduced slope). Excavate a linear swale around the perimeter to provide adequate fall for the pipes and install two pedestrian bridges. Add an upstream infiltration facility in 19th Ct NE with stormwater treatment.

Cost Estimate Assumptions:

850 LF grass lined swale, 520 LF 18 In Dia SD, 175 LF 48 In Dia infiltration gallery, stormwater filter system with high flow bypass. The cost has been increased from the original 2013 estimate.



Evidence of ponding in low spots



Site of proposed swale



Legend	
Existing	
	Catch Basin
	Discharge
	Manhole
	Conveyance
Proposed	
	Catch Basin
	Structure
	Bioretention
	Infiltration
	Pipe or Culvert
	Ditch
	ped bridge

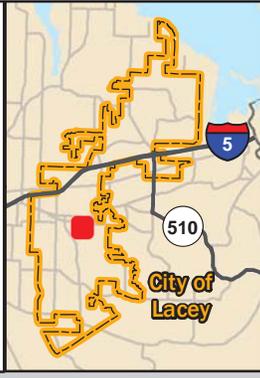


Figure 18. City of Lacey Stormwater CIP 13-9: Clearbrook Drainage System Improvements.



City of Lacey Aerial, 2015

CLIENT: City of Lacey
 PROJECT: Stormwater Comprehensive Plan - CIP Cost Estimates

PROJECT 9 - Clearbrook Drainage System Improvements

Prepared by: M. Fontaine
 Checked by: N. Christensen

Table 1. Conceptual Cost Estimate

Item	Quantity	Unit	Unit Cost	Amount	Notes
Outlet Pipe Replacement (cost would be similar for piping to proposed Holmann Park system assuming 0\$ easement)					
Removing Asphalt Conc. Pvmnt., Incl. Haul	191	SY	\$15	\$2,865	SPU 2007 unit cost report.
Structure Excavation Class B, Incl. Haul	343	CY	\$20	\$6,860	Assumes 3' pipe cover. WSDOT UBA and City of Lacey recent bids.
Bank Run Gravel for Trench Backfill	108	CY	\$10	\$1,080	6" btwn pipe bedding and base course. City of Lacey recent bids.
Crushed Surfacing, Base Course	54	TN	\$60	\$3,240	City of Lacey recent bids.
HMA for Pavement Repair	71	TN	\$110	\$7,810	WSDOT UBA and City of Lacey recent bids.
Catch Basin Type 2	1	EA	\$1,000	\$1,000	City of Lacey recent bids.
Connect to Drainage Structure	1	EA	\$750	\$750	WSDOT UBA and City of Lacey recent bids.
Replace Outlet Structure	1	EA	\$3,000	\$3,000	Engineers estimate.
Schedule A SSP, 18 In. Dia.	520	LF	\$30	\$15,600	For new pond outlet. City of Lacey recent bids.
Pond Rehabilitation					
Pond Excavation, Incl. Haul	787	CY	\$17	\$13,379	1.5' deep swale around perimeter of pond.
Construction Geotextile for Separation	944	SY	\$3	\$2,832	Recent bids: Eastsound Wetland.
Streambed Gravel	315	CY	\$75	\$23,625	Line Swale 1' deep with streambed gravel.
Planting	0.2	AC	\$30,000	\$6,000	Based on recent bids: Eastsound Wetland. Higher end planting for high quality early aesthetic. Includes plant establishment.
Pedestrian Bridge	2	EA	\$10,000	\$20,000	Simple pedestrian bridges. Recent bids: Eastsound wetland.
Site Restoration	1	LS	\$5,000	\$5,000	Engineers Estimate
Infiltration Gallery at 19th Ct NE					
Media Filtration Structure	1	EA	\$26,000	\$26,000	Upstream of infiltration gallery. Basic treatment - assume Contech StormFilter™ 48" Dia with high flow and overflow bypassed downstream. Based on price quote from Contech (Katheryn Thomason 503-258-3176) 16,800 to 20,000 delivered. Includes 30% markup for installation.
Infiltration Gallery, 48 In. Dia. Perf Pipe	175	LF	\$150	\$26,250	Under existing open space. Engineer estimate and City of Lacey recent bids.
Site Restoration	1	LS	\$2,000	\$2,000	Engineer estimate.
TOTAL DIRECT COSTS:				\$167,000	
MARKUPS					
Mobilization			8%	\$13,360	
Temporary Erosion and Sediment Control			2%	\$3,340	Manage soil stockpiles and sweeping.
Temporary Dewatering			2%	\$3,340	
Traffic Control			4%	\$6,680	
Contingency			30%	\$50,100	Utility conflicts unknown.
Sales Tax			8.7%	\$21,212	
Total Construction Cost:				\$265,000	
PREDESIGN COSTS					
Survey			LS	\$5,000	Base mapping. Multiple locations.
Geotechnical Evaluation			LS	\$15,000	Evaluate feasibility for deep infiltration at this site and recommend whether to revise concept to include treatment and deep infiltration rather than improved conveyance offsite.
Predesign			LS		Included in geotech.
OTHER PROJECT COSTS					
Total Predesign (Survey, Geotech, Predesign)				\$20,000	
Design			10%	\$35,000	2 general sheets, 3 plan sheets, 2 detail sheet.
Permitting			LS	\$5,000	Grading permit and street use permit.
Construction Management			15%	\$40,000	
City of Lacey Project Management			5%	\$13,000	
Total Estimated Project Cost:				\$378,000	



**Capital Improvement Program Project
Summary Sheet**

**Homann Area System
Rehabilitation**

Location: Homann Dr SE and 17th Ave SE to Glen Mary Drive SE and Homann Park

Number: 13-10 **Priority:** Medium

Estimated Cost: \$1,800,000

ENR CCI 11,268.48 (June 2019)

Problem Description:

Infiltration galleries in this area are no longer functioning due to poor soils and are causing localized nuisance flooding. The City has been making minor improvements in this area since 1985, though a long-term solution has not been put into place.

Project Solution:

Conduct a cost benefit analysis including a geotechnical evaluation to either (Option 1) add stormwater conveyance and construct a regional infiltration facility located in the baseball field north of the site OR (Option 2) install bioretention facilities in the right of way to enhance local infiltration and take advantage of high infiltrating soils in the area.

Cost Estimate Assumptions:

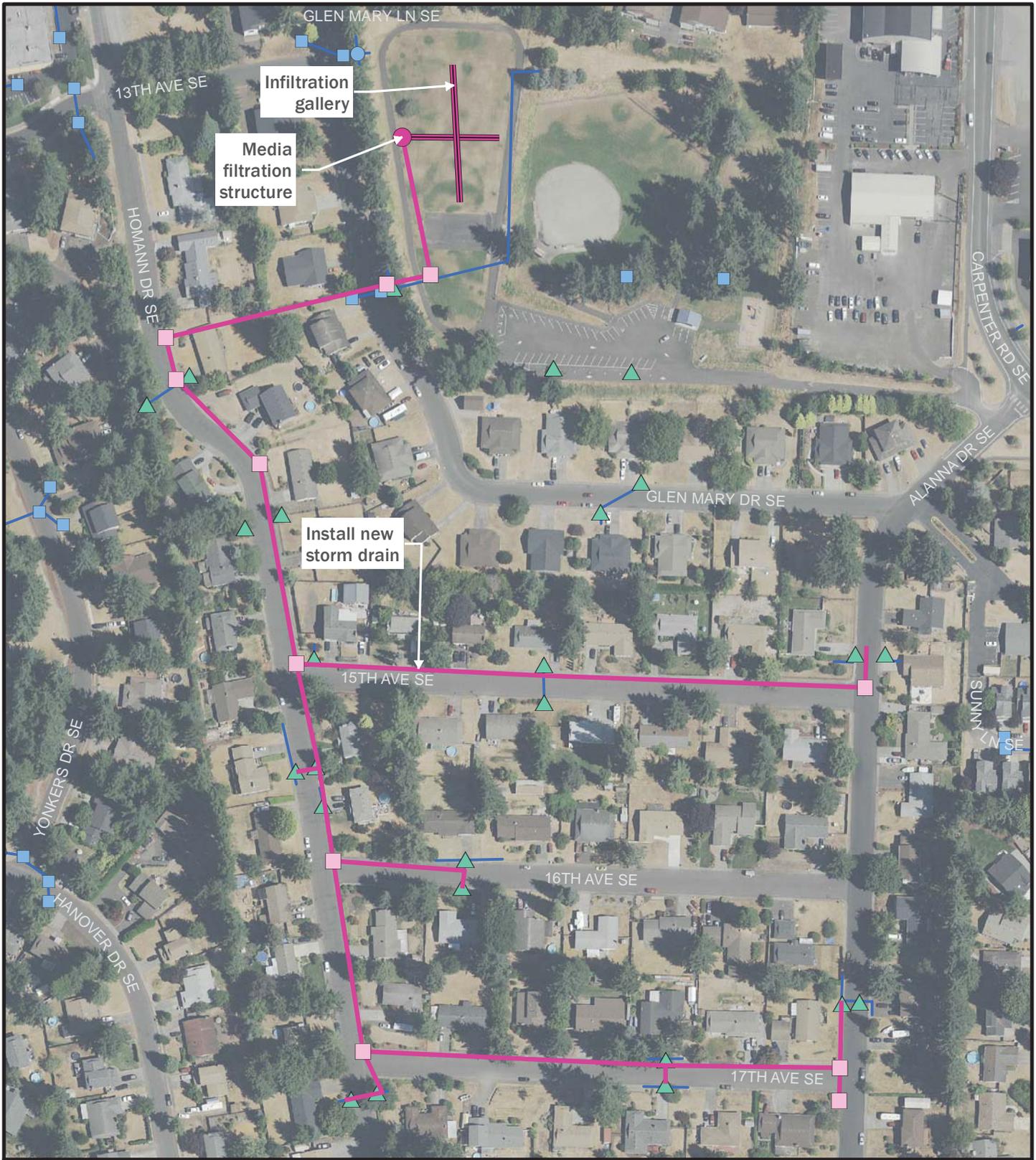
Option 1: (\$1.8M) Install about 4,000 LF of conveyance and new structures, rehabilitate existing drywells, and install an infiltration gallery in the baseball field north of the neighborhood. A media filtration structure is included upstream of the infiltration gallery. Only the design and analysis components of this project are included in the current CIP implementation schedule for \$320,000.



Baseball field north of the site (to be used for regional infiltration in Option 1)



ROW in the neighborhood (to be used for bioretention in Option 2)



Legend	
Existing	Proposed
Catch Basin	Catch Basin
Discharge	Structure
Manhole	Infiltration
Conveyance	Pipe or Culvert

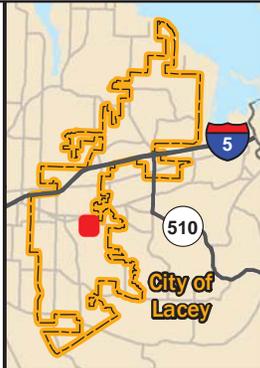
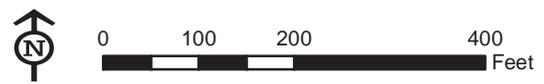


Figure 4. City of Lacey Stormwater CIP 13-10: Homann Area System Rehabilitation (Option 1).



City of Lacey Aerial, 2015



Legend

Existing

- Catch Basin
- ▲ Discharge
- Manhole
- Conveyance

Proposed

- Bioretention
- Pipe or Culvert

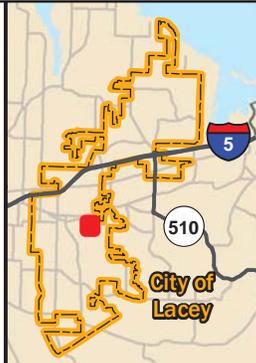


Figure 5. City of Lacey Stormwater CIP 13-10: Homann Area System Rehabilitation (Option 2).



City of Lacey Aerial, 2015

Engineering Construction Cost Estimate for Conceptual Design - DRAFT

Project Name: Homann Area System Rehabilitation -- Option 1 (Infiltration Gallery)
Project Number: 17-06745-000
Client: City of Lacey Stormwater Comprehensive Plan Update



QA Review

Completed/Updated By: Meghan Mullen
 Last Updated On: 4/22/2019
 Reviewed By: Matt Fontaine
 Reviewed On: 6/14/2019
 Approved By: Matt Fontaine
 Approved On: 6/14/2019

Item No.	Spec Division	Item Description	Qty	Unit	Unit Cost	Total Cost
	Div 1	General Requirements				
1		Mobilization	1	L.S.	10%	\$ 44,204
2		Erosion/Water Pollution Control	1	L.S.	5%	\$ 22,102
3		Temporary Dewatering	1	L.S.	1%	\$ 4,420
4		Utility Protection and Relocation	1	L.S.	40%	\$ 176,817
5		Project Temporary Traffic Control	1	L.S.	2%	\$ 8,841
	Div 2	Earthwork				
6		Removing Asphalt Conc. Pvmt., Incl. Haul	1,214	S.Y.	\$ 18	\$ 21,850
7		Structure Excavation Class B, Incl. Haul	1,747	C.Y.	\$ 15	\$ 26,201
	Div 4	Bases				
8		Bank Run Gravel for Trench Backfill	252	C.Y.	\$ 10	\$ 2,523
9		Crushed surfacing, base course	374	Ton	\$ 50	\$ 18,714
	Div 5	Surface Treatments and Pavements				
10		HMA for Pavement Repair	396	Ton	\$ 150	\$ 59,405
	Div 7	Drainage Structures, Storm Sewers, Sanitary Sewers, Water Mains, and Conduits				
11		Catch Basin Type 1	7	Each	\$ 3,000	\$ 21,000
12		Catch Basin Type 2	4	Each	\$ 5,000	\$ 20,000
13		Connect to Drainage Structure	13	Each	\$ 800	\$ 10,400
14		Rehab Drywell	9		\$ 500	\$ 4,500
15		Schedule A SSP, 12 In. Dia.	3,070	L.F.	\$ 50	\$ 153,500
16		Schedule A SSP, 24 In. Dia.	640	L.F.	\$ 80	\$ 51,200
17		Media Filtration Structure	1	Each	\$ 26,000	\$ 26,000
18		Infiltration Gallery, 60 in. dia.	250	L.F.	\$ 80	\$ 20,000
	Div 8	Miscellaneous Construction				
19		Topsoil Type A	0.1	Acre	\$ 41,000	\$ 5,647
20		Seeding, Fertilizing, and Mulching	0.1	Acre	\$ 8,000	\$ 1,102
		Construction Subtotal				\$ 698,426
		Contingency	30%			\$ 209,528
		Lacey Cost Adjustment Factor	10%			\$ 69,842.63
		Subtotal (with Contingency and Lacey Cost Adj. Factor)				\$ 977,797
		Tax	9.3%			\$ 90,935
		Construction Total (with Contingency and Tax)				\$ 1,068,732
		Survey		L.S.		\$ 40,000
		Geotechnical / Infiltration Evaluation		L.S.		\$ 40,000
		Predesign		L.S.		\$ 30,000
		Design	20%			\$ 214,000
		Permitting		L.S.		\$ 5,000
		Construction Management	15%			\$ 160,310
		City of Lacey Project Management	20%			\$ 213,746
		Estimated Project Total (rounded to 2 significant figures)				\$ 1,800,000

Engineering Construction Cost Estimate for Conceptual Design - DRAFT

Project Name: Homann Area System Rehabilitation -- Option 2 (Bioretention facilities)
Project Number: 17-06745-000
Client: City of Lacey Stormwater Comprehensive Plan Update



QA Review

Completed/Updated By: Meghan Mullen
 Last Updated On: 4/23/2019
 Reviewed By: Matt Fontaine
 Reviewed On: 6/14/2019
 Approved By: Matt Fontaine
 Approved On: 6/14/2019

Item No.	Spec Division	Item Description	Qty	Unit	Unit Cost	Total Cost
Div 1 General Requirements						
1		Mobilization	1	L.S.	10%	\$ 20,102
2		Erosion/Water Pollution Control	1	L.S.	10%	\$ 20,102
3		Temporary Dewatering	1	L.S.	0.5%	\$ 1,005
4		Utility Protection and Relocation	1	L.S.	20%	\$ 40,204
5		Project Temporary Traffic Control	1	L.S.	5%	\$ 10,051
Div 2 Earthwork						
6		Removing Asphalt Conc. Pvmt., Incl. Haul	440	S.Y.	\$ 18	\$ 7,920
7		Structure Excavation Class B, Incl. Haul	760	C.Y.	\$ 15	\$ 11,400
Div 7 Drainage Structures, Storm Sewers, Sanitary Sewers, Water Mains, and Conduits						
8		Connect to Drainage Structure	10	Each	\$ 800	\$ 8,000
Div 8 Miscellaneous Construction						
9		Bioretention Soil	420	C.Y.	\$ 150	\$ 63,000
10		Planting	4,000	S.F.	\$ 10	\$ 40,000
11		Mulch	70	C.Y.	\$ 10	\$ 700
12		Miscellaneous Restoration	1	L.S.	\$ 70,000	\$ 70,000
Construction Subtotal						\$ 292,484
Contingency			30%			\$ 87,745.23
Lacey Cost Adjustment Factor			10%			\$ 29,248.41
Subtotal (with Contingency and Lacey Cost Adj. Factor)						\$ 409,478
Tax			9.3%			\$ 38,081
Construction Total (with Contingency and Tax)						\$ 447,559
Professional Fees						
		Survey		L.S.		\$ 20,000
		Geotechnical / Infiltration Evaluation		L.S.		\$ 40,000
		Pre-design		L.S.		\$ 30,000
		Design	20%			\$ 90,000
		Permitting		L.S.		\$ 5,000
		Construction Management	15%			\$ 67,134
		City of Lacey Project Management	20%			\$ 89,512
Estimated Project Total (rounded to 2 significant figures)						\$ 790,000



Capital Improvement Program Project
Summary Sheet

1010 Midway Storm Improvements

Location: Midway Dr NE and 15th
Ave NE

Number: 13-11 Priority: Medium

Estimated Cost: \$50,000

ENR CCI 11,268.48 (June 2019)

Problem Description:

A clogged storm drain pipe and blind connection into the County storm drain is causing flooding. The County is responsible for maintenance, though flow comes from Olympia as well. Upstream, the system lacks capacity and is frequently clogged. The outfall to the lake has become partially obstructed with sediment and needs to be dredged out and modified to make it easy to maintain. Access to the outfall from the pond is difficult due to a narrow easement.

Project Solution:

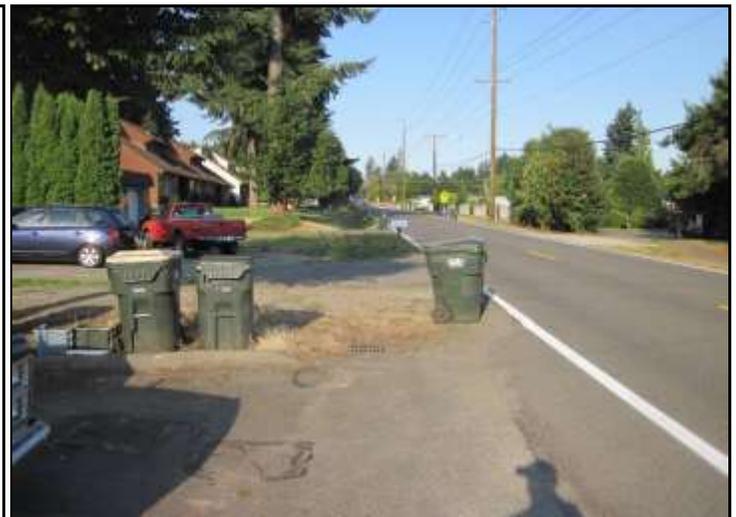
Replace a portion of the existing storm drain pipe and install new catch basins at both ends. Consider issues with high flow / inadequate conveyance capacity in the ditch and culvert system, in addition to the problem created by the blind tee.

Cost Estimate Assumptions:

100 LF of 12 In Dia SD, 1 CB Type 1, 1 CB Type 2. The cost has been increased from the original 2013 estimate.



Existing location of Tee beneath pavement



Looking west along 15th Ave. NE



Legend

Existing

- Catch Basin
- Conveyance

Proposed

- Type 1 CB
- Type 2 CB
- Pipe or Culvert

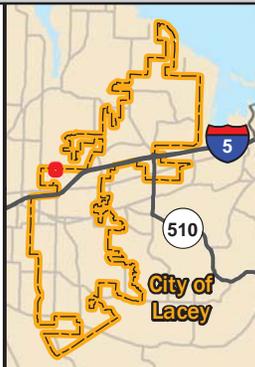


Figure 11. City of Lacey Stormwater CIP 13-11: 1010 Midway Storm Improvements.



City of Lacey Aerial, 2015

CLIENT: City of Lacey
 PROJECT: Stormwater Comprehensive Plan - CIP Cost Estimates

PROJECT 11 - 1010 Midway Storm Improvements

Prepared by: M. Fontaine
 Checked by: M. Brennan
 Revised by: M. Fontaine

Table 1. Conceptual Cost Estimate

Item	Quantity	Unit	Unit Cost	Amount	Notes
Structure Excavation Class B, Incl. Haul	42	CY	\$20	\$840	WSDOT UBA and City of Lacey recent bids. High end for small qty.
Bank Run Gravel for Trench Backfill	28	TN	\$10	\$280	City of Lacey recent bids.
Catch Basin Type 1	1	EA	\$1,000	\$1,000	City of Lacey recent bids.
Catch Basin Type 2	1	EA	\$3,000	\$3,000	City of Lacey recent bids.
Schedule A SSP, 12 In. Dia.	100	LF	\$30	\$3,000	City of Lacey recent bids.
Topsoil Type A	4	CY	\$20	\$80	4 in. thickness on landscaped areas for restoration. City of Lacey recent bids.
Miscellaneous Restoration	1	LS	\$5,000	\$5,000	Engineers estimate. Restore private property and right of way.
TOTAL DIRECT COSTS:				\$13,000	
MARKUPS					
Mobilization			8%	\$1,040	
Temporary Erosion and Sediment Control			5%	\$650	Manage stockpiles.
Temporary Dewatering			5%	\$650	Minor trench dewatering.
Traffic Control			3%	\$390	Signs and flagger for 1 to 2 days.
Contingency			30%	\$3,900	Uncertain utility conflicts.
Sales Tax			8.7%	\$1,708	
Total Construction Cost:				\$21,000	
PREDESIGN COSTS					
Survey			LS	\$2,000	Base mapping.
Geotechnical Evaluation			LS	\$0	
Predesign			5%	\$1,050	Oversee survey.
OTHER PROJECT COSTS					
Total Predesign (Survey, Geotech, Predesign)				\$3,000	
Design			LS	\$10,000	1 sheet with plan and profile. Use typical details.
Permitting			LS	\$0	
Construction Management			15%	\$3,000	
City of Lacey Project Management			5%	\$1,000	
Total Estimated Project Cost:				\$38,000	



Capital Improvement Program Project
Summary Sheet

Belair-Impala Stormwater Installation

Location: Impala Dr SE, 32nd Ave SE
(west of Stikes Dr.)

Number: 13-12 Priority: Medium

Estimated Cost: \$1,100,000

ENR CCI 11,268.48 (June 2019)

Problem Description:

Lack of drainage infrastructure in this area is causing nuisance flooding. All stormwater runoff flows overland towards Wonderwood Park causing chronic flooding on residential streets and in some driveways. Flooding is most significant at the downstream end of the neighborhood. Drainage infrastructure on Stikes Dr. and the eastern portion of 32nd Ave is being completed as part of another project.

Project Solution:

Install storm drain along Impala Dr SE and 32nd Ave SE to convey stormwater to the new drainage system installed as part of the 33rd Ave and Stikes Dr. project.

Cost Estimate Assumptions:

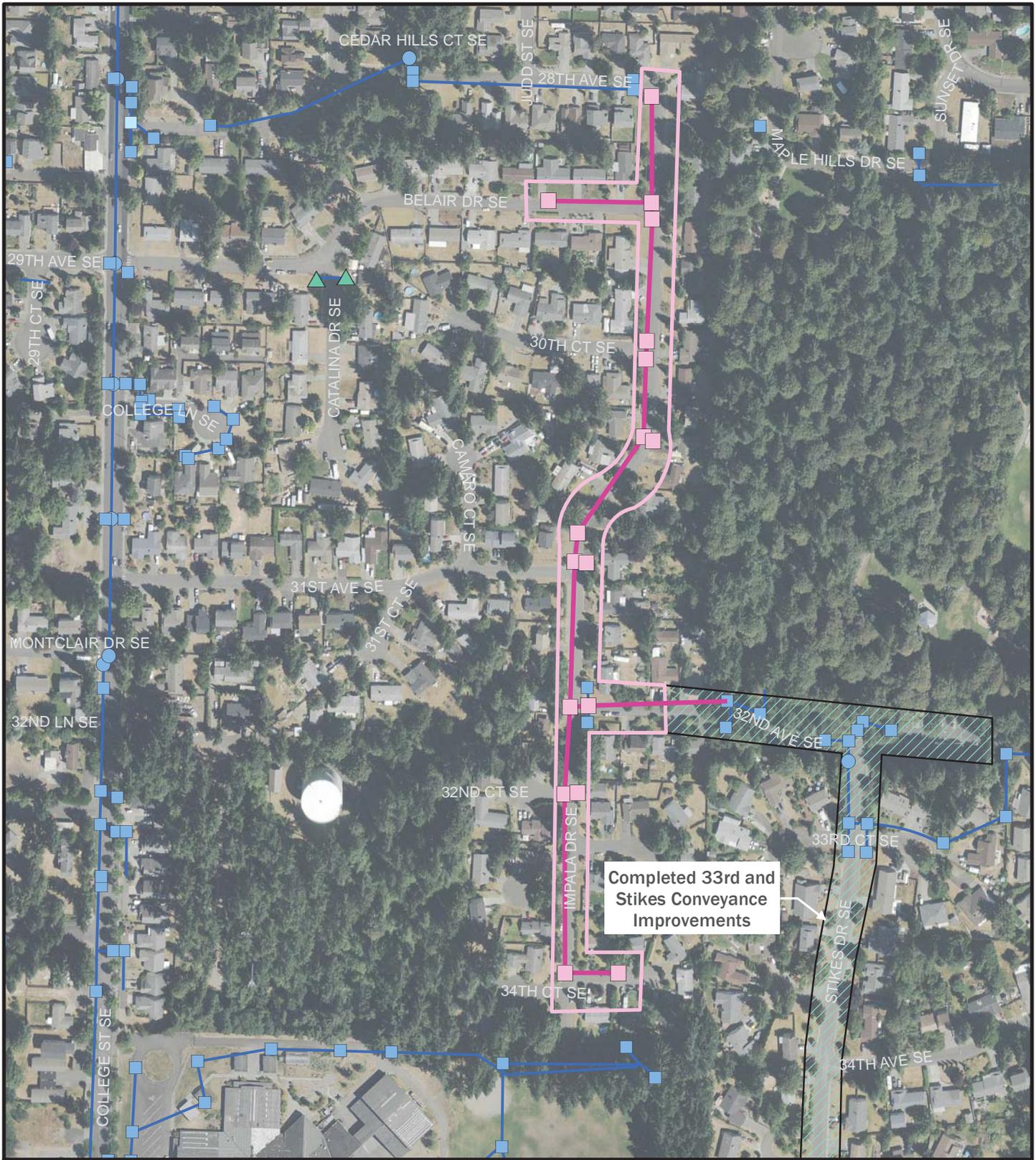
2,780 LF of 12 In Dia SD, 17 CB Type 1, 1 connection to existing drainage structures at the 33rd Ave and Stikes Dr. project boundary.



Completed Brentwood project nearby



Road without drainage system



Completed 33rd and Stikes Conveyance Improvements

Legend

- | | |
|-----------------|-----------------|
| Existing | Proposed |
| Catch Basin | Catch Basin |
| Discharge | Pipe or Culvert |
| Junction Box | Project Extent |
| Manhole | |
| Conveyance | |
| Completed CIP | |

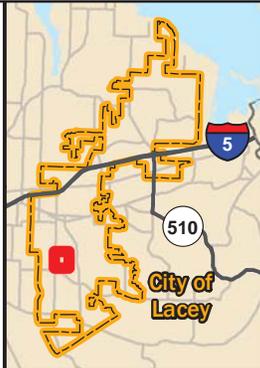


Figure 3. City of Lacey Stormwater CIP 13-12: Belair-Impala Stormwater Installation.



City of Lacey Aerial, 2015

Engineering Construction Cost Estimate for Conceptual Design - DRAFT

Project Name: Belair-Impala Stormwater Installation
Project Number: 17-06745-000
Client: City of Lacey Stormwater Comprehensive Plan Update



QA Review

Completed/Updated By: Meghan Mullen
 Last Updated On: 4/15/2019
 Reviewed By: Matt Fontaine
 Reviewed On: 6/14/2019
 Approved By: Matt Fontaine
 Approved On: 6/14/2019

Item No.	Spec Division	Item Description	Qty	Unit	Unit Cost	Total Cost
	Div 1	General Requirements				
1		Mobilization	1	L.S.	10%	\$ 33,386
2		Erosion/Water Pollution Control	1	L.S.	5%	\$ 16,693
3		Temporary Dewatering	1	L.S.	2%	\$ 6,677
4		Utility Protection and Relocation	1	L.S.	30%	\$ 100,157
5		Project Temporary Traffic Control	1	L.S.	2%	\$ 6,677
	Div 2	Earthwork				
7		Structure Excavation Class B, Incl. Haul	1,283	C.Y.	\$ 20	\$ 25,669
	Div 4	Bases				
8		Bank Run Gravel for Trench Backfill	178	C.Y.	\$ 10	\$ 1,776
9		Crushed surfacing, base course	266	Ton	\$ 50	\$ 13,319
	Div 5	Surface Treatments and Pavements				
10		HMA for Pavement Repair	348	Ton	\$ 300	\$ 104,291
	Div 7	Drainage Structures, Storm Sewers, Sanitary Sewers, Water Mains, and Conduits				
11		Catch Basin Type 1	17	Each	\$ 3,000	\$ 51,000
12		Connect to Drainage Structure	1	Each	\$ 800	\$ 800
13		Schedule A SSP, 12 In. Dia.	2,740	L.F.	\$ 50	\$ 137,000
		Construction Subtotal				\$ 497,445
		Contingency	30%			\$ 149,233.41
		Lacey Cost Adjustment Factor	10%			\$ 49,744.47
		Subtotal (with Contingency and Lacey Cost Adj. Factor)				\$ 696,423
		Tax	9.3%			\$ 64,767
		Construction Total (with Contingency and Tax)				\$ 761,190
		Survey		L.S.		\$ 20,000
		Geotechnical / Infiltration Evaluation		L.S.		\$ 20,000
		Predesign		L.S.		\$ 20,000
		Design	20%			\$ 152,000
		Permitting		L.S.		\$ 5,000
		Construction Management	15%			\$ 114,178.48
		City of Lacey Project Management	20%			\$ 152,237.98
		Estimated Project Total (rounded to 2 significant figures)				\$ 1,200,000



Capital Improvement Program Project
Summary Sheet

**Alder and Gemini Drainage
System Improvements**

Location: Alder St SE and Gemini St
SE, south of Lacey
Boulevard SE

Number: 13-14 Priority: Medium

Estimated Cost: \$520,000

ENR CCI 11,268.48 (June 2019)

Problem Description:

Lack of drainage infrastructure along Alder St and Gemini St causing frequent nuisance flooding.

Project Solution:

Rehab existing drywells, install new storm drain to convey stormwater to new infiltration galleries in community open space, and an overflow from the infiltration facility to the storm drain in Lacey Blvd. More thorough geotechnical analysis will be needed before infiltration facilities can be designed. As an alternative to infiltration, consider piping flow to the Woodland Creek Facility (via Lacey Boulevard).

Cost Estimate Assumptions:

1,185 LF 12 In Dia SD, 5 con. to ex. drainage str., 4 drywell rehabs, 1 high flow bypass, 1 stormwater filter, 1 drywell retrofit with stormwater filter, 4 CB Type 1, 200 LF 48 In Dia infiltration gallery in open space. The cost has been increased from the original 2013 estimate.



Neighborhood lacks stormwater drainage



Neighborhood lacks stormwater drainage



Legend	
Existing	Proposed
Catch Basin	Catch Basin
Discharge	Structure
Junction Box	Infiltration
Manhole	Pipe or Culvert
Conveyance	

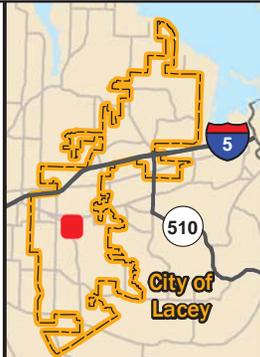


Figure 13. City of Lacey Stormwater CIP 13-14: Alder and Gemini Drainage System Improvements.



City of Lacey Aerial, 2015

CLIENT: City of Lacey
 PROJECT: Stormwater Comprehensive Plan - CIP Cost Estimates

PROJECT14 - Alder and Gemini Drainage System Improvements

Prepared by: M. Fontaine
 Checked by: M. Brennan
 Reversed by: M. Fontaine

Table 1. Conceptual Cost Estimate

Item	Quantity	Unit	Unit Cost	Amount	Notes
Removing Asphalt Conc. Pvmnt., Incl. Haul	461	SY	\$20	\$9,220	SPU 2007 unit cost report.
Structure Excavation Class B, Incl. Haul	800	CY	\$20	\$16,000	Excavation for pipe, infiltration gallery, and structures. WSDOT UBA and City of Lacey recent bids.
Bank Run Gravel for Trench Backfill	77	CY	\$10	\$770	City of Lacey recent bids.
Crushed Surfacing, Base Course	115	TN	\$60	\$6,900	City of Lacey recent bids.
HMA for Pavement Repair	150	TN	\$110	\$16,500	City of Lacey recent bids.
Connect to Drainage Structure	5	EA	\$750	\$3,750	City of Lacey recent bids.
Catch Basin - Type 1	4	EA	\$1,000	\$4,000	City of Lacey recent bids.
Schedule A SSP, 12 In. Dia.	1,185	LF	\$30	\$35,550	City of Lacey recent bids.
Connect to Drainage Structure	4	EA	\$750	\$3,000	WSDOT UBA and City of Lacey recent bids.
Rehab Drywell	4	EA	\$300	\$1,200	Engineers estimate. Jet out drywell pores and vector out sediment.
High Flow Bypass Structure	1	EA	\$6,500	\$6,500	Bypass high flow around infiltration gallery. Based on price quote from CONTECH (Katheryn Thomason 503-258-3176). 48" barrel, steps, catch basin lid, adjustable weir, and delivery. Includes 30% markup.
Media Filtration Structure	1	EA	\$26,000	\$26,000	Upstream of infiltration gallery. Basic treatment - assume contech stormfilter 48" Dia. Based on price quote from CONTECH (Katheryn Thomason 503-258-3176) 16,800 to 20,000 delivered. Includes 30% markup for installation.
Drywell Stormwater Filter, 48 In. Dia.	1	EA	\$26,000	\$26,000	Retrofit existing drywell. Based on price quote from CONTECH (Mike Scott 425-835-0440). Assumes new 3 cartridge drywell storm filter, 1 drywell riser segment, 30% markup on materials, and installation.
Infiltration Gallery, 48 In. Dia.	200	LF	\$150	\$30,000	Under existing open space. Engineer estimate and City of Lacey recent bids.
TOTAL DIRECT COSTS:				\$185,000	
MARKUPS					
Mobilization			8%	\$14,800	
Temporary Erosion and Sediment Control			3%	\$5,550	Manage stockpiles, protect inlets, street sweeping.
Temporary Dewatering			5%	\$9,250	May require minor trench dewatering.
Traffic Control			2%	\$3,700	Residential street.
Contingency			30%	\$55,500	Utility conflicts unknown and infiltration facility sizing incomplete.
Sales Tax			8.7%	\$23,821	
Total Construction Cost:				\$298,000	
PREDESIGN COSTS					
Survey			LS	\$5,000	Base mapping. Large project area.
Geotechnical Evaluation			LS	\$7,000	PIT tests and memo for infiltration gallery.
Pre-design			LS	\$10,000	Evaluate alignment, drywell rehab alternatives, and potential for infiltration in open space. Brief memo.
OTHER PROJECT COSTS					
Total Pre-design (Survey, Geotech, Pre-design)			LS	\$22,000	
Design			LS	\$45,000	Assumes general sheet, 3 plans w/ profile, 1 detail sheet. No utility relocations included in design.
Permitting			LS	\$5,000	Grading permit and street use permit.
Construction Management			15%	\$45,000	
City of Lacey Project Management			5%	\$15,000	
Total Estimated Project Cost:				\$430,000	



Capital Improvement Program Project
Summary Sheet

White Fir Stormwater Installation

Location: White Fir Drive NE

Number: 13-15 Priority: Low

Estimated Cost: \$420,000

ENR CCI 11,268.48 (June 2019)

Problem Description:

Lack of drainage infrastructure in this area is causing nuisance flooding. There is a poorly functioning dry well at the downstream end of the pipe network that should be evaluated.

Project Solution:

Install new permeable gravel shoulder with underdrain pipe on north and south shoulders of White Fir Dr NE. Connect underdrain to existing storm drain system. Existing system discharges to infiltration area that is functioning well. Evaluate adequacy of proposed solution, particularly the adequacy of existing infiltration pond to manage the runoff.

Cost Estimate Assumptions:

1,400 LF of permeable gravel shoulder (700 LF on both sides of road) 10 ft wide, 1,400 LF 8 In Dia Underdrain Pipe, repair 15 driveway aprons. 4 connections to existing drainage structures.



Site of future shoulder improvements, looking west.



Site of future shoulder improvements, looking east.



Legend	
Existing	Proposed
Catch Basin	Infiltration
Discharge	
Junction Box	
Conveyance	

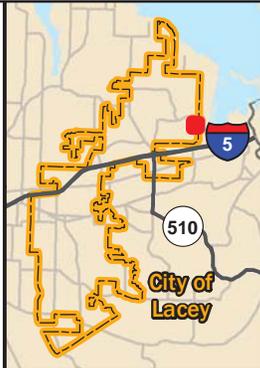


Figure 9. City of Lacey Stormwater CIP 13-15: White Fir Stormwater Installation.



Engineering Construction Cost Estimate for Conceptual Design - DRAFT

Project Name: White Fir Stormwater Installation
Project Number: 17-06745-000
Client: City of Lacey Stormwater Comprehensive Plan Update



QA Review

Completed/Updated By: Meghan Mullen
 Last Updated On: 3/21/2019
 Reviewed By: Matt Fontaine
 Reviewed On: 6/11/2019
 Approved By: Matt Fontaine
 Approved On: 6/11/2019

Item No.	Spec Division	Item Description	Qty	Unit	Unit Cost	Total Cost
	Div 1	General Requirements				
1		Mobilization	1	L.S.	10%	\$ 11,684.8
2		Erosion/Water Pollution Control	1	L.S.	5%	\$ 5,842.4
3		Temporary Dewatering	1	L.S.	0%	\$ -
4		Utility Protection and Relocation	1	L.S.	10%	\$ 11,684.8
5		Project Temporary Traffic Control	1	L.S.	2%	\$ 2,337.0
	Div 2	Earthwork				
7		Structure Excavation Class B, Incl. Haul	311	C.Y.	\$ 20	\$ 6,222.2
	Div 4	Bases				
8		Permeable Ballast	372	S.Y.	\$ 60	\$ 22,334.8
9		Crushed Surfacing, Base Course	27	C.Y.	\$ 100	\$ 2,740.7
	Div 5	Surface Treatments and Pavements				
10		HMA for Pavement Repair	15	Ton	\$ 300	\$ 4,350.0
	Div 7	Drainage Structures, Storm Sewers, Sanitary Sewers, Water Mains, and Conduits				
11		Underdrain Pipe, 8 In. Dia.	1,400	L.F.	\$ 20	\$ 28,000.0
12		Connect to Existing Structure	4	Each	\$ 800	\$ 3,200.0
13		Infiltration System Improvements	1	L.S.	\$ 50,000	\$ 50,000.0
		Construction Subtotal				\$ 148,397
		Contingency	50%			\$ 74,198.33
		Lacey Cost Adjustment Factor	10%			\$ 14,839.67
		Subtotal (with Contingency and Lacey Cost Adj. Factor)				\$ 237,435
		Tax	9.3%			\$ 22,081
		Construction Total (with Contingency and Tax)				\$ 259,516
		Survey		L.S.		\$ 10,000
		Geotechnical / Infiltration Evaluation		L.S.		\$ 30,000
		Predesign		L.S.		\$ -
		Design	10%			\$ 26,000
		Permitting		L.S.		\$ 5,000
		Construction Management	15%			\$ 38,927.41
		City of Lacey Project Management	20%			\$ 51,903.22
		Estimated Project Total (rounded to 2 significant figures)				\$ 420,000



Capital Improvement Program Project
Summary Sheet

5th Ct SE and 5th Way Easement Storm Improvements

Location: North of 5th Way SE and
west of 5th Ct SE.

Number: 13-16 Priority: Low

Estimated Cost: \$760,000

ENR CCI 11,268.48 (June 2019)

Problem Description:

Pipes/ structures in backyard are creating a maintenance problem because access is limited.

Project Solution:

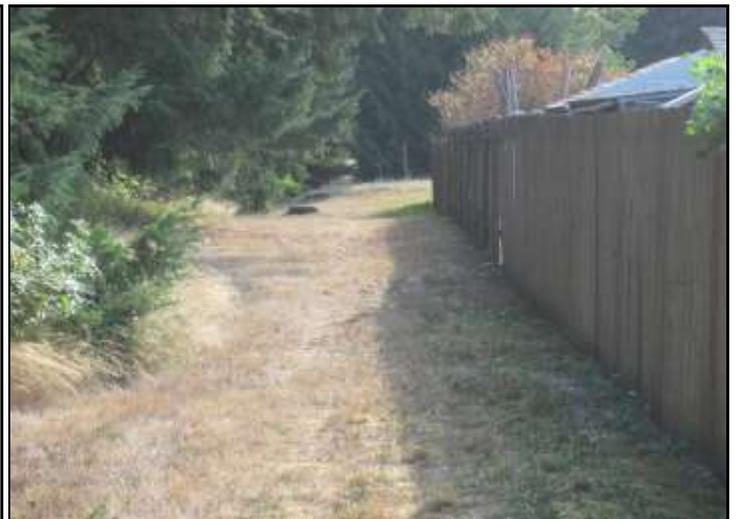
Relocate conveyance to the street during the next overlay. Fill and abandon the existing pipe located in the narrow easement behind the houses.

Cost Estimate Assumptions:

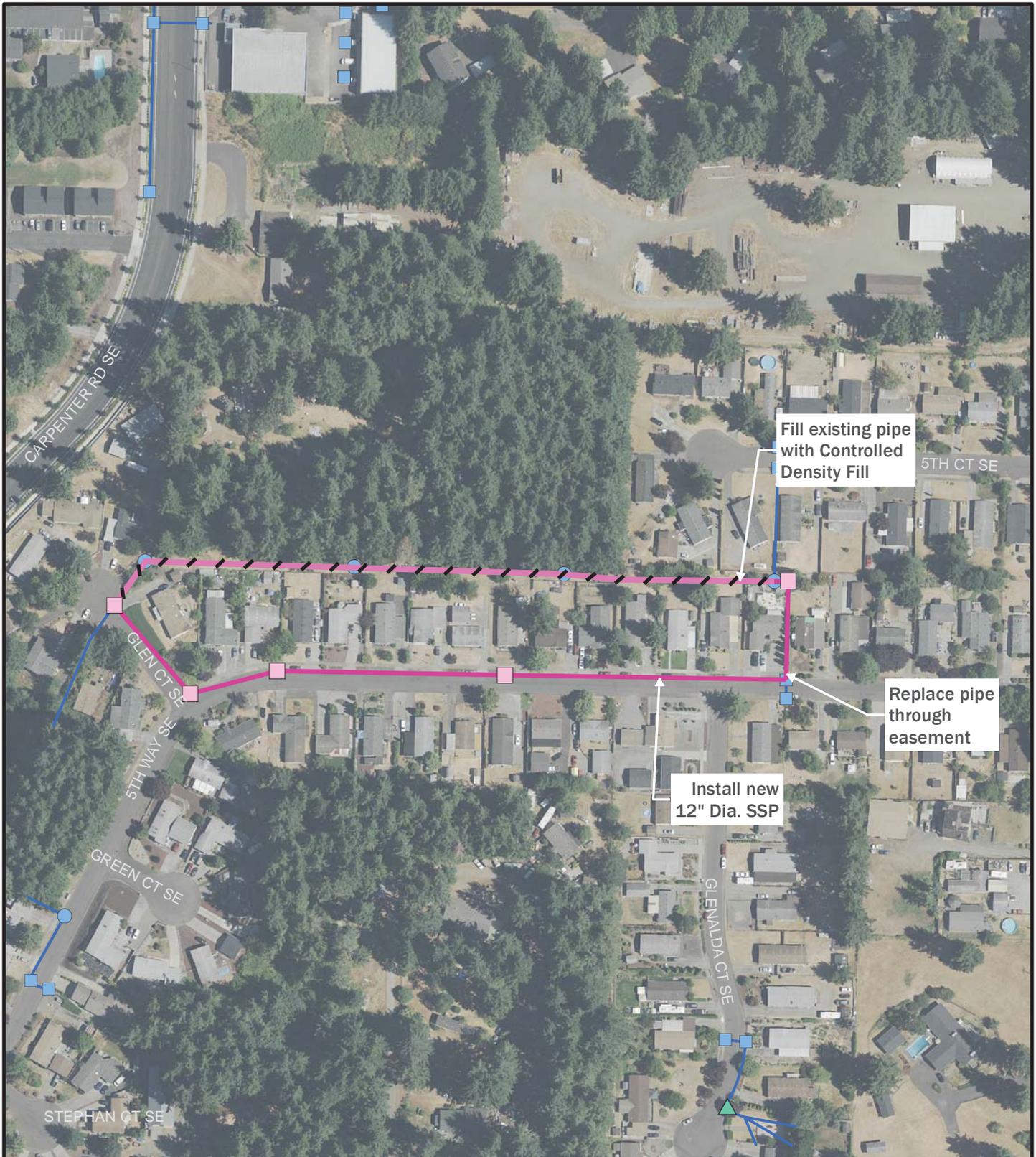
About 1,200 LF 24" Dia. Pipe, 5 new catch basins, and 2 connections to existing drainage.



Existing structure access



Existing narrow easement behind houses



Fill existing pipe with Controlled Density Fill

Replace pipe through easement

Install new 12" Dia. SSP

Legend

Existing

- Catch Basin
- ▲ Discharge
- Manhole
- Conveyance

Proposed

- Catch Basin
- - - Demolish
- Pipe or Culvert

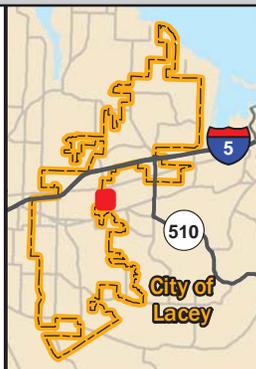


Figure 12. City of Lacey Stormwater CIP 13-16: 5th Ct SE and 5th Way Easement Storm Improvements.



City of Lacey Aerial, 2015

Engineering Construction Cost Estimate for Conceptual Design - DRAFT

Project Name: 5th Ct SE and 5th Way Easement Storm Improvements
Project Number: 17-06745-000
Client: City of Lacey Stormwater Comprehensive Plan Update



QA Review

Completed/Updated By: Meghan Mullen
 Last Updated On: 4/15/2019
 Reviewed By: Matt Fontaine
 Reviewed On: 6/11/2019
 Approved By: Matt Fontaine
 Approved On: 6/11/2019

Item No.	Spec Division	Item Description	Qty	Unit	Unit Cost	Total Cost
	Div 1	General Requirements				
1		Mobilization	1	L.S.	10%	\$ 24,830
2		Erosion/Water Pollution Control	1	L.S.	5%	\$ 12,415
3		Temporary Dewatering	1	L.S.	2%	\$ 4,966
4		Utility Protection and Relocation	1	L.S.	10%	\$ 24,830
5		Project Temporary Traffic Control	1	L.S.	2%	\$ 4,966
	Div 2	Earthwork				
7		Structure Excavation Class B, Incl. Haul	1,312	C.Y.	\$ 20	\$ 26,237
8		Controlled Density Fill	105	C.Y.	\$ 210	\$ 21,991
	Div 4	Bases				
9		Bank Run Gravel for Trench Backfill	500	C.Y.	\$ 15	\$ 7,500
10		Crushed surfacing, top course	150	Ton	\$ 75	\$ 11,250
	Div 5	Surface Treatments and Pavements				
11		HMA for Pavement Repair	196	Ton	\$ 300	\$ 58,725
	Div 7	Drainage Structures, Storm Sewers, Sanitary Sewers, Water Mains, and Conduits				
12		Catch Basin Type 2	5	Each	\$ 5,000	\$ 25,000
13		Connect to Drainage Structure	2	Each	\$ 800	\$ 1,600
14		Schedule A SSP, 24 In. Dia.	1,200	L.F.	\$ 80	\$ 96,000
		Construction Subtotal				\$ 320,311
		Contingency	30%			\$ 96,093.33
		Lacey Cost Adjustment Factor	10%			\$ 32,031.11
		Subtotal (with Contingency and Lacey Cost Adj. Factor)				\$ 448,436
		Tax	9.3%			\$ 41,705
		Construction Total (with Contingency and Tax)				\$ 490,140
		Survey		L.S.		\$ 10,000
		Geotechnical Evaluation		L.S.		\$ -
		Predesign		L.S.		\$ 10,000
		Design	15%			\$ 74,000
		Permitting		L.S.		\$ 5,000
		Construction Management	15%			\$ 73,521.01
		City of Lacey Project Management	20%			\$ 98,028.01
		Estimated Project Total (rounded to 2 significant figures)				\$ 760,000



Capital Improvement Program Project
Summary Sheet

Shady Lane Treatment
Facility Improvements

Location: Shady Lane Road SE and
Sierra Drive SE

Number: 13-17 Priority: Medium

Estimated Cost: \$160,000

ENR CCI 11,268.48 (June 2019)

Problem Description:

A large amount of sediment has accumulated in the wet pond and needs to be removed. High water levels have resulted in backwatering but no flooding.

Project Solution:

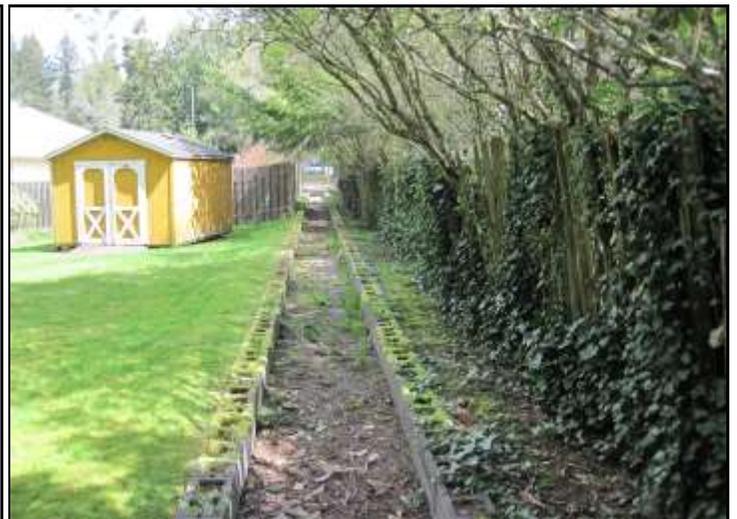
Remove sediment and vegetation. Revegetate in accordance with the Lacey Stormwater Design Manual. Install maintenance access, install structure at inlet to reduce sediment buildup, install low maintenance outlet structure. Because the spillway is functioning, consider abandoning the pipe to the outfall. Consider modifying the spillway to make maintenance easier.

Cost Estimate Assumptions:

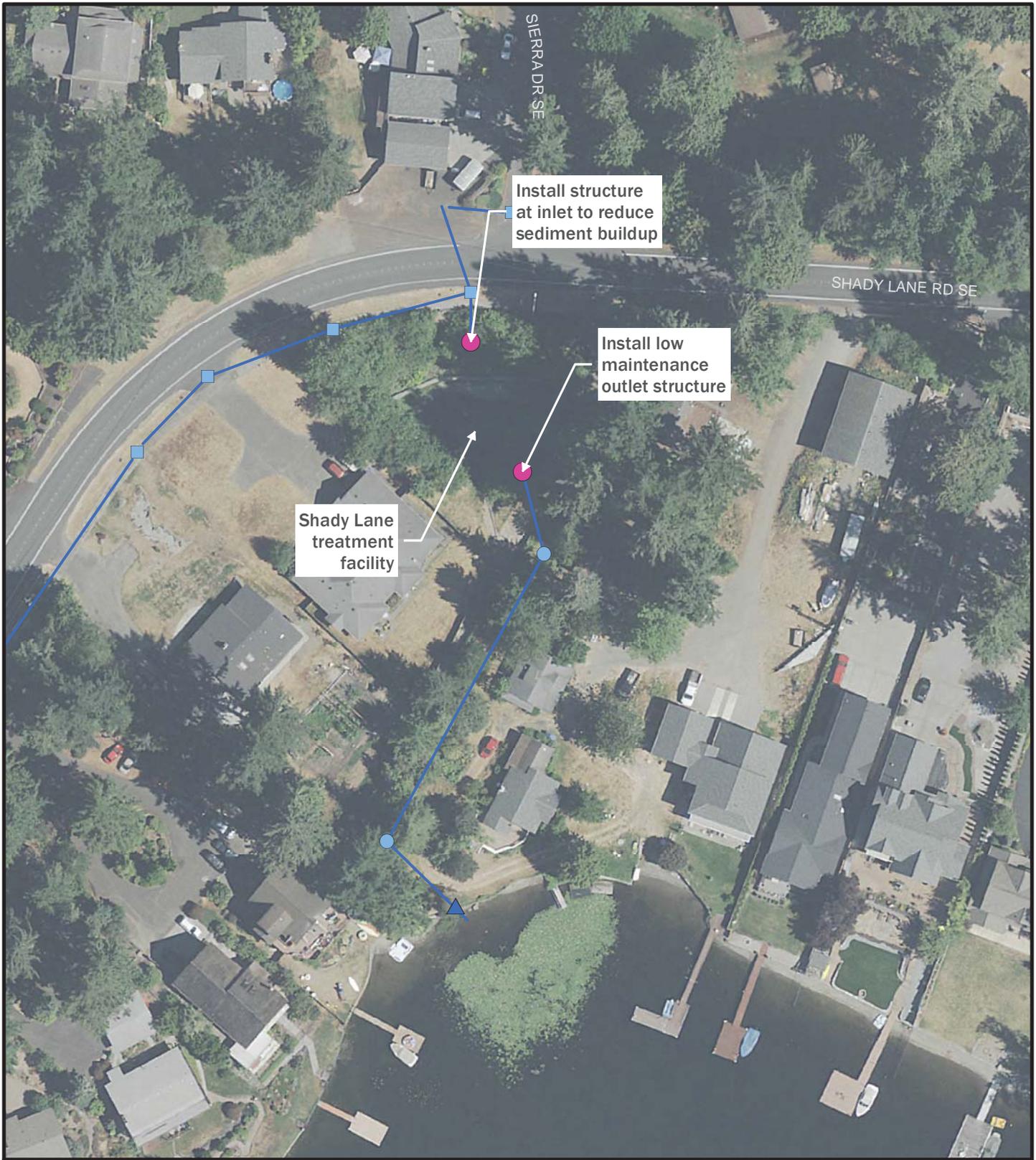
Remove 2' of accumulated sediment from the wet pond, replant 0.2 acres, replace outfall, install hydrodynamic separator upstream. The cost has been increased from the original 2013 estimate. Permitting has not yet been accounted for in the cost estimate.



Facility spillway



Existing above-ground overflow from facility.



Legend

Existing	Proposed
■ Catch Basin	● Structure
▲ Outfall	
● Manhole	
— Conveyance	

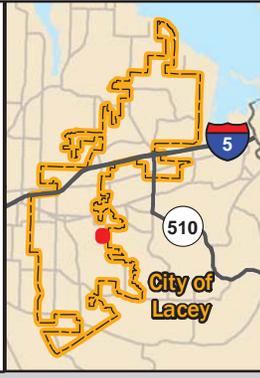


Figure 10. City of Lacey Stormwater CIP 13-17: Shady Lane Treatment Facility Improvements.



City of Lacey Aerial, 2015

CLIENT: City of Lacey

PROJECT: Stormwater Comprehensive Plan - CIP Cost Estimates

PROJECT 17- Shady Lane Treatment Facility

Prepared by: M. Fontaine

Checked by: N. Christensen

Table 1. Conceptual Cost Estimate

Item	Quantity	Unit	Unit Cost	Amount	Notes
Pond Excavation, Incl. Haul	728	CY	\$17	\$12,376	Muck out wet ponds. Avg depth of 2'. No liner protection.
Hydrodynamic Separator	1	EA	\$ 7,500	\$7,500	Engineers estimate.
Outlet Structure	1	EA	\$ 7,500	\$7,500	Engineers estimate.
Planting - Shrubs and Seeding Mix	0.2	AC	\$ 10,000	\$2,000	Replant wetpond. Shrubs and wetland seeding.
Site Restoration	1	LS	\$ 5,000	\$5,000	
Replace Outfall	1	LS	\$ 15,000	\$15,000	Difficult access.
TOTAL DIRECT COSTS:				\$49,000	
MARKUPS AND OTHER COSTS					
Mobilization			8%	\$3,920	
Temporary Erosion and Sediment Control			2%	\$980	
Temporary Dewatering			10%	\$4,900	Significant dewatering.
Traffic Control			0%	\$0	
Contingency			30%	\$14,700	30% contingency due to uncertain excavation quantities.
Sales Tax			8.7%	\$4,263	
Total Construction Cost:				\$78,000	
PREDESIGN COSTS					
Survey			LS	\$5,000	Base map. Difficult conditions.
Geotechnical Evaluation			LS	\$0	
Predesign			LS	\$0	
OTHER PROJECT COSTS					
Total Predesign (Survey, Geotech, Predesign)				\$5,000	
Design			LS	\$20,000	Basic grading plan, planting plan, details for new outfall, and special provisions.
Permitting			LS	\$15,000	Will require permits from Army Corps, WDFW, and potentially City of Lacey, but permitting should not be difficult because work appears to fall under the Army Corps Nationwide permit.
Construction Management			15%	\$12,000	
City of Lacey Project Management			5%	\$4,000	
Total Estimated Project Cost:				\$134,000	

APPENDIX E

Gap Analysis and Needs Assessment

Table E-1. Recommended Activities for Flood Reduction.		Funding					
Recommendation	Assumptions	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
		2020	2021	2022	2023	2024	2025
Minimum		Minimum					
CIP projects (TBD)	Stormwater projects identified through the CIP prioritization process and staff time (\$) included in CIP cost estimates for City project management.						
Minimum Tier Total		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Recommended		Recommended					
All activities from Minimum (NPDES Compliant) tier	Same assumptions as Minimum tier (NPDES Compliant).	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Recommended Tier Total		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Enhanced		Enhanced					
All activities from Recommended tier	Same assumptions as Recommended tier.	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Enhanced Tier Total		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -

Staff (FTE)					
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
2020	2021	2022	2023	2024	2025
Minimum					
Recommended					
Enhanced					

Table E-2. Recommended Activities for Surface Water Quality Improvement (retrofitting).		Funding					
Recommendation	Assumptions	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
		2020	2021	2022	2023	2024	2025
Minimum		Minimum					
Regional Water Quality Facility Program	Conduct study in conjunction with SMAP to locate, design and construct stormwater treatment facilities for existing untreated discharges, potentially supplementing with grant funding. Assumes \$100,000 included in the CIP plan to develop the program. 0.1 FTE (one-time cost) to develop the program and 0.1 FTE ongoing cost to apply for grant funding and administer the program.						
Minimum Tier Total		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Recommended		Recommended					
All activities from Minimum (NPDES Compliant) tier	Same assumptions as Minimum tier (NPDES Compliant).	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Recommended Tier Total		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Enhanced		Enhanced					
All activities from Recommended tier	Same assumptions as Recommended tier.	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Enhanced Tier Total		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -

Staff (FTE)					
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
2020	2021	2022	2023	2024	2025
Minimum					
		0.10	0.10	0.10	0.10
		0.10	0.10	0.10	0.10
Recommended					
		0.10	0.10	0.10	0.10
		0.10	0.10	0.10	0.10
Enhanced					
		0.10	0.10	0.10	0.10
		0.10	0.10	0.10	0.10

Table E-3. Recommended Activities for Groundwater Quality Protection.		Funding					
Recommendation	Assumptions	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
		2020	2021	2022	2023	2024	2025
Minimum		Minimum					
Develop stormwater infiltration policies and regulations to protect groundwater, particularly for deep UIC wells.	Groundwater protection policies and regulations to be developed as part of 2019 SCP update and 2021 SDM update. Staff time to implement the policies is included in Table 8.						
Minimum Tier Total		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Recommended		Recommended					
All activities from Minimum (NPDES Compliant) tier	Same assumptions as Minimum tier (NPDES Compliant).	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Water Quality and Infiltration Retrofit Program	Retrofit for WQ improvement and infiltration improvement at existing infiltration trench/gallery locations (add treatment BMPs). Annual project costs are included in the CIP plan. Two weeks per year of staff time to implement the program.						
Enhanced regional monitoring	Enhance the regional program to monitor groundwater and review results for trends in pollutants (particularly pathogens and nitrates; site-specific nitrate loading). Hire 1 FTE to do additional monitoring, monitor program design, collect and manage field data, and track non-point-source-related environmental data. Note that this full FTE will be half funded by the water utility and half funded by the surface water utility, so only 0.5 FTE is recorded here.						
UIC monitoring	Develop and implement a program to monitor groundwater in areas where deep UICs are proposed or existing. Assume 2 days per month of staff time to collect data and analyze results. Assume laboratory costs of \$40 k per year (\$100 for parameters or interest, 4 samples per year, and 10 sites).	\$ 40,000	\$ 40,000	\$ 40,000	\$ 40,000	\$ 40,000	\$ 40,000
Recommended Tier Total		\$ 40,000	\$ 40,000	\$ 40,000	\$ 40,000	\$ 40,000	\$ 40,000
Enhanced		Enhanced					
All activities from Recommended tier	Same assumptions as Recommended tier.	\$ 40,000	\$ 40,000	\$ 40,000	\$ 40,000	\$ 40,000	\$ 40,000
Enhanced Tier Total		\$ 40,000	\$ 40,000	\$ 40,000	\$ 40,000	\$ 40,000	\$ 40,000

Staff (FTE)					
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
2020	2021	2022	2023	2024	2025
Minimum					
Recommended					
0.05	0.05	0.05	0.05	0.05	0.05
0.50	0.50	0.50	0.50	0.50	0.50
0.11	0.11	0.11	0.11	0.11	0.11
0.65	0.65	0.65	0.65	0.65	0.65
Enhanced					
0.65	0.65	0.65	0.65	0.65	0.65
0.65	0.65	0.65	0.65	0.65	0.65

Table E-4. Recommended Activities for Habitat Improvement.		Funding					
Recommendation	Assumptions	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
		2020	2021	2022	2023	2024	2025
Minimum		Minimum					
CIP project(s)	Projects identified through the CIP project prioritization process.						
Minimum Tier Total		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Recommended		Recommended					
All activities from Minimum (NPDES Compliant) tier	Same assumptions as Minimum tier (NPDES Compliant).	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Stream team	Expansion of the habitat improvement program will be accomplished through public education activities listed in Table 5.						
Recommended Tier Total		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Enhanced		Enhanced					
All activities from Recommended tier	Same assumptions as Recommended tier.						
Enhanced Tier Total		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -

Staff (FTE)					
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
2020	2021	2022	2023	2024	2025
Minimum					
Recommended					
Enhanced					

Table E-5. Recommended Activities for Public Participation (education, outreach, and involvement).		Funding					
Recommendation	Assumptions	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
		2020	2021	2022	2023	2024	2025
Minimum		Minimum					
Evaluate behavior change	Conduct new evaluation of a behavior change program. Assumes 100 consultant hours at \$100 per hour and 30 percent staff hours for project management. (Due July 2020)	\$ 10,000					
Conduct CBSM	Conduct CBSM (community-based social marketing) to meet future permit requirements. Assumes 100 consultant hours at \$100 per hour and 30 percent staff hours for project management. (Due February 2021)		\$ 10,000				
SWMP reporting	Define public involvement opportunities for the annual SWMP update and reporting process. Assume 16 hours of staff time every year.						
Post SWMP publicly	Make the SWMP document and Annual Compliance Report available to the public by posting on the City of Lacey website. Assume 4 hours of staff time each year.						
Minimum Tier Total		\$ 10,000	\$ 10,000	\$ -	\$ -	\$ -	\$ -
Recommended		Recommended					
All activities from Minimum (NPDES Compliant) tier	Same assumptions as Minimum tier (NPDES Compliant).	\$ 10,000	\$ 10,000	\$ -	\$ -	\$ -	\$ -
Recommended Tier Total		\$ 10,000	\$ 10,000	\$ -	\$ -	\$ -	\$ -

Staff (FTE)					
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
2020	2021	2022	2023	2024	2025
Minimum					
0.02					
	0.02				
0.01	0.01	0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00	0.00	0.00
0.03	0.03	0.01	0.01	0.01	0.01
Recommended					
0.03	0.03	0.01	0.01	0.01	0.01
0.03	0.03	0.01	0.01	0.01	0.01

Table E-5. Recommended Activities for Public Participation (education, outreach, and involvement).		Funding						Staff (FTE)					
Recommendation	Assumptions	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
		2020	2021	2022	2023	2024	2025	2020	2021	2022	2023	2024	2025
Enhanced		Enhanced						Enhanced					
All activities from Recommended tier	Same assumptions as Recommended tier.	\$ 10,000	\$ 10,000	\$ -	\$ -	\$ -	\$ -	0.03	0.03	0.01	0.01	0.01	0.01
Stream Restoration Organizing	Support stream restoration community organizing. o Increase awareness of Stream Team events, including advertisement in the parks catalogue o Increase contribution to REEP and Stream Team articles o Conduct additional 5th grade stormwater lessons to Lacey students and expand program to include multiple grade levels o Conduct additional Eye on Nature Field Trips with Lacey students at the Nisqually Wildlife Refuge o Conduct and offer additional riparian buffer restoration projects for City of Lacey residents o Expand Water Resources' ability to offer WIN Group project offerings at Woodland Creek Community Park							0.50	0.50	0.50	0.50	0.50	0.50
Update SOPs	Review and develop additional public education and outreach materials and Standard Operating Procedures (SOPs) for minimizing pollutant releases from permitted non-stormwater discharges.							0.25	0.25	0.25	0.25	0.25	0.25
Education support work	Hire staff to support office work related to public education reporting and effectiveness analysis (in addition to the permit-compliant tasks described in the Minimum tier) o Update the website more regularly o Conduct staff training and public education and outreach on implementation of the 2016 Stormwater Design Manual. o Determine a means of measuring impact of in-person programs o Implement new or modify existing education and outreach activities, continue to track activities and monitor success.							0.25	0.25	0.25	0.25	0.25	0.25
Enhanced Tier Total		\$ 10,000	\$ 10,000	\$ -	\$ -	\$ -	\$ -	1.03	1.03	1.01	1.01	1.01	1.01

Table E-6. Recommended Activities for Pollution Source Control.		Funding						Staff (FTE)					
Recommendation	Assumptions	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
		2020	2021	2022	2023	2024	2025	2020	2021	2022	2023	2024	2025
Minimum (NPDES Compliant)		Minimum (NPDES Compliant)						Minimum (NPDES Compliant)					
Map outfall attributes	Map size and material for all known MS4 outfalls. City staff time estimated at 0.25 FTE. (Due January 2020; assumes work performed in 2019)												
Map private connections	Complete mapping of all known connections from the MS4 to a privately-owned stormwater system. City staff time estimated at 0.25 FTE. (Due August 2023)								0.25				
Auto accidents tracking	Integrate auto accidents into the Spill Response Plan. Use existing staff resources to accomplish this activity.												
Additional inspections	Add staff to inspect commercial and residential stormwater facilities. The number of facilities and the length of inspections has increased. Equipment is needed to improve the efficiency and equality of inspections.	\$ 5,000						0.25	0.25	0.25	0.25	0.25	0.25
Business inventory	Develop and maintain source control inventory. Dedicated initial staff time to develop the inventory and update the inventory annually. (Due August 2022)									0.25			
Source control ordinance	Develop ordinance and enforcement policy. Assumes ongoing work to review and update the ordinance. (Due August 2022)									0.05	0.05	0.05	0.05
Business inspections training	Develop and implement on-going training program. Assumes 80 consultant hours at \$100/hour and 30 percent staff time for project management to develop materials and present initial training, 0.10 FTE to conduct future trainings and research/attend external trainings. (Due January 2023)			\$ 8,000						0.01	0.10	0.10	0.10
Implement business inspections	Implement business inspection program. Assumes 0.5 FTE for implementation. (Due January 2023)										0.50	0.50	0.50
Minimum Tier Total		\$ 5,000	\$ -	\$ 8,000	\$ -	\$ -	\$ -	0.25	0.50	0.56	0.90	0.90	0.90

Table E-6. Recommended Activities for Pollution Source Control.		Funding					
Recommendation	Assumptions	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
		2020	2021	2022	2023	2024	2025
Recommended		Recommended					
All activities from Minimum (NPDES Compliant) tier	Same assumptions as Minimum (NPDES Compliant).	\$ 5,000	\$ -	\$ 8,000	\$ -	\$ -	\$ -
Enhance screening program	Further develop and implement the Stormwater Outfall Illicit Discharge screening program. Assume an additional 0.25 FTE will be needed to implement this program.						
Recommended Tier Total		\$ 5,000	\$ -	\$ 8,000	\$ -	\$ -	\$ -
Enhanced		Enhanced					
All activities from Recommended tier	Same assumptions as Recommended.	\$ 5,000	\$ -	\$ 8,000	\$ -	\$ -	\$ -
Enhanced Tier Total		\$ 5,000	\$ -	\$ 8,000	\$ -	\$ -	\$ -

Staff (FTE)					
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
2020	2021	2022	2023	2024	2025
Recommended					
0.25	0.50	0.56	0.90	0.90	0.90
0.25	0.25	0.25	0.25	0.25	0.25
0.50	0.75	0.81	1.15	1.15	1.15
Enhanced					
0.50	0.75	0.81	1.15	1.15	1.15
0.50	0.75	0.81	1.15	1.15	1.15

Table E-7. Recommended Activities for Infrastructure Operations and Maintenance.		Funding					
Recommendation	Assumptions	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
		2020	2021	2022	2023	2024	2025
Minimum (NPDES Compliant)		Minimum (NPDES Compliant)					
Update SWPPPs	Update municipal Stormwater Pollution Prevention Plans (SWPPPs) to reflect changes at multiple facilities that may include Decant / Pit facility, Parks Regional Athletic Complex (RAC), Parks Rainier Vista Park, odor control facilities, and well sites. Assumes 200 consultant hours at \$100/hour and 30 percent staff time for project management to update SWPPPs.	\$ 20,000					
SWPPP inspections	Conduct wet and dry weather inspection as outlined in the SWPPPs for City-owned facilities. The SWPPPs require quarterly inspections during storm events and one dry-weather inspection each year of all BMPs (8 hours assumed per sampling event).						
SWPPP spill history	Update spill history record for City-owned facilities. Assume two days of staff time.						
Minimum Tier Total		\$ 20,000	\$ -				

Staff (FTE)					
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
2020	2021	2022	2023	2024	2025
Minimum (NPDES Compliant)					
0.03					
0.05	0.05	0.05	0.05	0.05	0.05
0.01					
0.09	0.05	0.05	0.05	0.05	0.05

Table E-7. Recommended Activities for Infrastructure Operations and Maintenance.		Funding					
Recommendation	Assumptions	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
		2020	2021	2022	2023	2024	2025
Recommended		Recommended					
All activities from Minimum (NPDES Compliant) tier	Same assumptions as Minimum.	\$ 20,000	\$ -	\$ -	\$ -	\$ -	\$ -
Develop facility SOPs	Develop Standard Operating Procedures (SOPs) for inspection, operation, and maintenance of the following City facility types: - Stormwater catch basins - Flow control treatment facilities (multiple varieties of facilities) Assume 80 hours to develop SOPs.						
Document activity SOPs	Standard Operating Procedures (SOPs) are currently documented in work requests and should be documented formally. Assuming all 15 generic activities in the NPDES permit apply and that SOPs are developed for each activity, assume 8 hours per activity to document SOPs.						
Ongoing improvements (2021)	As growth continues, the stormwater system will expand and continue to require ongoing improvements. To account for this growing need, the size of the maintenance crew will also need to increase. In 2021, the city expects to replace one of the seasonal employees with a journey-level FTE.						
Ongoing improvements (2023)	To satisfy the need described above, hire another seasonal staff member.						
Recommended Tier Total		\$ 20,000	\$ -				
Enhanced		Enhanced					
All activities from Recommended tier	Same assumptions as Recommended.	\$ 20,000	\$ -	\$ -	\$ -	\$ -	\$ -
Enhanced Tier Total		\$ 20,000	\$ -				

Staff (FTE)					
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
2020	2021	2022	2023	2024	2025
Recommended					
0.09	0.05	0.05	0.05	0.05	0.05
0.05					
0.07					
	0.50	0.50	0.50	0.50	0.50
			0.50	0.50	0.50
0.20	0.55	0.55	1.05	1.05	1.05
Enhanced					
0.20	0.55	0.55	1.05	1.05	1.05
0.20	0.55	0.55	1.05	1.05	1.05

Table E-8. Recommended Activities for Development Practices.		Funding					
Recommendation	Assumptions	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
		2020	2021	2022	2023	2024	2025
Minimum (NPDES Compliant)		Minimum (NPDES Compliant)					
Annual LID review	Develop a framework for LID review of all new policies and continue annual review of new code and documents. Assumes \$20,000 one-time effort with consultant support and one-time City staff time estimated at 40 hours. Assumes 40 hours per year for ongoing annual review.	\$ 20,000					
Update SDM	Update Stormwater Design Manual in 2021. Assume \$100k for outside support is included in the CIP plan and 200 hours of staff time included here.						
Enhanced site plan review	Hire additional stormwater site plan review staff to distribute the burden of reviewing submittals against more complicated requirements. With current staffing levels, stormwater site plans cannot be reviewed on time, which results in financial and environmental risk for the City.						
Enhanced site inspection	Hire additional site inspection staff. With current staffing levels, performance verification inspections cannot be conducted and inspectors don't have time to adequately review all stormwater facility elements (e.g. inspecting private roof drains, reviewing bioretention soil media [BSM] specifications, inspecting BSM delivered to the site,) which results in financial and environmental risk for the City.						
SW plan review checklists	Update and develop additional stormwater plan review checklists and templates. Assumes 150 consultant hours at \$100/hour and 80 hours of staff time to manage the project.	\$ 15,000					
Minimum Tier Total		\$ 35,000	\$ -				

Staff (FTE)					
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
2020	2021	2022	2023	2024	2025
Minimum (NPDES Compliant)					
0.02	0.02	0.02	0.02	0.02	0.02
	0.11				
0.50	0.50	0.50	0.50	0.50	0.50
0.50	0.50	0.50	0.50	0.50	0.50
0.05					
1.07	1.14	1.02	1.02	1.02	1.02

Table E-8. Recommended Activities for Development Practices.		Funding					
Recommendation	Assumptions	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
		2020	2021	2022	2023	2024	2025
Recommended		Recommended					
All activities from Minimum (NPDES Compliant) tier	Same assumptions as Minimum.	\$ 35,000	\$ -	\$ -	\$ -	\$ -	\$ -
Self-reporting policy	Develop and implement a policy of self-reporting from contractors. Assumes 100 consultant hours at \$100 per hour and equivalent staff time to develop the policy. Assumes 40 hours per year to implement the policy.	\$ 10,000					
Tenant improvement policy	Develop and implement a policy to address tenant improvements related to inspection of private facilities. Assumes 100 consultant hours at \$100 per hour and equivalent staff time to develop the policy. Assumes 40 hours per year to implement the policy.	\$ 10,000					
Enhanced inspector training	Develop and implement on-going training program for construction site inspectors and private stormwater facility maintenance inspectors based on new permit requirements. Assumes 80 consultant hours at \$100/hour and 30 percent staff time to manage the project to develop training material and conduct initial training. Includes annual staff time needed to update training material, conduct future trainings, and attend trainings.		\$ 8,000				
Enhanced developer tools	Develop additional stormwater plan review checklists and tools for contractors and developers. Assumes 150 consultant hours at \$100/hour and 80 hours of staff time to manage the project.	\$ 15,000					
Improve review process	Hire additional stormwater site plan review and site inspection staff to do a more thorough initial review and review stormwater submittals within 10 business days of receipt. This will further reduce risk to the City.						
Recommended Tier Total		\$ 70,000	\$ 8,000	\$ -	\$ -	\$ -	\$ -
Enhanced		Enhanced					
All activities from Recommended tier	Same assumptions as Recommended.	\$ 70,000	\$ 8,000	\$ -	\$ -	\$ -	\$ -
Enhanced Tier Total		\$ 70,000	\$ 8,000	\$ -	\$ -	\$ -	\$ -

Staff (FTE)					
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
2020	2021	2022	2023	2024	2025
Recommended					
1.07	1.14	1.02	1.02	1.02	1.02
0.06	0.02	0.02	0.02	0.02	0.02
0.06	0.02	0.02	0.02	0.02	0.02
	0.01	0.02	0.02	0.02	0.02
0.05					
		0.50	0.50	0.50	0.50
1.23	1.19	1.59	1.59	1.59	1.59
Enhanced					
1.23	1.19	1.59	1.59	1.59	1.59
1.23	1.19	1.59	1.59	1.59	1.59

Table E-9. Recommended Activities for Stormwater Planning, Administration, and Funding.		Funding					
Recommendation	Assumptions	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
		2020	2021	2022	2023	2024	2025
Minimum		Minimum					
Long-range planning annual report questions	Answer annual report questions with the 2021 annual report to Ecology summarizing coordination with long-range planning efforts. Assumes \$5,000 of consultant support plus 40 staff hours for management. (Responses due March 2021)		\$ 5,000				
Long-range planning report	Prepare report in 2022 summarizing coordination with long-range planning efforts. Assumes \$5,000 of consultant support plus 40 staff hours for management. (Report due January 2023)			\$ 5,000			
SMAP	Stormwater management action planning (SMAP): priority watershed plan development. Assumes \$100,000 planning effort with 1,000 hours of consultant support at \$100/hr is included in the CIP. One-time City staff time estimated at 0.1 FTE. (Due March 2022 - March 2023)			\$ 100,000			
Stormwater Comprehensive Plan Update	Assumes \$250,000 of external support is included in the CIP plan and 0.2 FTE of staff time.						
Inter-disciplinary team	Convene an inter-disciplinary team to advise the SWMP. Assumes that this team will include approximately 10 staff that will meet quarterly for 2 hours, but only 4 staff will record their time to the SWM Utility. (Due August 2020)						
Minimum Tier Total		\$ -	\$ 5,000	\$ 105,000	\$ -	\$ -	\$ -
Recommended		Recommended					
All activities from Minimum (NPDES Compliant) tier	Same assumptions as Minimum tier (NPDES Compliant).	\$ -	\$ 5,000	\$ 105,000	\$ -	\$ -	\$ -
Update rate structure	Implement an impervious-area based rate structure. Assumes one-time staff time to implement the new rate structure based on the financial analysis performed during the Stormwater Comprehensive Plan update.						
Software integration	More efficiently integrate multiple software types (excel, collector, HTE, and others). Assume 80 hours of consultant time at \$100 per hour and equivalent staff time to determine the best software integration approach. Assume 20 staff hours per year to provide training.	\$ 8,000					
Recommended Tier Total		\$ 8,000	\$ 5,000	\$ 105,000	\$ -	\$ -	\$ -
Enhanced		Enhanced					
All activities from Recommended tier	Same assumptions as Recommended tier.	\$ 8,000	\$ 5,000	\$ 105,000	\$ -	\$ -	\$ -
Enhanced Tier Total		\$ 8,000	\$ 5,000	\$ 105,000	\$ -	\$ -	\$ -

Staff (FTE)					
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
2020	2021	2022	2023	2024	2025
Minimum					
	0.02				
		0.02			
			0.10		
				0.20	
0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.04	0.14	0.02	0.22	0.02
Recommended					
0.02	0.04	0.14	0.02	0.22	0.02
	0.10				
0.06	0.01	0.01	0.01	0.01	0.01
0.07	0.15	0.15	0.03	0.23	0.03
Enhanced					
0.07	0.15	0.15	0.03	0.23	0.03
0.07	0.15	0.15	0.03	0.23	0.03

Table E-10. Summary of Outside Support and Equipment Cost.						
Tier of Service	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
	2020	2021	2022	2023	2024	2025
Minimum Tier Total	\$70,000	\$15,000	\$113,000	\$0	\$0	\$0
Recommended Tier Total	\$153,000	\$63,000	\$153,000	\$40,000	\$40,000	\$40,000
Enhanced Tier Total	\$153,000	\$63,000	\$153,000	\$40,000	\$40,000	\$40,000

Table E-11. Summary of Staff Hours (FTE).						
Tier of Service	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
	2020	2021	2022	2023	2024	2025
Minimum Tier Total	1.45	1.75	1.88	2.09	2.29	2.09
Recommended Tier Total	2.68	3.32	3.86	4.58	4.78	4.58
Enhanced Tier Total	3.68	4.32	4.86	5.58	5.78	5.58