



# Stormwater Management Action Plan







# Stormwater Management Action Plan Totem Lake Catchment

March 2023



**AltaTerra**



## City of Kirkland Local Land Acknowledgment

*"We acknowledge that the Southern Salish Sea region lies on the unceded and ancestral land of the Coast Salish peoples, the Duwamish, Muckleshoot, Puyallup, Skykomish, Snoqualmie, Snohomish, Suquamish and Tulalip tribes and other tribes of the Puget Sound Salish people, and that present-day City of Kirkland is in the traditional heartland of the Lake People and the River People. We honor with gratitude the land itself, the First People — who have reserved treaty rights and continue to live here since time immemorial — and their ancestral heritage."*

Visit [www.kirklandwa.gov/LandAcknowledgement](http://www.kirklandwa.gov/LandAcknowledgement) for more information



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This plan is submitted to Washington State Department of Ecology in fulfillment of Condition S5.C.1.d of the 2019-2024 Western Washington Phase II National Pollutant Discharge Elimination System (NPDES) Stormwater Permit issued by the Washington State Department of Ecology (Ecology, 2019a).



# Executive Summary

This Stormwater Management Action Plan (SMAP) details the actions the City of Kirkland plans to take to improve water quality in the creeks, lake, and wetlands of the Totem Lake Catchment within the Juanita Watershed. The SMAP includes both short-term and long-term planning actions.

## Why is this plan necessary?

The City is required to conduct this planning as part of compliance with our state regulated National Pollutant Discharge Elimination System (NPDES) Permit for our stormwater system. This plan is a result of those requirements and advances the City's on-going goal to improve water quality.

## How was the Totem Lake Catchment selected?

Kirkland's 15 watersheds were prioritized and ranked based on a combination of state and local priorities, public and stakeholder input, water quality goals, environmental justice goals, and stormwater management priorities. This process identified the Juanita Creek watershed as the top priority. A similar process was then applied to the catchments within Juanita Creek and identified the Totem Lake catchment as the highest priority area based on factors identified on Page 6.

## What does this plan include?

This plan details actions selected to support cleaner water. These actions include:

- Planning, designing, and constructing new or enhanced stormwater infrastructure
- Inspecting and cleaning stormwater pipes
- Providing technical assistance and support to prevent pollution at businesses
- Reducing pollution from dumpsters by implementing the regional "Shut the Lid" Behavior Change Campaign
- Continuing various stormwater programs that support pollution reduction



# Introduction and Background

This Stormwater Management Action Plan (SMAP) was prepared by the City of Kirkland as required by Condition S5.C.1.d of the 2019-2024 Western Washington Phase II National Pollutant Discharge Elimination System (NPDES) Stormwater Permit issued by the Washington State Department of Ecology (Ecology, 2019a).

Kirkland has ongoing programs and projects to address holistic surface water management goals including to improve habitat, improve water quality, reduce impacts from flooding and maintain infrastructure. Retrofit planning has been a city-wide priority in Kirkland for the last decade. The 2014 Surface Water Master Plan Update (Kirkland 2014) recommended, and the City ultimately funded and advanced several watershed specific stormwater retrofit actions. Stormwater retrofit is still a priority and the City continues to conduct watershed-specific retrofit planning. The 2023 Surface Water Master Plan Update (Kirkland 2023a) recommends additional retrofit programming focused on aging infrastructure, as well as partnering with other departments and the community on retrofit opportunities.

The primary focus of Ecology's stormwater management planning requirement is to address impacts from existing and/or planned development on water quality in the selected priority receiving water. In pursuit of this goal, this SMAP works to identify actions to help protect and improve receiving water quality. For more information on the City's overall storm and surface water management program, please see the following documents:

- 2023 Surface Water Master Plan Update (Kirkland 2023a)
- Stormwater Management Plan (Kirkland 2023b)

To prepare for the development of this SMAP, the City conducted a Receiving Water Assessment and Receiving Water Prioritization. Those processes resulted in the City selecting the Totem Lake Catchment of the Juanita Creek Watershed as its high priority catchment for stormwater action planning. Figure 1 shows the location of the Juanita Creek Watershed and the Totem Lake Catchment within Juanita Creek.

A summary of the preliminary analysis conducted prior to development of this SMAP and the results that informed development of the projects and strategies is contained in this document.





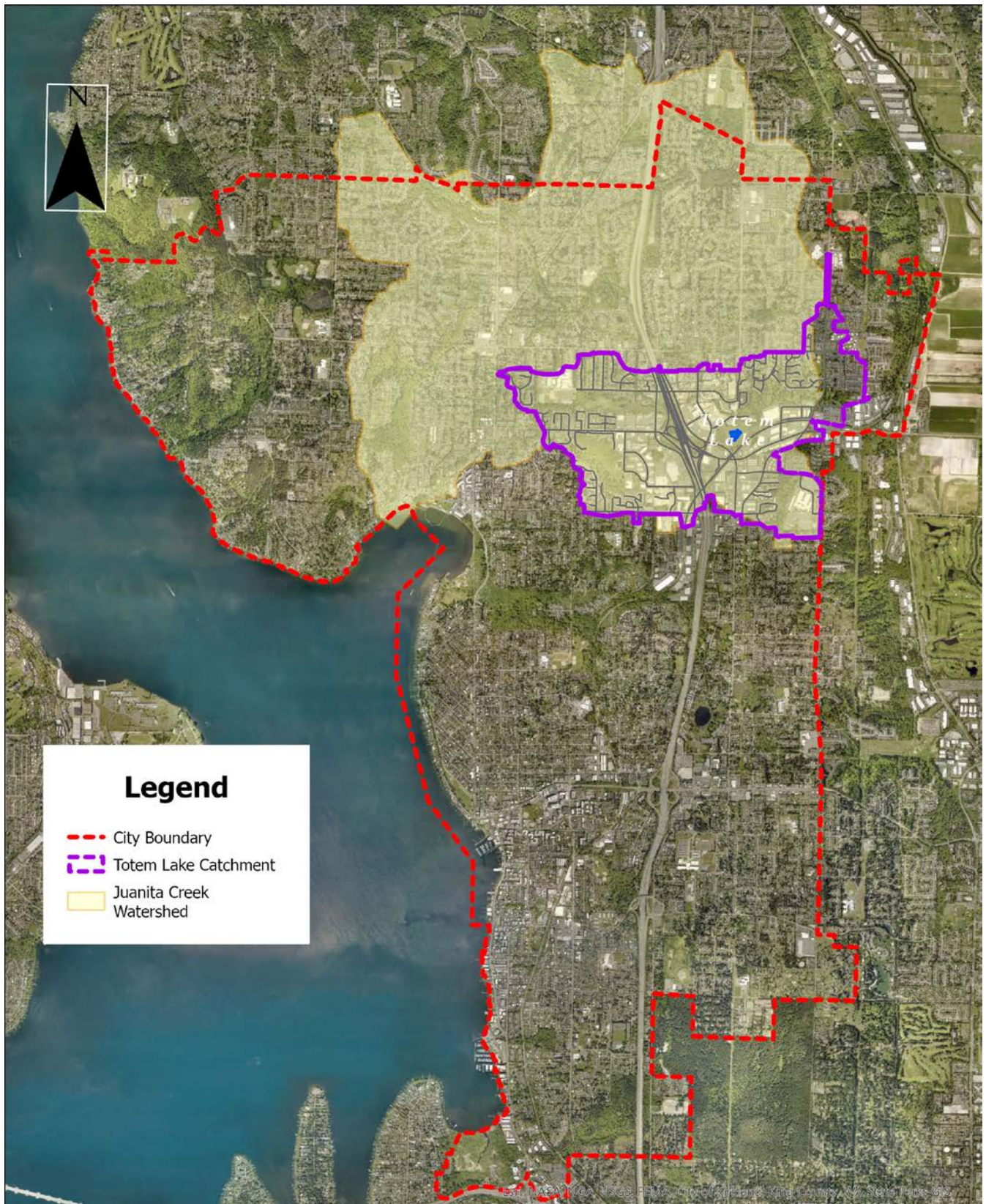


Figure 1. Vicinity Map



Permit section S5.C.1.d.iii lists the following required components of the SMAP:

- (a) A description of the stormwater facility retrofits needed for the area, including the BMP types and preferred locations.
- (b) Land management/development strategies and/or actions identified for water quality management.
- (c) Targeted, enhanced, or customized implementation of stormwater management actions related to permit sections within S5, including:
  - IDDE field screening,
  - Prioritization of Source Control inspections,
  - O&M inspections or enhanced maintenance, or
  - Public Education and Outreach behavior change programs.
  - Identified actions shall support other specifically identified stormwater management strategies and actions for the basin overall, or the catchment area.
- (d) If applicable, identification of changes needed to local long-range plans, to address SMAP priorities.
- (e) A proposed implementation schedule and budget sources for:
  - Short-term actions (i.e. actions to be accomplished within six years), and
  - Long-term actions (i.e., actions to be accomplished within seven to 20 years).
- (f) A process and schedule to provide future assessment and feedback to improve the planning process and implementation of procedures or projects.

This SMAP follows the same order as listed in the Permit and where actions are not appropriate for the Totem Lake Catchment, it is noted.





# Summary of Watershed Assessment and Prioritization

The City conducted a receiving water inventory and assessment pursuant to NPDES Permit Requirement S5.C.1.d.i in March 2022 and submitted the results to Ecology (City of Kirkland, 2022a). Following the watershed inventory and assessment of receiving water conditions, the City completed its prioritization process (Permit section S.5.C.1.d.ii) in June 2022 (City of Kirkland, 2022b).

## Receiving Water Conditions

Receiving water conditions were assessed for the City's 15 watersheds, including the following characteristics:

- Total size
- Size within the City
- Basin size within the city
- Impervious Area
- Forested percentage
- Primary land use and percentage
- Secondary land use and percentage
- Salmon use
- Current 303(d) listings
- B-IBI scores
- Water Quality Index Results
- Stormwater Management Influence

Based on the results of the initial receiving water characterization, and stormwater management influence, the city decided to include all of its watersheds in the prioritization process and not eliminate any from further consideration as a candidate for Stormwater Management Action Planning. Attachment A includes the receiving water characterization summary table.



## Watershed Prioritization

Kirkland's 15 watersheds were prioritized and ranked (Table 1) based on several factors including:

- Ecology's Stormwater Management Action Planning Guidance (Ecology, 2019b)
- Public feedback
- Stakeholder input
- City priorities

Criteria considered in the watershed prioritization included questions from the following five categories:

1. Fish presence, including salmonids.
2. Water quality issues and presence or absence of stormwater facilities.
3. Stormwater management influence and flow control.
4. Environmental justice and overburdened communities.
5. City influence and priorities.

*Table 1. Watershed Prioritization Ranking*

Basin Name	Rank
Juanita Creek	1
Forbes Creek	2
Champagne Creek	3
Denny Creek	4
Moss Bay	5
South Juanita Slope	6
Lower Sammamish River Valley	7
To Redmond	8
Carillon Creek	9
Houghton Slope A	10
Houghton Slope B	11
Yarrow Creek	12
Holmes Point	13
Kirkland Slope	14
Kingsgate Slope	15





## Catchment Selection Process

A similar process to the watershed prioritization was used to prioritize one of five tributary catchments in the Juanita Creek watershed for Stormwater Management Action Planning. Questions were developed to refine and rank the highest priority catchments to reflect the range of issues the City expects to influence and address in the Stormwater Management Action Plan including habitat and salmon use, water quality, environmental justice, and city influence and priorities.

Two catchments rose to the top in the catchment ranking process, Totem Lake and the North Mainstem. Ultimately, staff decided on the Totem Lake Catchment based on the following considerations which include but are not limited to:

- Totem Lake has more achievable and impactful short-term actions.
- Totem Lake is a Regional Growth Center. The City has seen and expects continued redevelopment and associated capital investments to support this growth.
- High density of light industrial and commercial activity occurs in this area.
- Opportunity for public/private partnerships for stormwater management.
- On State's 303d list for fecal coliform bacteria, dissolved oxygen, and temperature
- Contains the Totem Lake tributary to Juanita Creek, which supports salmon species, including Chinook salmon.
- Downstream owners have concerns about high flows and erosion.
- Equity criteria based on EPA Environmental Justice Screening tool

## Overview of the Catchment

The Totem Lake Catchment is one of four major tributaries to Juanita Creek. Land use in the catchment includes a mix of single- and multi-family residential development, commercial and light industrial businesses, a mall, a regional hospital, and a college campus. Major north-south (Interstate 405) and east-west (NE 124<sup>th</sup> Street) transportation corridors bisect the catchment. A portion of the catchment has been designated as a [Regional Growth Center](#) and will continue to see increased density of development. Figure 2 shows the zoning designations in the vicinity of the catchment.



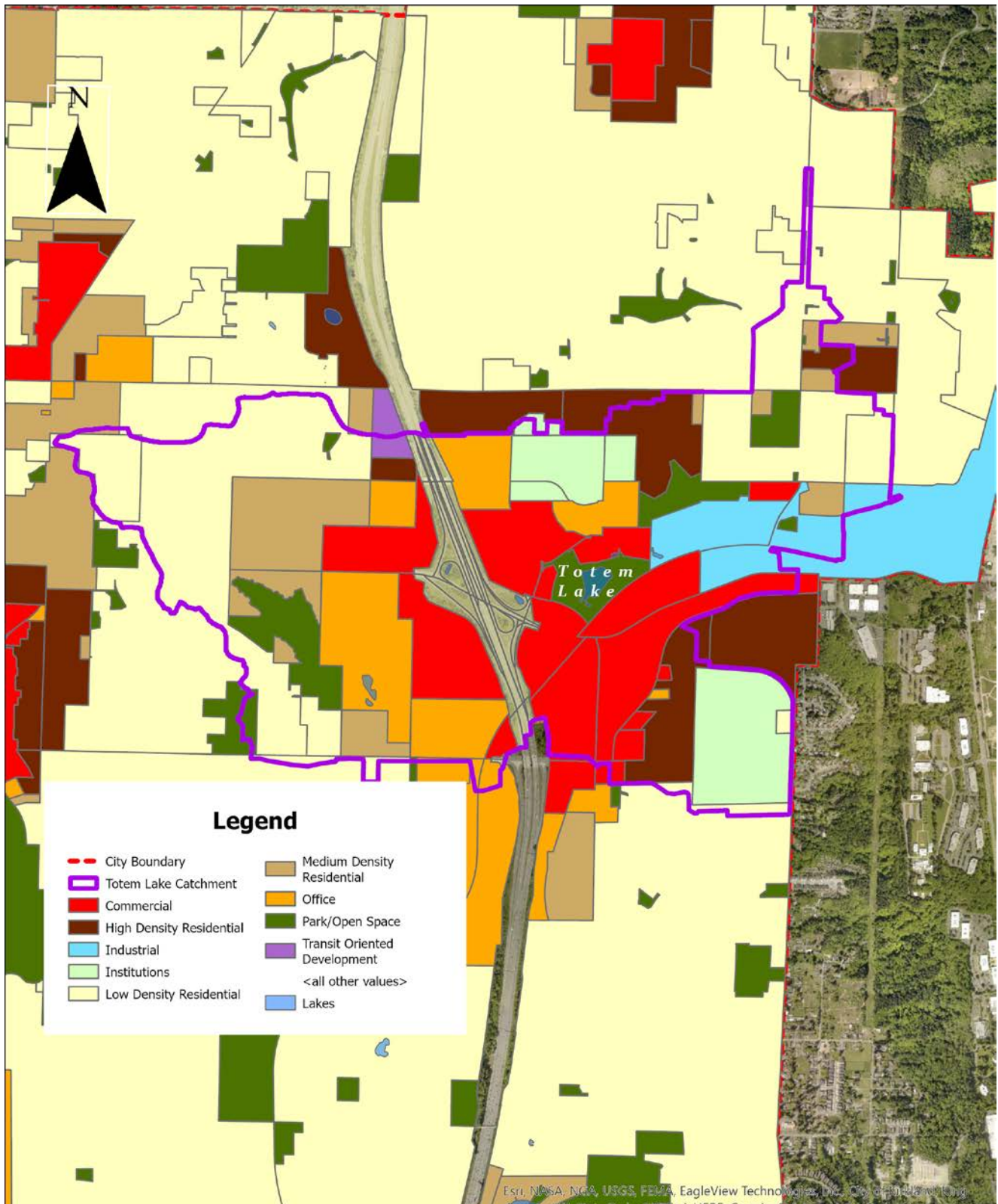


Figure 2. Zoning Designations in Vicinity of Totem Lake Catchment



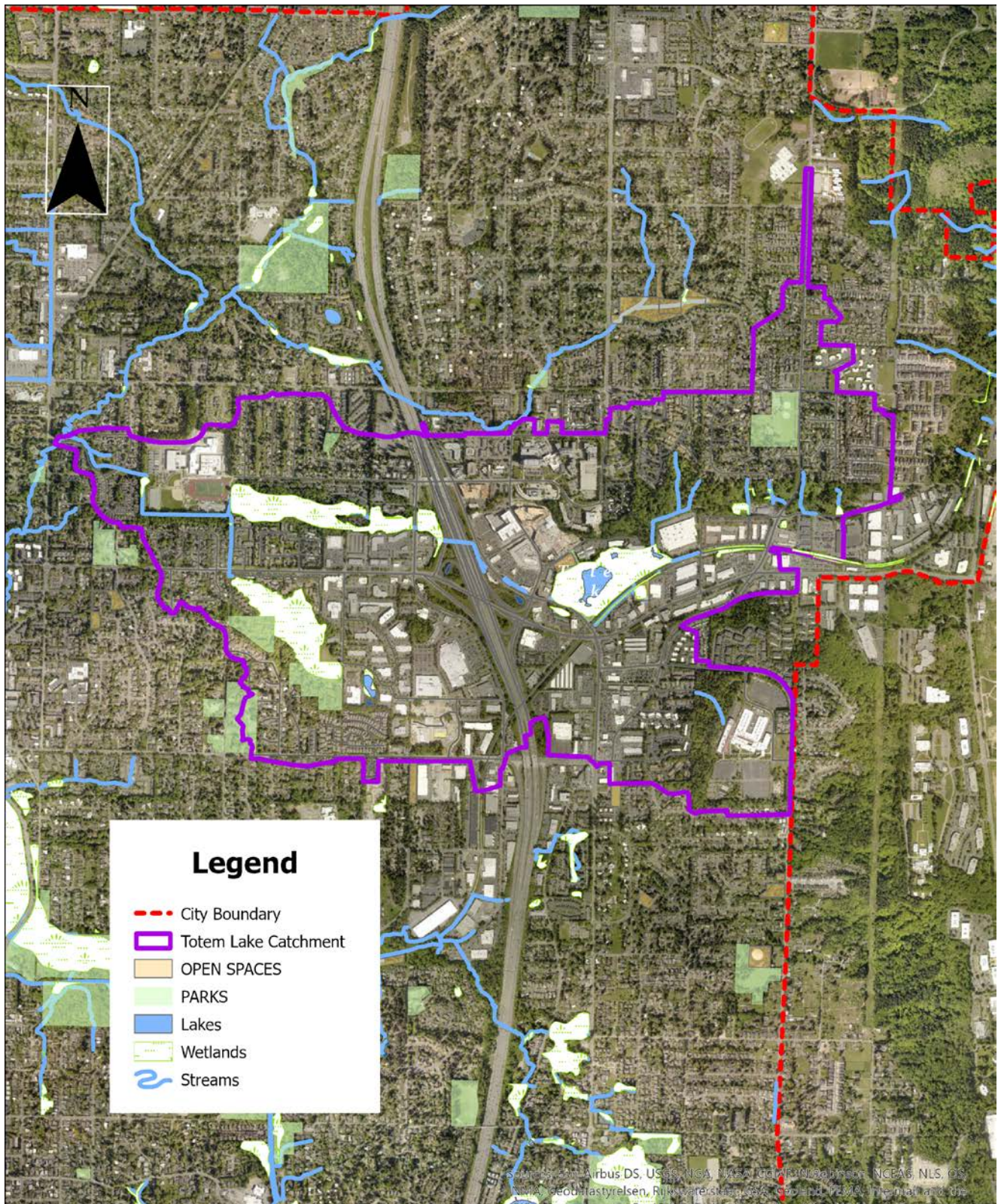


Figure 3. Location of Wetlands, Streams, Parks, and Open Spaces in Totem Lake Catchment



Totem Lake itself, large wetland complexes surrounding the lake, and the Juanita Creek stream corridor are the primary open spaces in the catchment. Figure 3 shows the open spaces, wetlands, and streams.

## Catchment Planning History

The Totem Lake Catchment upstream of I-405 has previously been evaluated by the City in an Ecology-grant funded project, Totem Lake/Juanita Creek Basin Stormwater Retrofit Conceptual Design. Twenty-nine candidate projects, some of which were in the same location, were identified for potential retrofits and were evaluated for project feasibility.

Of the twenty-nine projects, six were selected for development of stormwater retrofit concepts. After additional project review and discussion with a panel of technical assistance experts, two projects, 132<sup>nd</sup> Square Park and NE 120<sup>th</sup> Street Right-of-Way Water Quality Treatment, were advanced to the implementation phase. These projects are discussed under Strategic Stormwater Retrofits. In addition to these two city-sponsored retrofit projects, water quality treatment and in some cases flow control has been provided as existing highly impervious properties have redeveloped. Figure 4 below shows locations where properties have developed since 2000 (in black). These sites were built to modern stormwater regulations, slowing and cleaning stormwater before it discharges into Totem Lake and Juanita Creek. Figure 5 shows locations of the retrofit sites that were considered and sites where facilities were advanced to construction.





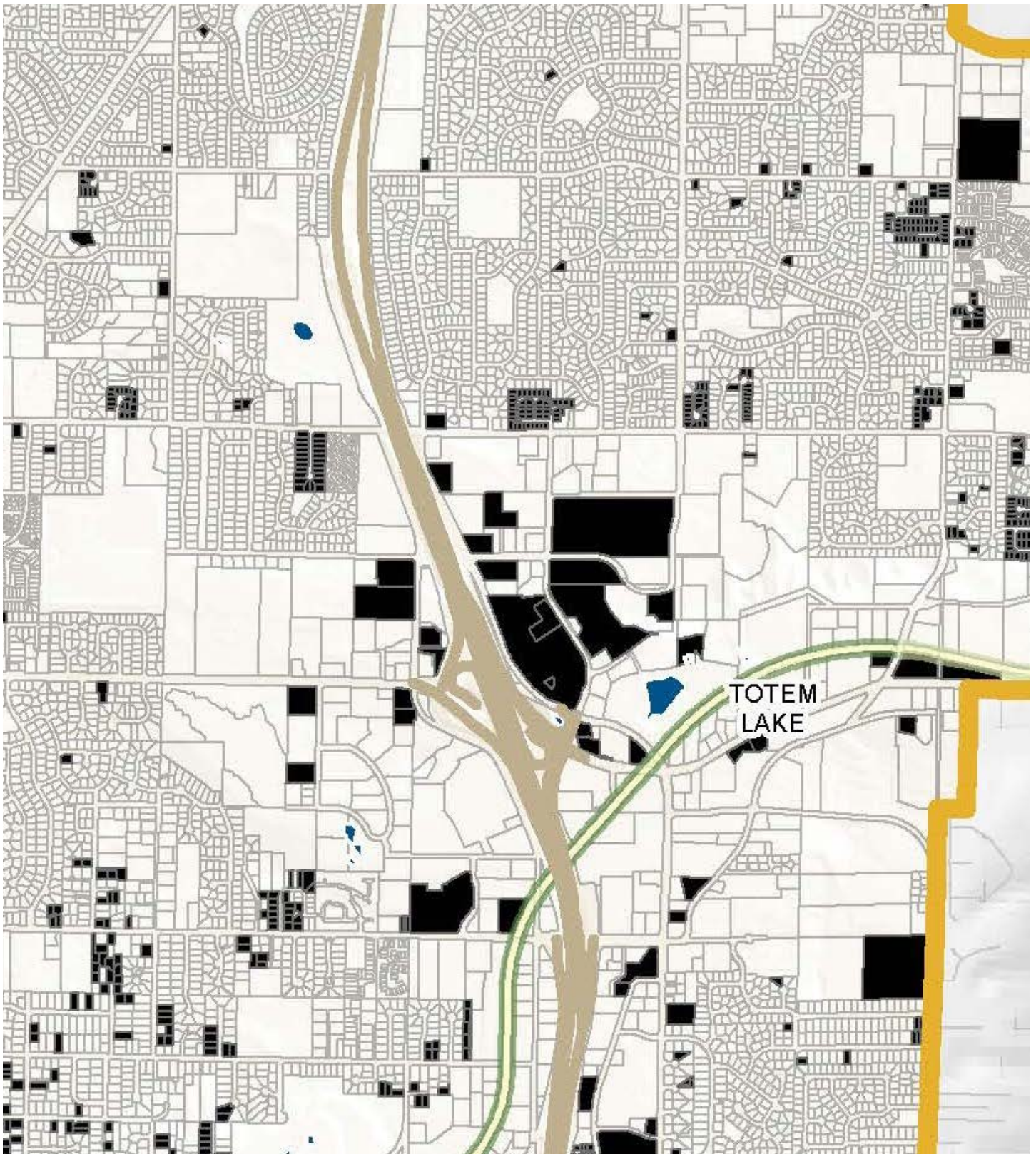


Figure 4. Locations Showing Development since 2000 (in black).



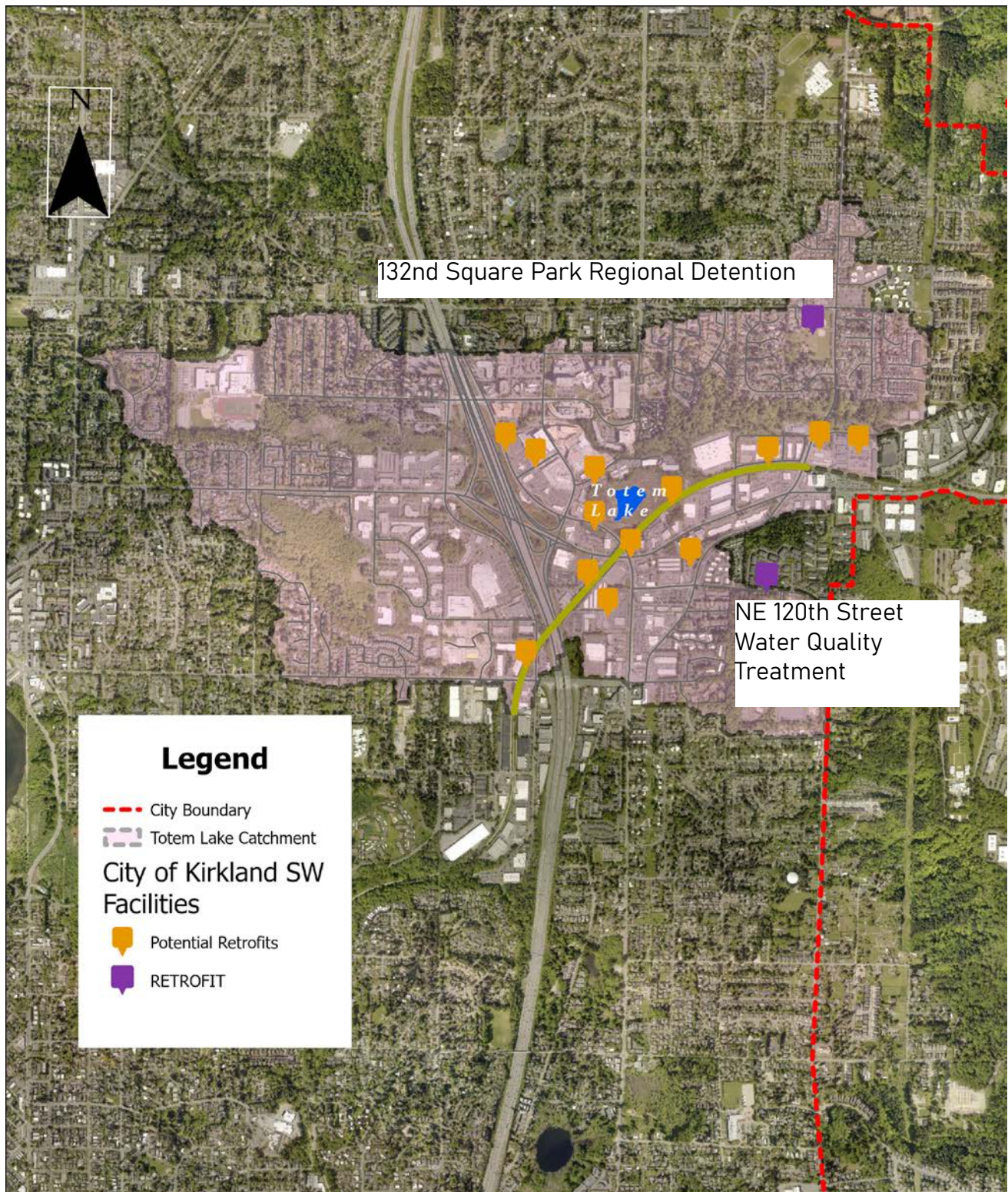


Figure 5. Locations of Sites Considered for Potential Retrofit and Retrofit Capital Projects Advanced to Implementation Phase (in purple). In some cases multiple facilities were considered at a particular site.



# Stormwater Management Actions in Catchment

## Identification and Prioritization of Actions

Stormwater management actions were identified for the Totem Lake Catchment through review of previous retrofit planning (City of Kirkland, 2015), during development of the City's Surface Water Master Plan Update, which is expected to be adopted in April 2023 (City of Kirkland, 2023a), and through this planning process. The duration, schedule, and costs of capital and non-capital (programmatic) stormwater management actions were identified in the Surface Water Master Planning process and incorporated City Council and Staff priorities. A subset of these actions are tailored/customized for use in the Totem Lake Catchment. Several short-term non-capital stormwater actions will likely result in further refinement of a list of capital projects to be constructed over the lifetime of this Stormwater Management Action Plan.

## Strategic Stormwater Retrofits

Implementation of stormwater retrofits in the Totem Lake Catchment is on-going. The City is committed to improving water quality and flows in this catchment as part of an overall effort to improve fish and wildlife habitat in the Juanita Creek watershed. The economic vitality of this urban center is supported and enhanced by these stormwater efforts, as Kirkland residents have a strong connection to the natural environment and interest in maintaining healthy open spaces that support wildlife. In addition, retrofits reduce flooding which has in the past impacted Totem Lake businesses.

The City's largest retrofit undertaking to date is in the Totem Lake Catchment – 132<sup>nd</sup> Square Park Regional Detention. Additional strategic retrofit actions to make progress on improving flows and water quality in this catchment are listed in Table 2. These actions were identified via the City's Surface Water Master Planning process and will be focused and tailored to the needs of the Totem Lake Catchment. A more detailed description of the retrofits follows Table 2.



Table 2. List of Strategic Stormwater Retrofits

Project	Description	Schedule		Best Management Practice Type	Preferred Locations
		Short-term (2023–2030)	Long-term (2030 or later)		
132 <sup>nd</sup> Square Park Regional Detention	Construct water quality and flow control treatment facility for 50 acres of up-stream receiving area. Monitor stormwater infiltration facility to determine design accuracy and facility impact.	Complete construction, which is in progress. Conduct Monitoring	N/A	Stormwater Retrofit using proprietary water quality treatment and infiltration thru bottomless vault.	132 <sup>nd</sup> Square Park and stormwater pipes in vicinity
NE 120 <sup>th</sup> Street Right-of-Way Water Quality Treatment	Implementation of water quality treatment for about 4 acres of upstream area, including a high-traffic roadway.	Project Completed.	N/A	Stormwater Retrofit using Stormfilter cartridges, proprietary treatment devices, placed in 6 catch basins within the right of way.	NE 120 <sup>th</sup> Street.
Totem Square Regional Detention and Water Quality Treatment	Design and construct water quality and flow control treatment facility to capture flow in the vicinity of intersection of 124 <sup>th</sup> Ave NE and NE 124 <sup>th</sup> Street.		Design and Construct Project	Stormwater Retrofit using vault and/or bioretention.	NE 124 <sup>th</sup> Street and 124 <sup>th</sup> Ave NE and vicinity. Requires coordination with private developers.
Lake Washington Institute of Technology (LWIT) Water Quality Treatment and Detention	Design and construct a stormwater facility to provide flow control and water quality treatment from 23.4 acres of the LWIT campus.		Design and Construct Project	Stormwater Retrofit using vaults and/or infiltration.	Lake Washington Institute of Technology Campus. Requires coordination with private institution.
Retrofit Aging Stormwater Facilities	Develop plan to replace, upgrade, repair, or repurpose City's aging stormwater facilities	Develop Plan and Prioritized Project List	Design and Construct Projects	Existing Facility Retrofit	Whole Totem Lake Catchment.  Potential prioritization criteria: potential for expansion or repurposing, type of facility, coordination with other city projects
Retrofit and Replace Aging and Failing Pipes	Develop plan to replace and repair aging and failing pipes based on condition and risk.	Develop Plan and Prioritized Project List	Design and Construct Projects	System upgrade and retrofit	Guided by CCTV Condition Assessment  Potential prioritization criteria: likelihood of failure, consequences of failure, potential for coordination of repair/replacement with other city projects.
Identify Opportunities for Retrofit along Cross Kirkland Corridor	Review CKC Master Plan for surface water projects and needs related to surface water	Prioritized Project List	Design and Construct Projects	New Retrofit Facilities – BMPs to be determined, as appropriate.	Cross Kirkland Corridor  Potential prioritization criteria: potential for co-benefits, potential for coordination with CKC mitigation needs, potential for infiltration
Evaluate and prioritize preferred locations for New Stormwater Retrofit on west side of I-405	Review facility heat map to identify locations that are lacking stormwater treatment.	Develop Plan and Prioritized Project List	Design and Construct Projects	New Retrofit Facilities – BMPs to be determined as appropriate.	West Side of I-405  Potential prioritization criteria: property ownership, permitting, absence of existing treatment, upstream land use, infiltration potential, construction feasibility, and coordination with existing stormwater infrastructure and other city projects



Figure 6 shows location-specific stormwater retrofits that are in-progress, constructed, or recommended for design. Additional stormwater retrofits are planned for the catchment in general. Preferred locations are where needs have been identified, as listed in Table 2 and described below.

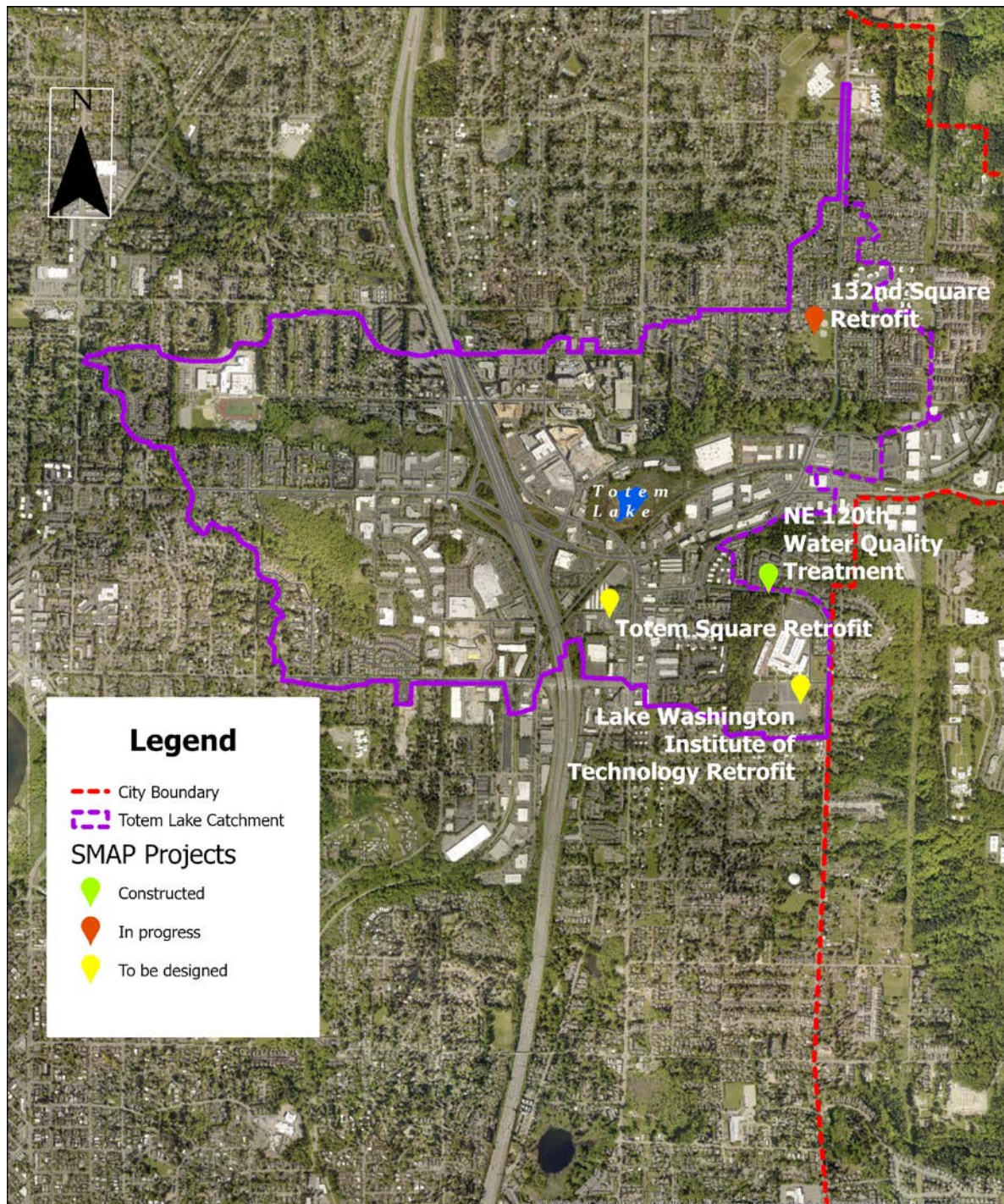


Figure 6. Location of Strategic Stormwater Retrofits



## 132nd Square Park Regional Detention

The 132<sup>nd</sup> Square Park achieves multiple city objectives in one location. The park was identified through analysis to be a good location to treat and infiltrate nearly 50 acres of contributing area. At the same time, park amenities were improved through the installation of a year-round accessible turf field, bathroom and recreational facilities, and parking. The resulting stormwater treatment and infiltration vault will manage the stormwater from ~5% of the catchment area. The project was partially funded via an Ecology Stormwater Financial Assistance Program grant. This project is in the final stages of construction and will be completed in 2023.

After the project has been completed, hydraulic monitoring will be conducted at the site to evaluate predicted vs actual stormwater infiltration, and to measure the actual downstream flow reduction. The data will be used to guide future operation and maintenance of the facility. The information will also inform the design and sizing of future infiltration facilities. Stormwater infiltration is a high priority because it provides both water quality treatment and flow reduction (as opposed to merely flow control), and because it supports groundwater flow to streams and lakes during summer low-flow periods, which is crucial for fish populations.

## The NE 120<sup>th</sup> Street Right-of-Way Water Quality Treatment

This project has been constructed. It provides water quality treatment for about 4 acres of upstream area, including a high-traffic roadway. Treatment consists of Stormfilter cartridges, proprietary treatment devices, placed in 6 catch basins within the right of way. The project was partially funded via an Ecology Stormwater Financial Assistance Program grant.

## Totem Square Retrofit

The Totem Square Retrofit is a regional stormwater facility that would provide flow control and water quality treatment in the vicinity of 124<sup>th</sup> Avenue NE. This project would significantly reduce stormwater flooding in the vicinity of 124<sup>th</sup> Ave NE and NE 124<sup>th</sup> Street, a major intersection. This project would require coordination with the owners of this property. A project summary sheet is provided in Attachment B.

## Lake Washington Institute of Technology Retrofit

The Lake Washington Institute of Technology Retrofit project would construct a stormwater facility to provide flow control and water quality treatment of 23.4 acres from the LWIT campus. Two alternatives are in consideration and would be re-evaluated during design for a vault with water quality treatment, or a vault with pre-treatment and infiltration. This project would require coordination with the LWIT campus. Project summary sheets for both alternatives are provided in Attachment B.





## Retrofit Aging Stormwater Facilities

Figure 7 shows the location of existing City stormwater facilities with potential for future retrofit. Older stormwater facilities consist largely of corrugated metal detention pipes, detention ponds, and grass-lined swales. The City is filling data gaps in its inventory of stormwater facilities through review of as-builts and other information so that there is a more complete record of stormwater facility ages and expected lifecycles. Upon completion of the data gap exercise, older stormwater facilities in the Totem Lake Catchment will be grouped into two age categories: pre-1980 and 1980 – 2000.

A lifecycle cost analysis of the pre-1980 facilities will be conducted to estimate cost of replacement in present day dollars. Stormwater facilities will be prioritized for replacement based on lifecycle cost, age, and condition (current functionality). Stormwater facilities constructed between 1980 and 2000 that are most likely to need upgrades, repairs, or repurposing will be evaluated for:

- Opportunities for re-purposing (i.e., conversion of ponds to vaults so that surface area of property can be used for something else) to achieve multiple city goals, such as pocket parks.
- Opportunity to consolidate multiple facilities in the same vicinity into a larger, more effective facility.
- Opportunities to improve infiltration of stormwater where non-infiltrative stormwater management techniques are currently used.
- Opportunities to consolidate with other projects that are focused on retrofitting untreated areas.
- Opportunities to remove facilities such as corrugated metal pipes used for flow control that are likely to fail and/or that are hard to maintain and to replace them with larger and easier to maintain facilities.

A long-term schedule and prioritized list of potential actions to improve aging stormwater facilities (pre-2000) in the Totem Lake Catchment will be developed.



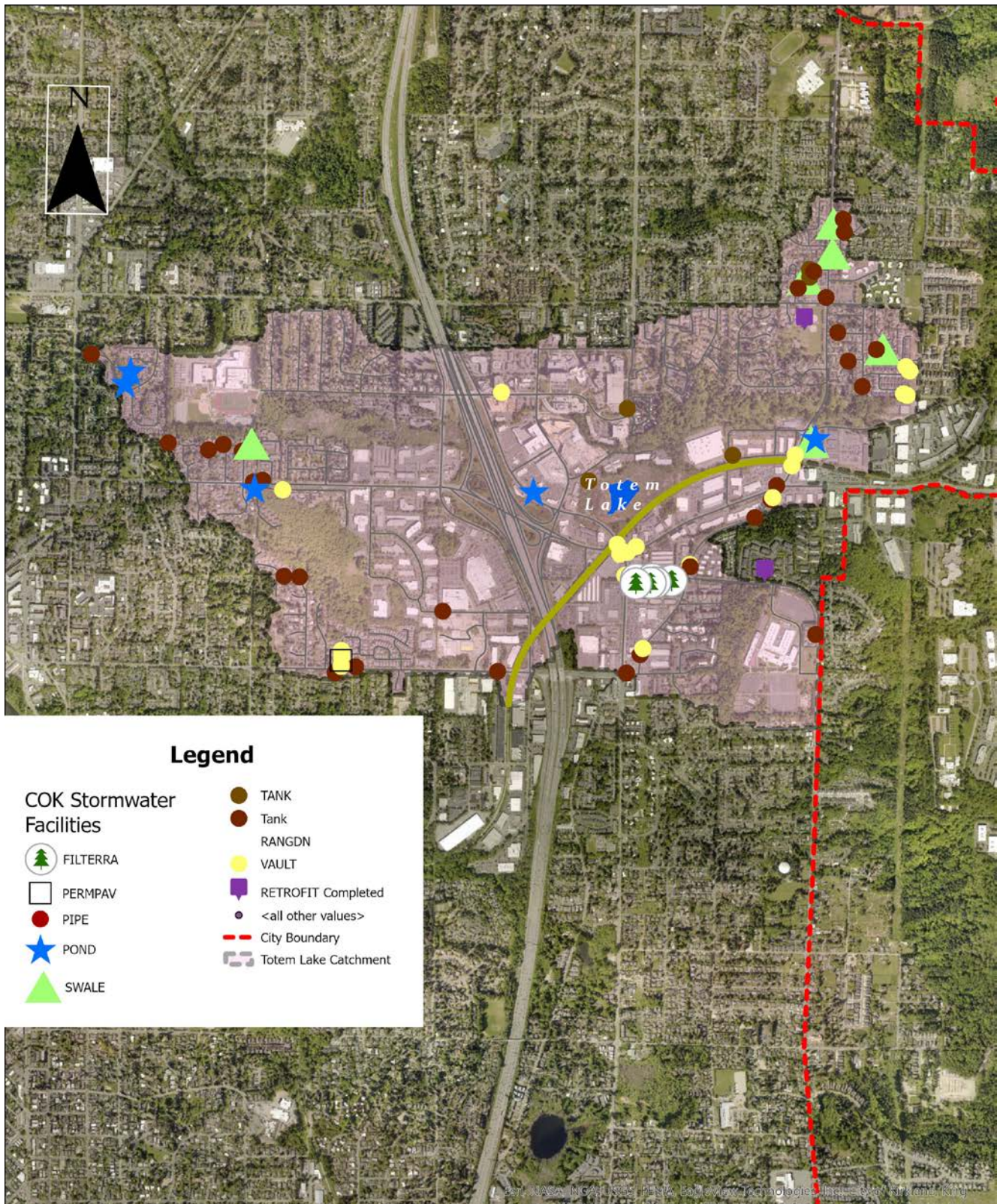


Figure 7. Locations of Existing City Stormwater Facilities for Potential Retrofit or Replacement, and Locations where Retrofit has been Completed



## Retrofit and Replace Aging and Failing Pipes

Pipes in the Totem Lake Catchment will be prioritized for repair and or replacement following condition assessment and risk characterization in the City's pipe evaluation tool. Repairing or replacing broken pipes can support water quality improvements by reducing sediment and debris that enters the stormwater system and decreasing the likelihood of infrastructure collapse, which could transport pollutants.

Kirkland is committed to assessing pipes in the Totem Lake Catchment with closed-circuit television (CCTV) equipment and standard pipe condition assessment rating protocols, as described below in Enhanced Stormwater Management Actions. The data collected during the CCTV inspections will be used to identify pipes that are in poor condition and in areas where risk of failure would result in a negative consequence. A long-term plan will be developed for repair and replacement of pipes in the Totem Lake Catchment based on risk.

## Identify Opportunities for Retrofit along Cross Kirkland Corridor

The Cross Kirkland Corridor (CKC) will be developed over time. A section of the CKC bisects the Totem Lake Catchment on its southeast side. The CKC intercepts and routes quite a bit of stormwater, allowing for potential opportunities and partnerships resulting in stormwater improvements as the development of the CKC takes place. This project involves reviewing the CKC Master Plan for potential surface water opportunities in the catchment, including:

- Shared open spaces for potential retrofit, habitat benefits, or stormwater parks
- Locations for construction of new retrofit facilities (incorporating water quality design work completed as part of NPDES capacity grant)
- Educational opportunities (i.e., signage, kiosks)

This action will involve coordination with the transportation division and City Manager on potential CKC ideas, projects, and funding. Viable projects may not be identified in the catchment upon review. This work will contribute to improved awareness of stormwater issues and to efficient use of city funds if locations are identified and used for new retrofit facilities.

## New Stormwater Retrofit Locations

The Totem Lake/Juanita Creek Basin Stormwater Retrofit Conceptual Design (City of Kirkland, 2015) focused on the catchment east of I-405, as shown in the potential retrofit locations identified in Figure 5. Figure 8 shows locations of all stormwater facilities, public and private in the Totem Lake



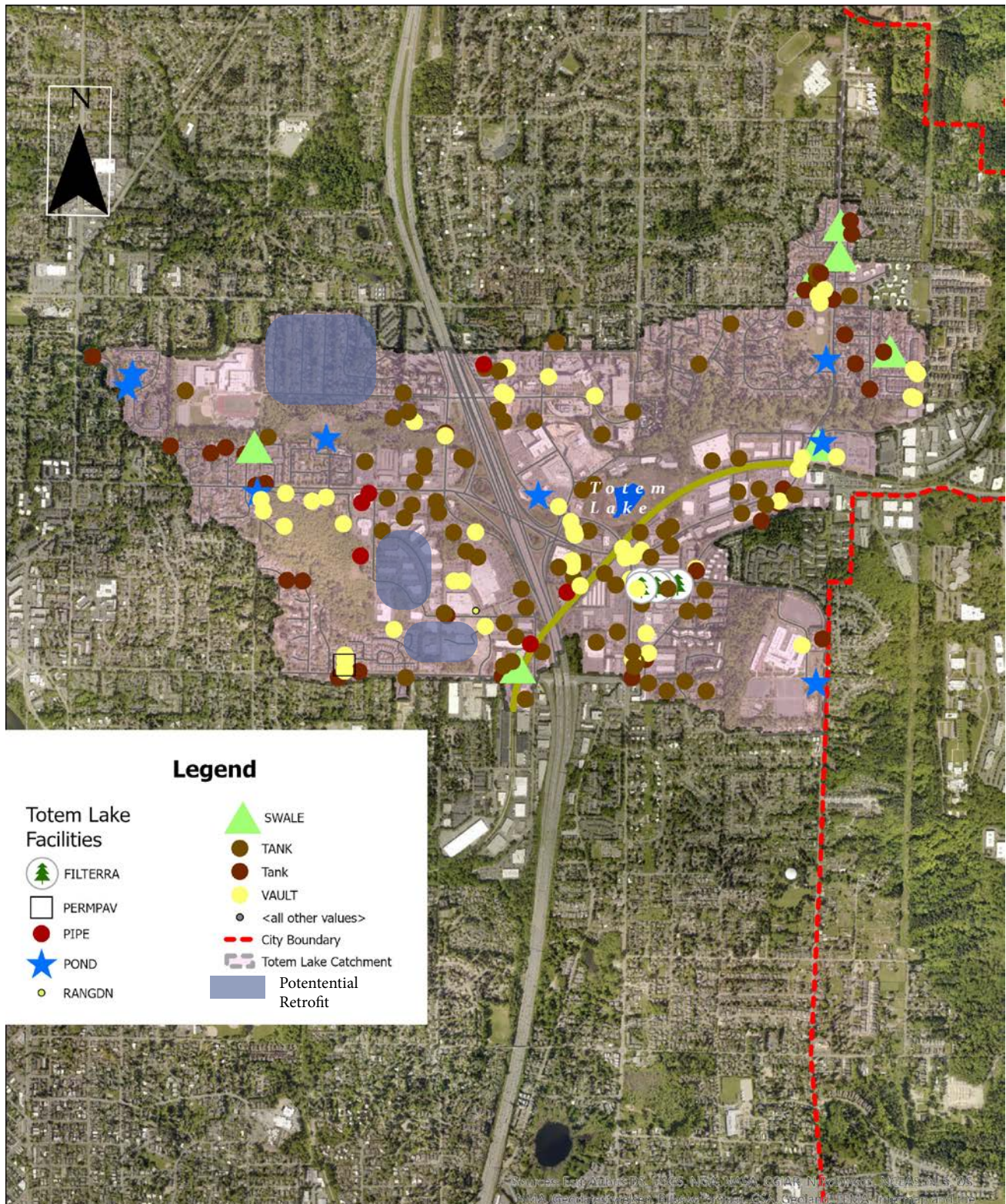


Figure 8. Public and Private Stormwater Facility Locations, Showing Gaps where New Retrofit could be Potentially Located (in blue squares)



Catchment, as well as the priority locations for possible BMPs where retrofits could be targeted for identification on the west side of I-405. While all stormwater management BMPs are considered, priority is given to projects that can treat and infiltrate stormwater in areas with substandard stormwater management on lands owned or operated by the City. A similar process to that which was completed in 2015 will be implemented to identify retrofits in areas that are potentially feasible. These projects will be combined with the projects on the east side of I-405 and prioritized for design and construction.

**Land Management Actions/Development Strategies**

Land management actions and development strategies were briefly considered for the Totem Lake Catchment, but determined to be less effective for meeting water quality and flow control objectives because of the following characteristics:

- The Totem Lake Catchment is built out.
- Remaining large scale development is already in-progress with permits and development standards negotiated, such that it would be difficult to suggest alternative stormwater standards or incentives.
- Existing Critical Areas Code (Kirkland Zoning Code (KZC)- Chapter 90) protects sensitive areas including streams and their buffers, wetlands and their buffers, lakes and their buffers, and steep slopes.

No land management actions or development strategies are proposed.

**Water Quality Actions**

Additional actions to support water quality improvements were evaluated for the Totem Lake Catchment. Two opportunities were identified and are summarized in Table 3. Detailed descriptions of the actions follow after Table 3.

*Table 3. Summary of Recommended Water Quality Opportunities*

Project	Description	Schedule	Best Management Practice
CCTV Pipe Inspection	Four hundred hours crew time dedicated to cleaning and inspection of pipes in Totem Lake Catchment.	Short-term	Pollution prevention
Street Sweeping	Sweep public roads 4 times per year.	Short-term	Pollution Prevention





## CCTV Pipe Inspection

There are tens of miles of stormwater pipes that have not been recently inspected in the Totem Lake Catchment, and many of those are constructed of corrugated metal (CMP), which has been problematic in some areas. CMP pipes will be targeted for cleaning and inspection and follow-up repair (i.e., aging pipe plan). Up to 400 crew hours will be committed to cleaning and inspection in the Totem Lake Catchment in the short-term.

## Street Sweeping

The City will sweep public roads in this catchment about 4 times per year. This activity helps keep pollutants and debris out of the stormwater system. Kirkland's [street sweeping map](#) shows streets where sweeping was recently completed.

## Enhanced Stormwater Management Programs

Two enhanced maintenance and operation activities are identified for the Totem Lake Catchment. Table 4 summarizes the stormwater management actions. Detailed descriptions of the actions follow after Table 4.

*Table 4. Summary of Targeted or Enhanced Stormwater Management Programs*

Project	Description	Schedule	Best Management Practice
Source Control Inspections	Inspect all businesses identified in the source control inventory in the Totem Lake Catchment.	Short-term	Pollution prevention
Dumpster Management Behavior Change Program	Provide behavior change program to at least 50% of the containers in Totem Lake.	Short-term	Pollution Prevention, Behavior Change

## Source Control Inspections

The City will target inspections through the Source Control program in the Totem Lake catchment area. All businesses identified in the catchment will receive an inspection. There are currently 225 businesses in this catchment on the inventory. These inspections focus on ways businesses can reduce or prevent pollution from entering the private and public stormwater system. They also provide information to businesses on how to respond if pollution does occur to reduce impact to the environment.





## Dumpster Management Behavior

Through a social marketing driven behavior change campaign, Kirkland helps commercial businesses keep dumpster lids shut to prevent pollution in our creeks and lakes. Kirkland will enhance implementation of this program in Totem Lake to reach the managers of more than 50% of the containers in the catchment.

## On-Going City-wide Stormwater Management Actions

Kirkland implements many city-wide programs that extend to the Totem Lake Catchment but are not exclusive to the Totem Lake Catchment. These stormwater programs and actions are on-going and expected to continue, but the City is not proposing targeted implementation in the SMAP. Rather, they are described below because of the water quality benefits these programs and actions provide to the watersheds in Kirkland, including Totem Lake Catchment.

Table 5 summarizes on-going City-wide strategies that are expected to continue and benefit water quality in the Totem Lake Catchment. Detailed description of the actions follow after Table 5.

*Table 5. Summary of On-going City-wide Stormwater Management Actions*

Project	Description	Schedule	Best Management Practice
IDDE	Continue funding City's spill response and education and outreach program to reduce incidents.	On-going	Pollution prevention
Private Drainage Facility Inspections	Continue conducting inspections of private drainage facilities, including those not required by NPDES.	On-going	Operations and maintenance
Identification of public/private retrofit opportunities	Continue flagging areas of potential mutual interest for stormwater retrofit opportunities with private redevelopment.	On-going	Retrofit



Project	Description	Schedule	Best Management Practice
On-line resources and postcards for private rainwater management facilities.	Educational resources for maintenance and repair of private facilities, and City contact information for technical assistance.	On-going	LID maintenance
Yard Smart Rain Rewards	Disconnect downspouts from stormwater drainage systems.	On-going	Retrofit
Tree Planting Rebates	Rebates for planting new trees (not replacement) on private property.	On-going	Urban forestry
Pet Waste Campaign	Pet waste sponsorship program and pet waste dispensers in the Totem Lake Catchment	On-going	Education and outreach
Flooding Outreach	Distribution of flood-preparedness materials to properties experiencing drainage and flooding issues.	On-going	Education and outreach
Green Kirkland Partnership	Coordination with community volunteers to conduct forest and native plant restoration in parks and green spaces, including Totem Lake Park and Heronfield wetlands.	On-going	Urban forestry

## Stormwater Management Programs

- Illicit discharge detection and elimination (IDDE) program activities

Kirkland holds a high standard for spill response that includes a public education and outreach component that provides spill kits to businesses, car-wash kits, and follows up with businesses and individuals that have spills and require spill response so that future incidents can be prevented. When unidentified spills occur, the City follows up with postcards to neighborhoods and businesses where the spill occurred to make them aware. Educational postcards are sent to all properties within ½ mile of spills and illicit discharges where the source is unknown. Several of these mailings have been sent within the Totem Lake Catchment. This program is City-wide and will continue.





- Private drainage facility inspections

The City inspects all NPDES required private stormwater facilities annually, and private facilities that don't require NPDES inspection every 3 years. This is a Citywide program and will continue.

- Identification of public/private retrofit opportunities

The city, as feasible, flags areas not of public ownership with high potential for stormwater retrofit, so that early coordination and potential partnerships can be negotiated with planned developments for mutual benefits. Areas of interest or specific parcels of interest for stormwater retrofit can be identified for use by City planners during the development application process, prior to a pre-application meeting.

## Education and Outreach Programs

- Rainwater Management Features

Kirkland has a robust education and outreach program that includes an on-line [interactive map](#) of rainwater management features on private property in Kirkland. Information includes the locations of private facilities, fact sheets for how to maintain, and drainage maintenance contractor lists.

- Yard Smart Rain Rewards

Kirkland provides technical assistance and rebates to residents that disconnect their downspouts from the city stormwater system and install rain gardens, native landscaping, or cisterns.

- Tree Planting Rebates

The City provides rebates for planting trees on private property, with more than 360 trees planted in the last two years, including some in the Totem Lake Catchment. The online [interactive map and dashboard](#) shows the numbers of participants, trees planted and locations.

- Pet Waste Campaign

Kirkland implements a multi-faceted [pet waste campaign](#) to encourage pet owners to clean up after their animals and dispose of pet waste properly. The pet waste station sponsorship program has installed several pet waste bag dispensers in the Totem Lake Catchment.

- Flooding Outreach



Kirkland sends flood preparedness and prevention outreach materials to all properties near recent drainage/flooding issues. This outreach includes proper BMPs for disposal of yard waste and extra leaves. Some of these outreach materials were delivered in the Totem Lake Catchment.

- Green Kirkland Partnership

The Green Kirkland Partnership Program trains and coordinates community volunteers and conducts forest and native plant restoration activities in parkland and open space areas throughout the city, including Totem Lake Park and Heronfield Wetlands Park in the Totem Lake Catchment.

## Long Range Plans

No specific changes were identified to existing long-range plans as necessary to implement SMAP priorities. However, the City will continue to coordinate with long-range planning efforts during the implementation of the identified SMAP such as Kirkland's 2044 Comprehensive Plan Update, Capital Facilities Plans, Surface Water Master Plan, Other Utility Plans (Sewer, Water, etc.) and Transportation Planning efforts.

## Budget and Schedule

The budget sources and general schedule for the actions identified in this plan are summarized in Table 6.

These projects and/or actions are expected to be funded by the Kirkland Surface Water Utility's Stormwater Fund and as feasible, supplemented by grants. However, sources of funds and the allocation of funding will be determined for individual projects upon identification and prioritization among other City surface water priorities.





*Table 6. Summary of budget sources and schedule of actions*

Project	Funding Source	Schedule (with- in these time- frames)	Best Management Practice
132 <sup>nd</sup> Square Park Re- gional Detention	Stormwater Fund	2023 - 2030	Monitoring/Storm- water Retrofit
Aging Stormwater Facilities	Stormwater fund	2023 - 2030	Facility Retrofit
Aging Pipe Plan	Stormwater fund	2023 - 2030	System upgrade and retrofit
Identify New Storm- water Retrofit Loca- tions	Stormwater fund	2023 - 2030	Stormwater Retrofit
Source Control In- spections	Ecology's Pollution Prevention As- sistance Program supplemented by Stormwater fund	2023- 2030	Pollution prevention
Cross Kirkland Corri- dor (CKC) Review	Stormwater fund	2023 - 2030	Stormwater Retrofit
CCTV Pipe Inspection	Stormwater fund	2023- 2030	Pollution prevention
Retrofit or repair ag- ing stormwater facili- ties (to be identified)	Stormwater fund supplemented by grants	After 2030	Stormwater retrofit
Repair or replace ag- ing stormwater pipes (to be identified)	Stormwater fund supplemented by grants	After 2030	Stormwater retrofit
Street Sweeping	Stormwater fund	2023 - 2030	Pollution Prevention
Dumpster Behavior Change Management	Stormwater fund	2023 - 2030	Pollution prevention, Behavior change

## Adaptive Management

This Stormwater Management Action Plan will be reviewed periodically to determine progress made toward completion of actions. New projects and actions identified will be added or removed from the plan as necessary as priorities change.



# References

- City of Kirkland, 2015. Totem Lake/Juanita Creek Basin Stormwater Retrofit Conceptual Design, Final Project Report for Ecology Grant G1400024, July 15, 2015.
- City of Kirkland, 2022a. Stormwater Management Action Plan Receiving Water Characterization.
- City of Kirkland, 2022b. Stormwater Management Action Plan Watershed Prioritization.
- City of Kirkland, 2023a. Surface Water Master Plan Update.
- City of Kirkland, 2023b. Stormwater Management Plan.
- Ecology, 2019a. Western Washington Phase II Municipal Stormwater Permit, Effective August 1, 2019.
- Ecology, 2019b. 2019 Stormwater Management Manual for Western Washington (SWMMWW).





# Attachment A

## Receiving Water Characterization



# City of Kirkland- Receiving Water Assessment

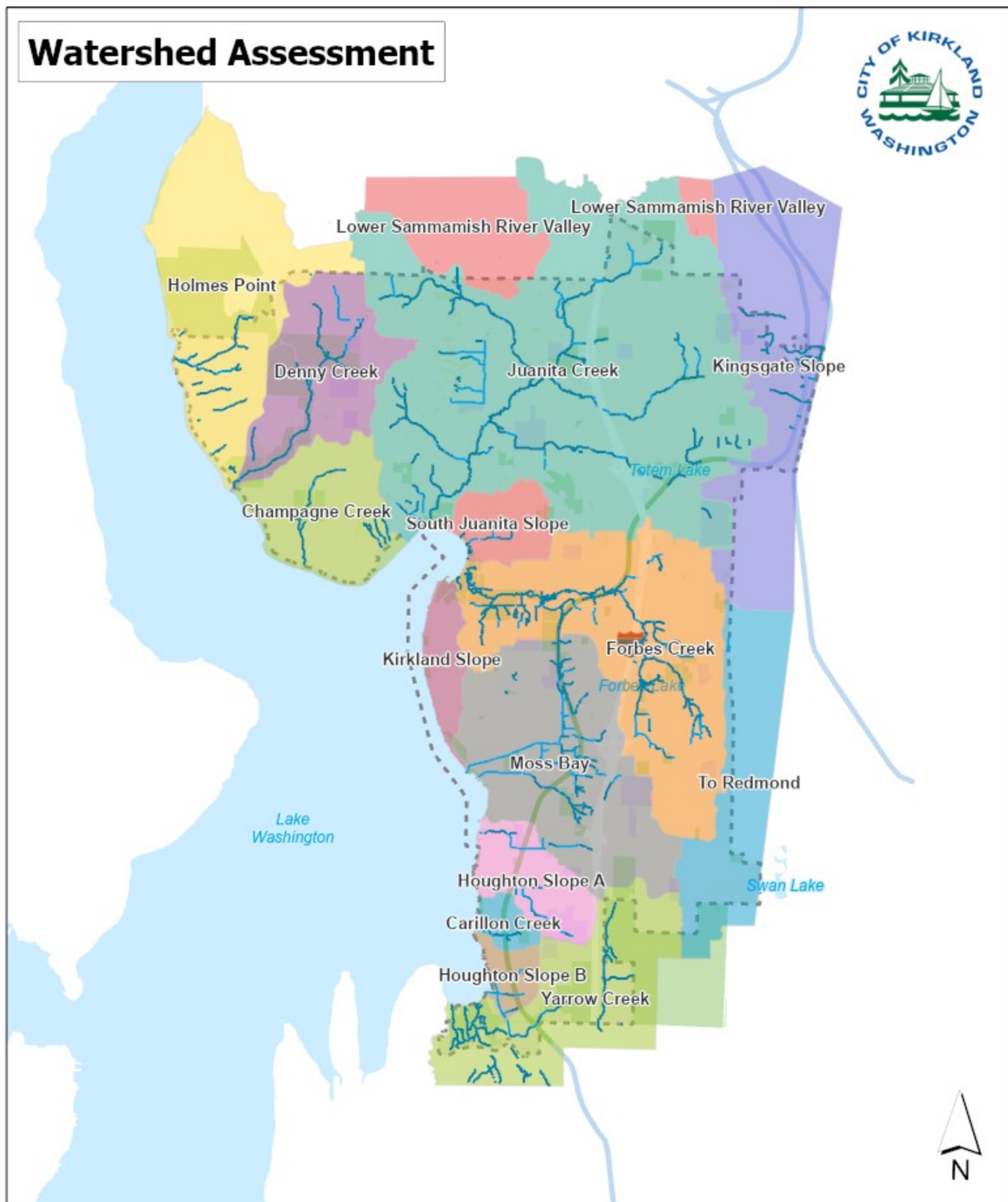
NPDES Permit Requirement S5.C.1.d.i.  
March 2022

Basin Name	Receiving Water	Total Size (square miles)	Size within City (sq. miles)	Basin within City Limits (%)	Impervious Area (%)	Forested (%)	Primary Land Use	Primary Land Use (%)	Secondary Land Use	Secondary Land Use (%)	Salmon Use	Current 303(d) Listings	B-IBI	Water Quality Index	Stormwater Management Influence	Included in Prioritization?*
Carillon Creek	Carillon Creek/ Lake Washington	0.17	0.17	100%	41%	34%	Low Density Residential	50.1%	Medium Density Residential	21%	no data	NA	no data	84 (Good)	moderate	Yes
Champagne Creek	Champagne Creek/ Lake Washington	0.97	0.97	100%	32%	45%	Low Density Residential	88.0%	Park/Open Space	9%	Yes	NA	no data	78 (Moderate)	moderate	Yes
Denny Creek	Denny Creek/ Lake Washington	1.26	1.27	100%	25%	53%	Low Density Residential	65.6%	Park/Open Space	32%	Yes	Bioassessment (BIBI score)	Poor	83 (Good)	moderate	Yes
Forbes Creek	Forbes Creek/ Lake Washington	2.87	2.89	100%	39%	39%	Low Density Residential	69.0%	Park/Open Space	10%	Yes	Forbes Creek: temperature, dissolved oxygen, bioassessment, and bacteria; Forbes Lake: phosphorus	Poor	74 (Moderate)	moderate-high	Yes
Holmes Point	Unnamed Creeks/ Lake Washington	2.30	0.71	31%	23%	60%	Low Density Residential	85.0%	Park/Open Space	10%	no data	NA	no data	67 (Moderate)	moderate	Yes
Houghton Slope A	Lakeview Creek and NW College Creek (unnamed)/ Lake Washington	0.59	0.59	100%	49%	26%	Low Density Residential	56.2%	Medium Density Residential	21%	no data	NA	no data	78 (Moderate)	moderate	Yes
Houghton Slope B	Unnamed Creek/ Lake Washington	0.21	0.21	100%	43%	33%	Low Density Residential	77.7%	Medium Density Residential	10%	no data	NA	no data	89 (Good)	Low	Yes
Juanita Creek	Cedar, Billy, Totem Lake, Kingsgate creek tributaries of Juanita Creek/ Lake Washington	7.03	5.81	83%	43%	35%	Low Density Residential	62.6%	Commercial	8%	Yes	Dissolved oxygen, temperature, and bacteria; Totem Lake: dissolved oxygen	Poor	75 (Moderate)	moderate-high	Yes
Kingsgate Slope	Unnamed creeks/ Sammamish River	12.57	0.70	6%	34%	38%	Low Density Residential	47.4%	Industrial	19%	Yes	Dissolved oxygen, temperature, bioassessment and bacteria	no data	63 (Moderate)	moderate	Yes
Kirkland Slope	Lake Washington	0.33	0.33	100%	41%	31%	Residential	86.1%	Space	13%	no data	NA	no data	No Data	Low	Yes
Lower Sammamish River Valley	Sammamish River	12.57	0.05	0.4%	48%	43%	Low Density Residential	73.5%	Medium Density Residential	27%	Yes	Dissolved oxygen, temperature, bioassessment and bacteria	no data	63 (Moderate)	moderate	Yes
Moss Bay	Everest Creek and Unnamed Creek/ Lake Washington	2.32	2.32	100%	48%	30%	Low Density Residential	59.2%	Medium Density Residential	9%	no data	NA	no data	84 (Good)	moderate	Yes
South Juanita Slope	Unnamed creeks/ Lake Washington	0.45	0.45	100%	45%	33%	Low Density Residential	65.9%	Commercial	12%	no data	NA	no data	82 (Good)	moderate	Yes
To Redmond	Unnamed creeks/ Sammamish River	12.62	0.47	4%	40%	28%	Low Density Residential	85.6%	Commercial	6%	Yes	Dissolved oxygen, temperature, pH, bioassessment and bacteria	no data	71 (Moderate)	moderate	Yes
Yarrow Creek	Yarrow Creek and Cochran Springs Creek/ Lake Washington	8.25	0.90	11%	28%	50%	Low Density Residential	55.1%	Park/Open Space	31%	Yes	Dissolved oxygen, bacteria	Poor	85 (Good)	moderate	Yes

\*Kirkland has selected to include all basins in the prioritization process



# Watershed Assessment



- |                              |                  |                     |
|------------------------------|------------------|---------------------|
| Open                         | Denny Creek      | Kingsgate Slope     |
| Pipe                         | Forbes Creek     | Kirkland Slope      |
| Lower Sammamish River Valley | Holmes Point     | Moss Bay            |
| Carillon Creek               | Houghton Slope A | South Juanita Slope |
| Champagne Creek              | Houghton Slope B | To Redmond          |
|                              | Juanita Creek    | Yarrow Creek        |

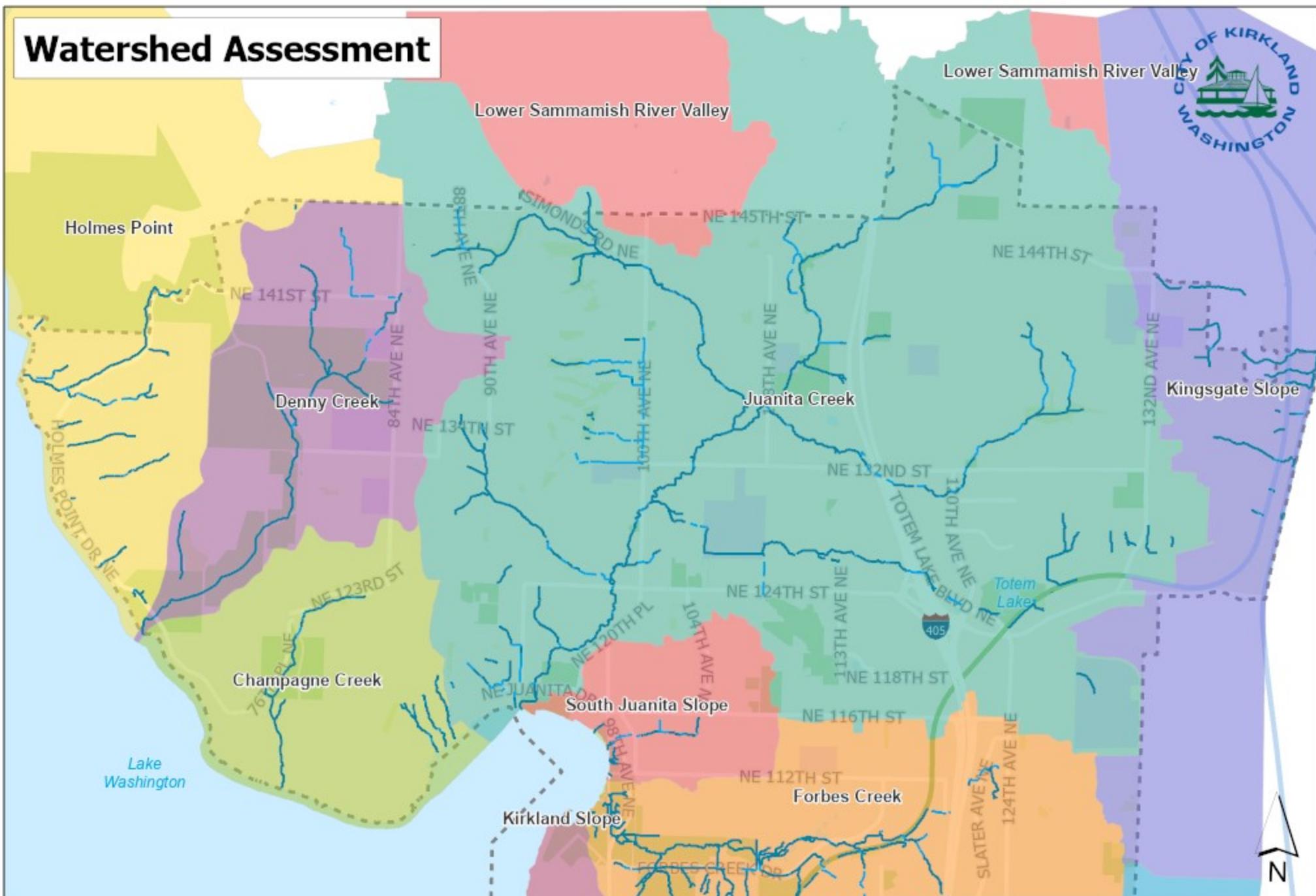
0 0.28 0.55 1.1 mi

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Printed: 3/21/2022

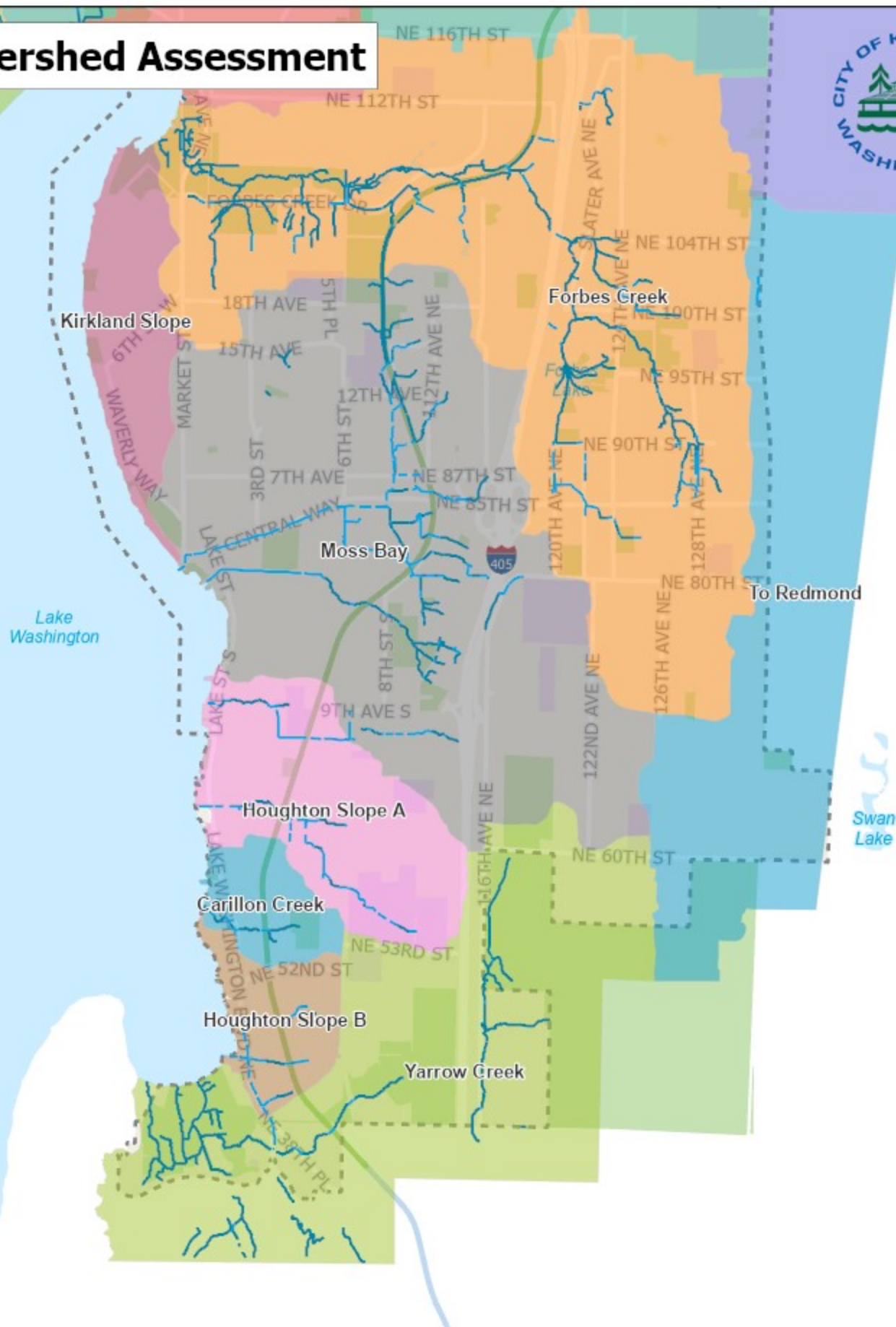


# Watershed Assessment





# Watershed Assessment



- |                |                  |                 |                     |
|----------------|------------------|-----------------|---------------------|
| — Open         | Champagne Creek  | Juanita Creek   | South Juanita Slope |
| - - - Pipe     | Forbes Creek     | Kingsgate Slope | To Redmond          |
| Carillon Creek | Houghton Slope A | Kirkland Slope  | Yarrow Creek        |
|                | Houghton Slope B | Moss Bay        |                     |

0 0.13 0.25 0.5 mi

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Printed: 3/21/2022



# Attachment B

Retrofit Project Summary Sheets



## PROJECT SUMMARY SHEET

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<b>Project Title:</b>	<b>Totem Square Regional Detention and Water Quality Treatment</b>
<b>Project Description:</b>	<p>Construct regional stormwater facility that would provide flow control and water quality treatment. Stormwater would be captured from two locations along the west side of 124<sup>th</sup> Ave, and one location from the private property to the south (same as existing drainage).</p> <p><u>Vault:</u></p> <ul style="list-style-type: none"><li>• 24,000 square feet top area</li><li>• 16.5 feet deep total storage</li><li>• 12.5 feet deep live storage</li><li>• 4 feet deep dead storage for water quality</li></ul> <p><u>Bioretention (Optional) for Enhanced Water Quality:</u></p> <ul style="list-style-type: none"><li>• 9,400 square feet top area</li><li>• 9 in. deep (3 in. ponding + 6 in. freeboard)</li><li>• 3H:1V side slopes</li><li>• Lined, no infiltration</li><li>• Flow control compliance assumes outflow directed to vault</li></ul>
<b>Major Site Impacts and Challenges:</b>	<ul style="list-style-type: none"><li>• Restriction of other utility locations within right of way.</li><li>• East half of parcel has soils with “high dispersed” infiltration capacity. Further study and/or a modified site layout would be required to take advantage of these soils.</li><li>• Utility covers/grates within bike path.</li><li>• Bioretention siting is challenging due to the ability to convey pollution-generating impervious surface to the bioretention cell. Also, steep slopes between parcel and CKC (to west) will likely restrict the cell’s ability to infiltrate and instead require the cell to be lined.</li></ul>
<b>Stormwater Compliance:</b>	Meets flow duration control standard and basic water quality standard for 20.3 acres. Option to meet enhanced water quality for 3.5 acres. Does not meet LID standard.
<b>Other Project Benefits:</b>	Would significantly reduce stormwater flooding in the vicinity of 124 <sup>th</sup> and 124 <sup>th</sup> , which is a major intersection.
<b>Estimated Project Costs:</b>	\$6,400,000 for Vault and Basic Water Quality (\$140,000 additional for Enhanced Water Quality)
<b>Associated Projects/Analysis:</b>	Potential geotechnical review of site soil infiltration and adjacent slope stability.

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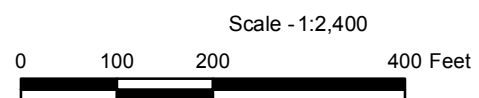


### Legend

	Parcel	<b>Proposed Retrofit</b>		Bioretention
	Potential Retrofit Parcel		Vault	
<b>Existing Stormwater System</b>			Pipe	
	Conduit	<b>Proposed Development</b>		
	Ditch		Building	
	Vault		Roadway	

### TOTEM LAKE STORMWATER RETROFIT

## Totem Square









Totem Lake Basin

## Site 22 Treated Area

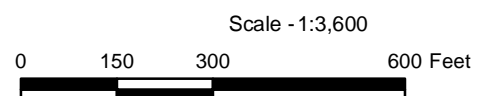


### Legend

-  Totem Lake Basin
-  Potential Retrofit Parcel
-  Tributary Area
-  Parcel

### TOTEM LAKE STORMWATER RETROFIT

#### Drainage Basin Map and Potential Retrofit Parcels



Northwest Hydraulic Consultants

project no. 200151

08-Jan-2015

SITE 22



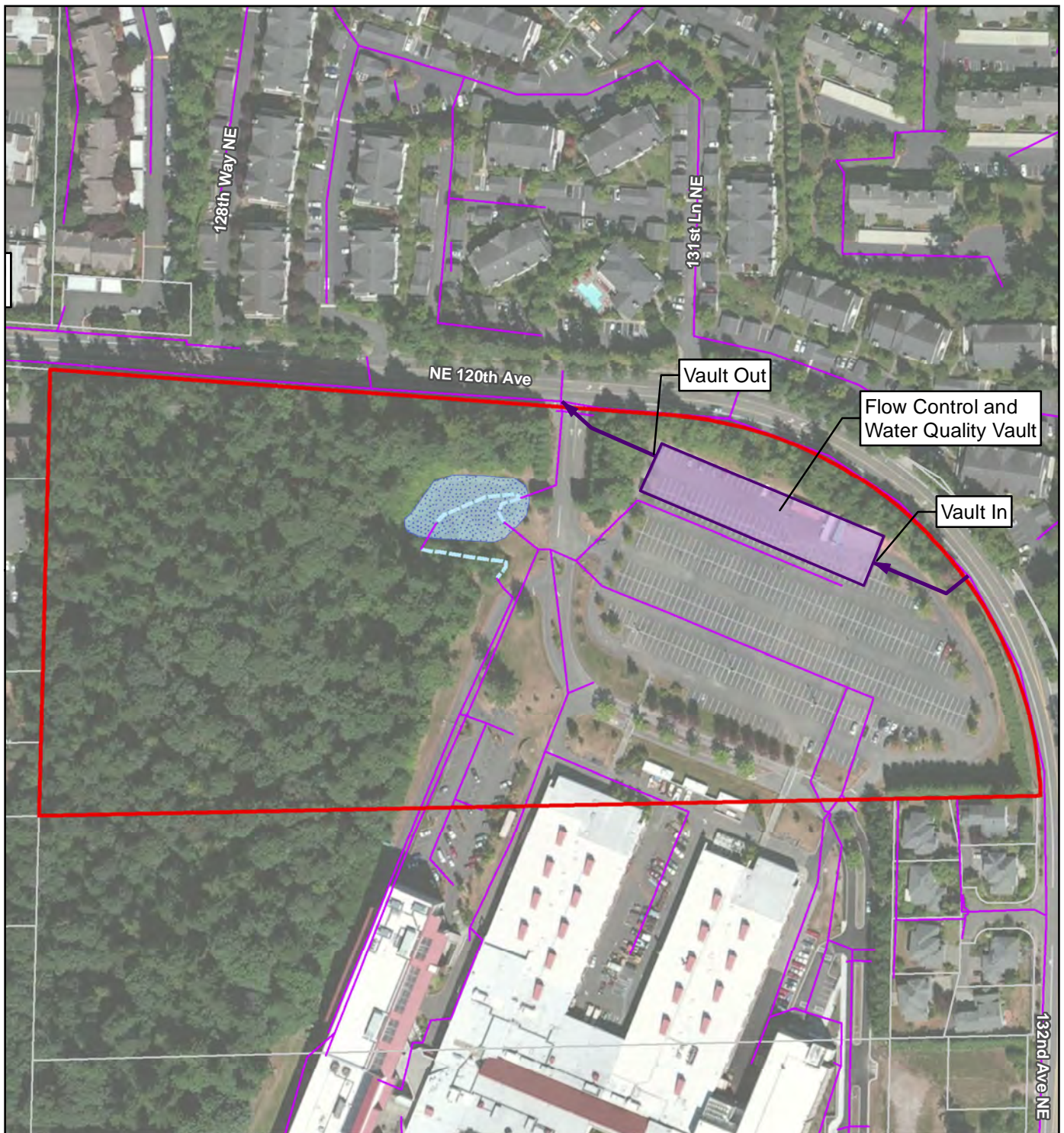
## PROJECT SUMMARY SHEET

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<b>Project Title:</b>	<b>LWIT Water Quality and Detention Vault</b>
<b>Project Description:</b>	<p>Construct stormwater facility that would provide flow control and water quality treatment. Stormwater would be captured from 23.4 acres of the LWIT campus.</p> <p><u>Vault:</u></p> <ul style="list-style-type: none"><li>• 25,000 square feet top area</li><li>• 4 feet deep dead storage</li><li>• 6 feet deep live storage</li></ul>
<b>Major Site Impacts and Challenges:</b>	<ul style="list-style-type: none"><li>• Preserves parking on top of vault.</li></ul>
<b>Stormwater Compliance:</b>	Meets basic water quality standard, provides significant flow control but does not meet flow control standard for 23.4-acre contributing area.
<b>Other Project Benefits:</b>	None.
<b>Estimated Project Costs:</b>	\$5,300,000
<b>Associated Projects/Analysis:</b>	Coordination with LWIT required.

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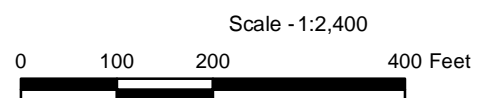


### Legend

- |   |   |
|---|---|
|  Parcel                    | <b>Proposed Retrofit</b>  |
|  Potential Retrofit Parcel |  Vault |
| <b>Existing Stormwater System</b>   |  Pipe  |
|  Ditch                     |   |
|  Conduit                   |   |
|  Pond                      |   |

### TOTEM LAKE STORMWATER RETROFIT

Site 26A LWIT

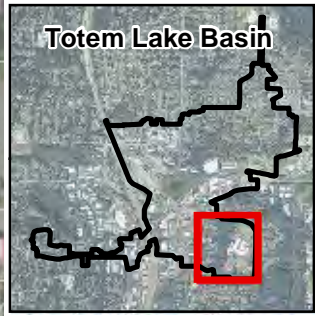


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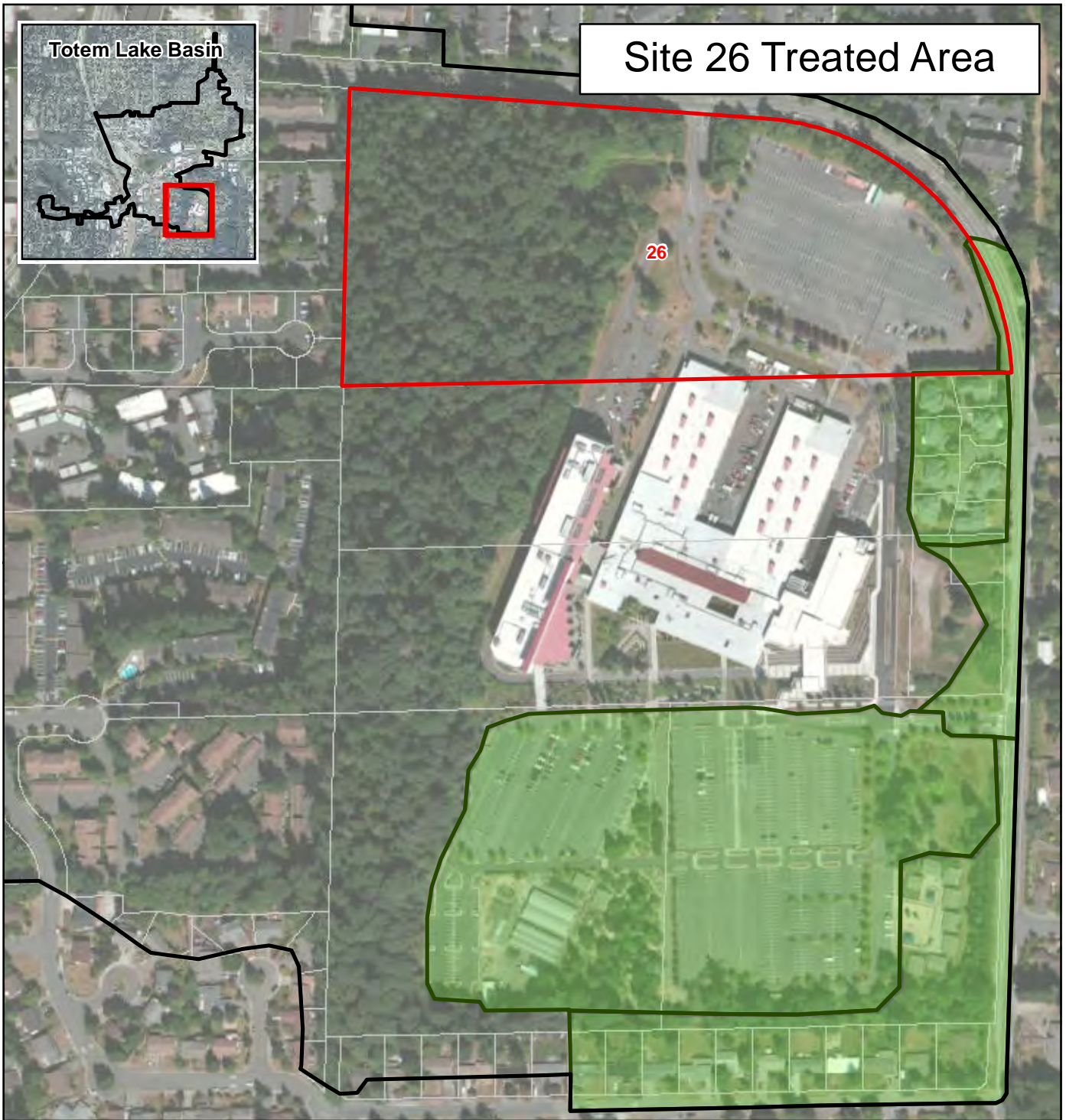
project no. 200151

08-July-2015









## Site 26 Treated Area

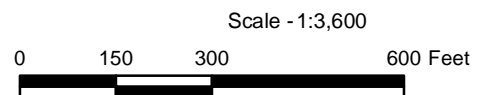


### Legend

-  Totem Lake Basin
-  Potential Retrofit Parcel
-  Tributary Area
-  Parcel

### TOTEM LAKE STORMWATER RETROFIT

## Drainage Basin Map and Potential Retrofit Parcels



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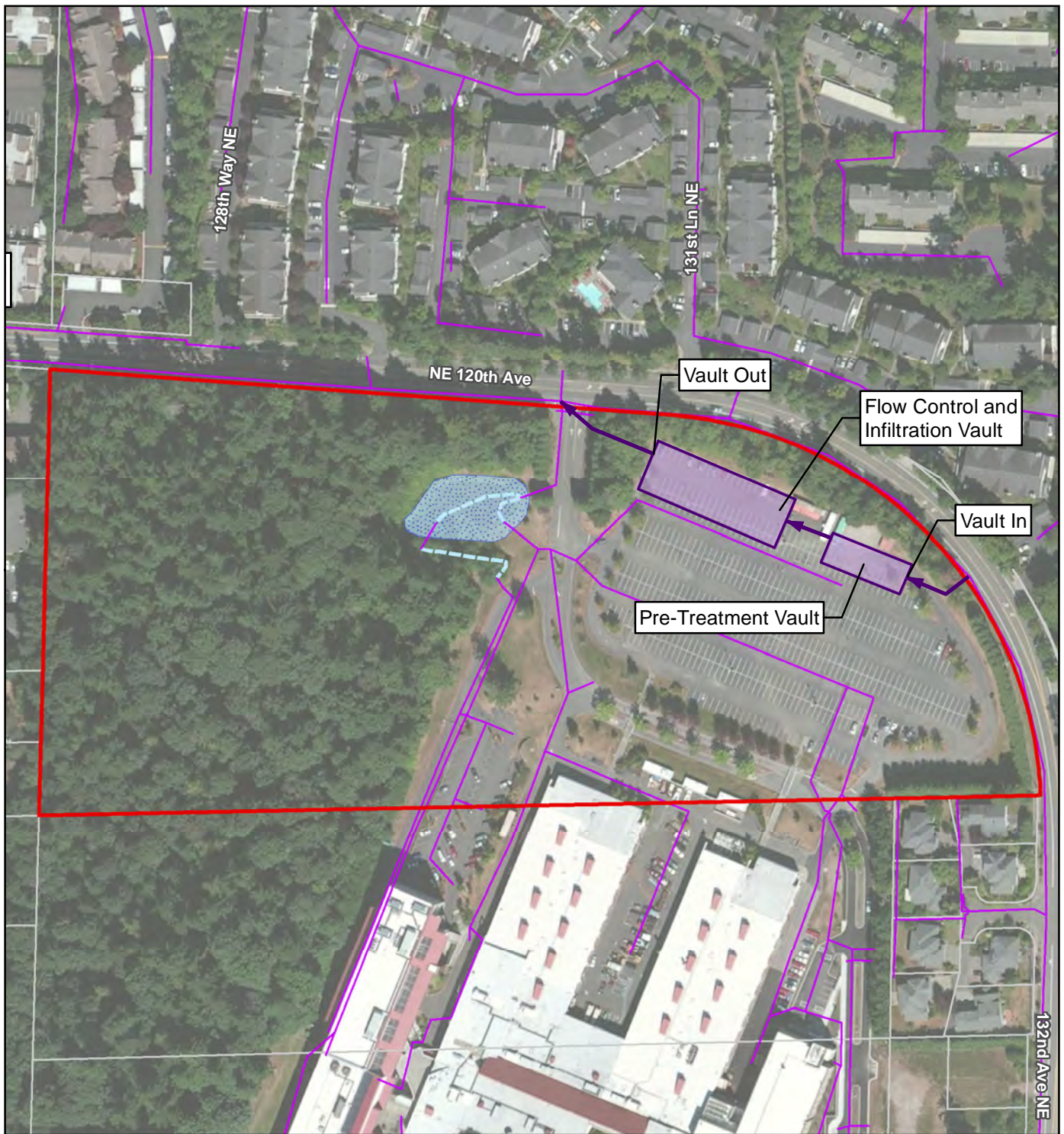
## PROJECT SUMMARY SHEET

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<b>Project Title:</b>	<b>LWIT Infiltration Vault</b>
<b>Project Description:</b>	<p>Construct stormwater facility that would provide infiltration, flow control and water quality treatment. Stormwater would be captured from 23.4 acres of the LWIT campus.</p> <p><u>Pre-Treatment Vault:</u></p> <ul style="list-style-type: none"><li>• 5,000 square feet top area</li><li>• 6 feet deep</li></ul> <p><u>Infiltration Vault:</u></p> <ul style="list-style-type: none"><li>• 15,000 square feet top area</li><li>• 10.5 feet deep live storage</li><li>• Assumed 2" per hour infiltration rate</li></ul>
<b>Major Site Impacts and Challenges:</b>	<ul style="list-style-type: none"><li>• Preserves parking on top of vault.</li></ul>
<b>Stormwater Compliance:</b>	Meets flow duration control standard and water quality standard for 23.4 acres. Meets LID standard.
<b>Other Project Benefits:</b>	Infiltration would reduce downstream flow volumes to Totem Lake.
<b>Estimated Project Costs:</b>	\$2,500,000
<b>Associated Projects/Analysis:</b>	Coordination with LWIT required.

---





### Legend



Parcel



Potential Retrofit Parcel

### Existing Stormwater System

--- Ditch

— Conduit

▒ Pond

### Proposed Retrofit

▒ Vault

→ Pipe

### TOTEM LAKE STORMWATER RETROFIT

### Site 26B LWIT

Scale - 1:2,400

0 100 200 400 Feet

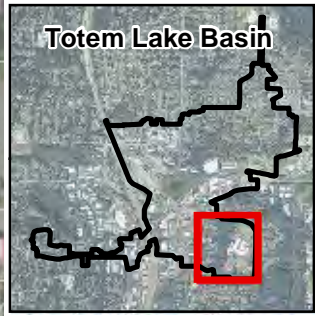


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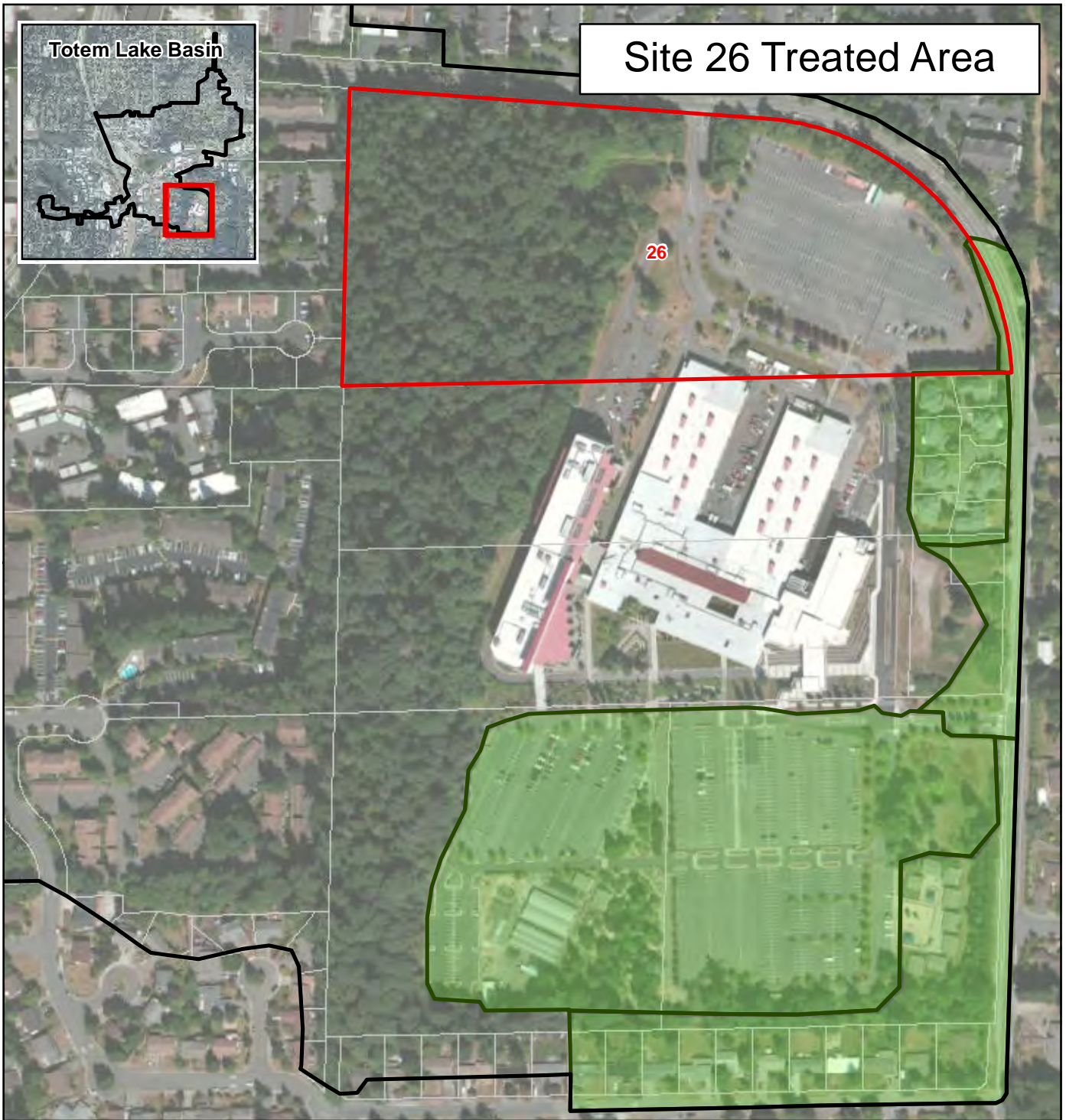
project no. 200151

08-July-2015









## Site 26 Treated Area

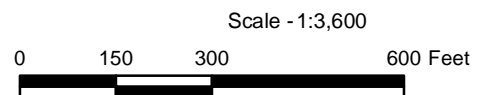


### Legend

-  Totem Lake Basin
-  Potential Retrofit Parcel
-  Tributary Area
-  Parcel

### TOTEM LAKE STORMWATER RETROFIT

#### Drainage Basin Map and Potential Retrofit Parcels



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project no. 200151

08-Jan-2015