Appendix J

Stormwater Retrofit Memorandum

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Date:	June 4, 2014
To:	Erin Nelson, PE, LG Brown & Caldwell
From:	Laura Ruppert, PE and Marie Phelan, EIT Osborn Consulting, Inc.
Subject:	Kirkland Surface Water Master Plan Retrofit Strategy Memorandum

This memorandum documents the stormwater retrofit strategy for stormwater management and water quality treatment for the City of Kirkland.

EXISTING CONDITIONS

Osborn Consulting, Inc. (OCI) utilized the Geographic Information System (GIS) to conduct a review of existing conditions within the City of Kirkland related to stormwater management. The City provided OCI with GIS map layers including parcels, sensitive areas, land use, impervious surfaces, drainage basin boundaries, and stormwater pipes, channels, and existing treatment facilities. The majority of stormwater facilities have no recorded installation year; however, most of those with a recorded year were installed since 1990. Nearly half the land is impervious, with the majority of land zoned for residential use.

RETROFIT STRATEGY

The purpose of the stormwater retrofit strategy is to provide the City with a framework for identifying opportunities to improve and expand upon existing stormwater treatment. To facilitate this, parcels were placed into one of five categories, where “old” is defined as pre-1990 and “newer” is 1990 and after:

- Areas that are **built-out** and **untreated**.
- Areas that are **built-out** and have **old facilities**.
- Areas that have **development potential** and are **untreated**.
- Areas that have **development potential** and **old facilities**.
- Areas that are **built-out** and have **newer facilities**.

Table 1 identifies the different stormwater retrofit strategies associated with a variety of existing condition scenarios.

Table 1: Stormwater Retrofit Strategies		
Existing Condition	**(Re-)Development Potential** Existing % Impervious is < Zoning Requirements	**Built-Out*** Existing % Impervious is ≥ Zoning Requirements
Untreated	Install New Facilities • Regional facilities • Partnering opportunity • Rely on developers to provide treatment • Focus on treatment of right-of-way (ROW)	Install New Facilities • Focus on treatment of ROW • Incentivize private property owners to install treatment?
Old Treatment (Pre-1990)	Retrofit old facilities • Modify facility size and/or control structure Install New Facilities • Regional facilities • Partnering opportunity • Rely on developers to provide treatment • Focus on treatment of ROW	Retrofit old facilities • Modify facility size and/or control structure Install New Facilities • Focus on treatment of ROW • Incentivize private property owners to install treatment?
"Newer"Treatment (1990-current)	No retrofit of recommended - assumes adequate treatment is provided or that other areas should have higher priority	
*Properties may still Re-Develop but will not increase % impervious compared to existing condition.		

METHODOLOGY

Potential area-specific retrofit opportunities were identified through a GIS analysis of existing data using the following steps:

1. Create a development GIS layer that shows parcels that can or cannot be developed in the future, based on current zoning.
2. Modify the existing stormwater facility GIS layer to include general categories of installation year.
3. Combine the development and existing stormwater facility GIS layers to evaluate the existing condition scenarios described in Table 1.

The process is described below.

Development

A “Development” layer was created to display parcels that are built-out or have development potential based on current zoning. The parcel GIS layer was modified with the addition of a “Development” field with the two choices of built-out (Cannot Be Developed) and development potential (Can Be Developed), based on current zoning.

OCI queried impervious surfaces within each zoning category. Impervious surfaces queried include rooflines, driveways/sidewalks, curbs/gutters, and parking lots. The sum of the existing impervious area was divided by the total area within each zoning category to determine the average percent impervious. The average percent impervious was applied to each parcel within that zoning category. The City of Kirkland Zoning Code (chapters 15-50) documents the maximum percent impervious allowable for each zoning category. OCI compared the percent impervious calculated to the maximum allowable by the applicable zoning category to assess if there was potential for increased percent impervious. Parcels which did not meet the maximum allowable percent impervious were categorized as “development potential,” while parcels which met or exceeded the maximum allowable were categorized as “built-out.”

Several parcel specific edits were made to the development potential parcels because of other conditions that would warrant them undevelopable, including the following:

- GIS information provided by the City for sensitive areas was used to identify areas where no future development will be allowed. These areas included wetlands, landslide hazard areas, floodplains, streams, and other environmentally sensitive areas. Any parcel within a 75 foot buffer (which is the Wetland Type 2 buffer per City of Kirkland Zoning Code, 90.45) of these sensitive areas was removed from the query for development potential parcels and labeled “built-out”.
- The City provided parcels which could not be developed additionally in a shapefile labeled “parcels at capacity;” These parcels were labeled “built-out.”
- Parcels in some zoning categories were also removed, including parks, greenbelts, and institutions. OCI assumed these dedicated land uses would remain relatively unchanged in the future. These parcels were labeled “built-out.”

The parcels remaining in the development potential query were labeled “Can Be Developed”. All parcels which met or exceeded the maximum percent impervious, or which are located in sensitive areas, parks, etc. were labeled “Cannot Be Developed”. See **Figure 1** for a map of the development layer.

Risers at Facilities

The City of Kirkland provided a GIS shapefile with stormwater structures such as risers, inlets, and outfalls. OCI queried the risers and created a new layer called “Risers at Facilities.” Risers were queried because it was assumed that facilities used for flow control would have risers. To determine which facilities lie in the “old facilities” class, OCI

grouped the risers by their installation date (provided in the GIS information). Ages were broken into the following:

- <1980
- 1980-1989
- 1990-1997
- 1998-2004
- 2005-Present
- "Null" facilities did not have installation year recorded

These year ranges were chosen based to capture individual decades or to generally correspond with Department of Ecology Manual updates. This analysis considers "old" to be pre-1990 installation. See **Figure 2** for a map of the "Risers at Facilities" layer.

Treatment

A"Treatment" layer was created from the parcel GIS layer overlain with the "Risers at Facilities" layer to query the parcels bordering stormwater facilities. As some facilities were located in the right-of-way, a buffer of 20 feet was added. The parcels selected by this query were labeled "Treated", while the rest were labeled "Untreated".

Focusing on the "treated" parcels, OCI queried all risers older than 1990. These parcels were labeled "Old Facilities". All parcels remaining labeled as "Treated" are lower priority for retrofit at this time, as they are newer facilities and likely meet the 1990 (or newer) King County Surface Water Design Manual standards.. See **Figure 3** for a map of the treatment layer.

Retrofit

A "Retrofit" layer was also copied from the parcel shapefile, and joined with the "Development" and "Treatment" layers. By querying the "Development" and "Treatment" layers, OCI overlapped those parcels that met the conditions of interest with regard to retrofit potential as described below.

- "Cannot Be Developed" and "Untreated" were labeled **Built-Out & Untreated**;
- "Cannot Be Developed" and "Old Facilities" were labeled **Built-Out & Old Facilities**;
- "Can Be Developed" and "Untreated" were labeled **Dev Potential & Untreated**;
- "Can Be Developed" and "Old Facilities" were labeled **Dev Potential & Old Facilities**.

All other parcels were labeled "Treated, with Facilities Newer than 1990" and are not recommended for retrofit. See **Figure 4** for a map of the retrofit layer.

Figure 1: Development Layer

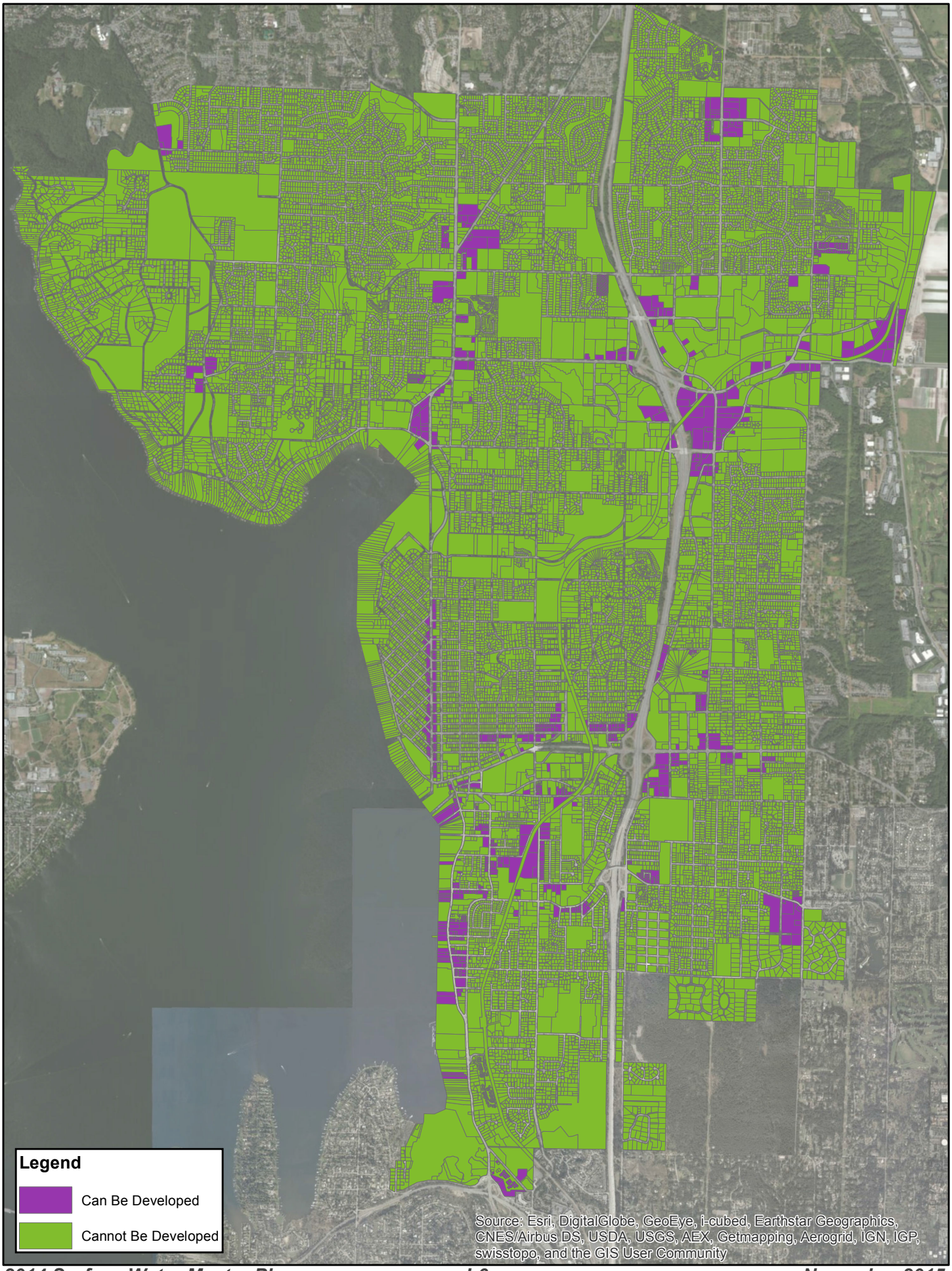


Figure 2: Risers at Facilities Layer

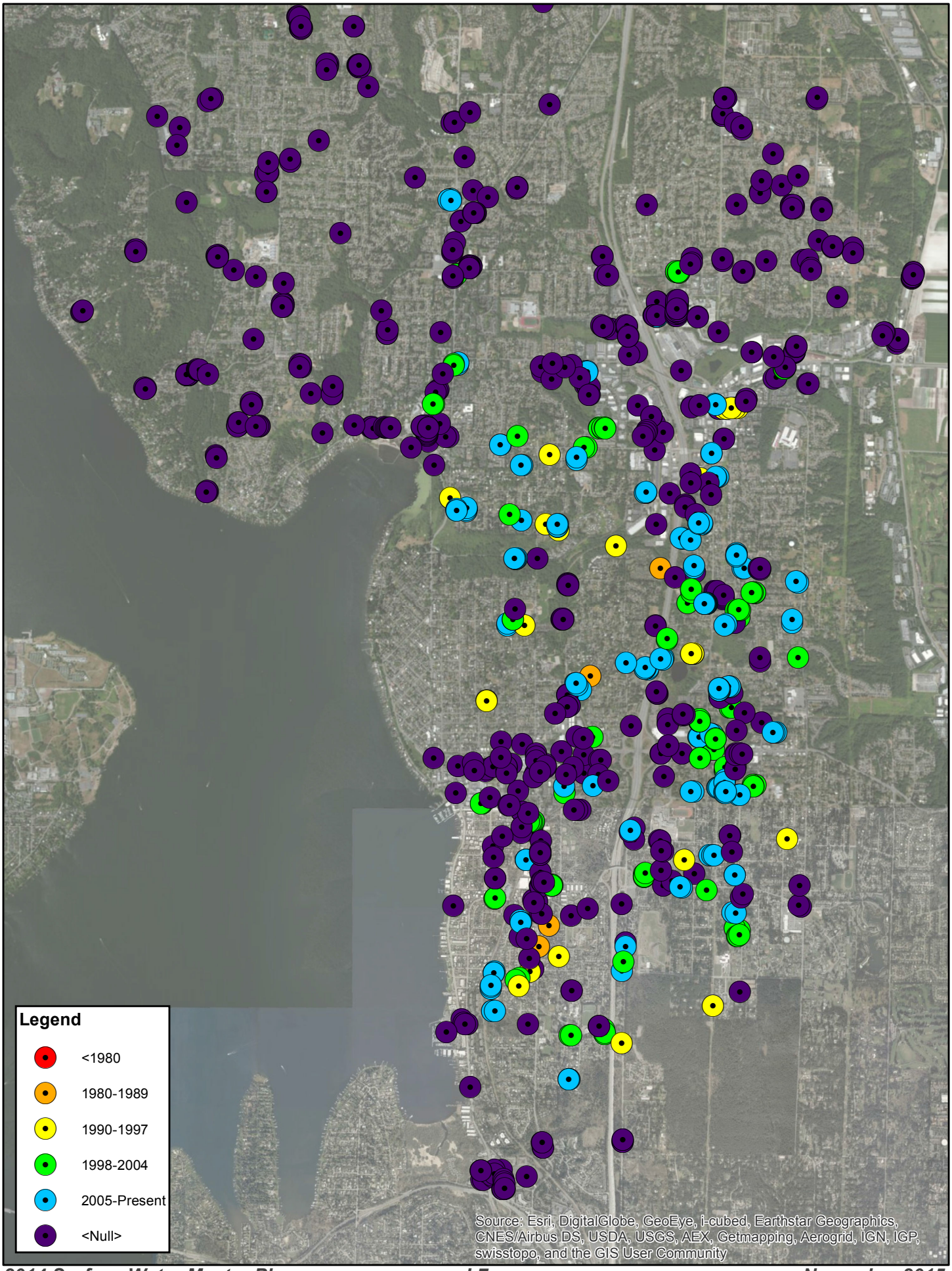


Figure 3: Treatment Layer

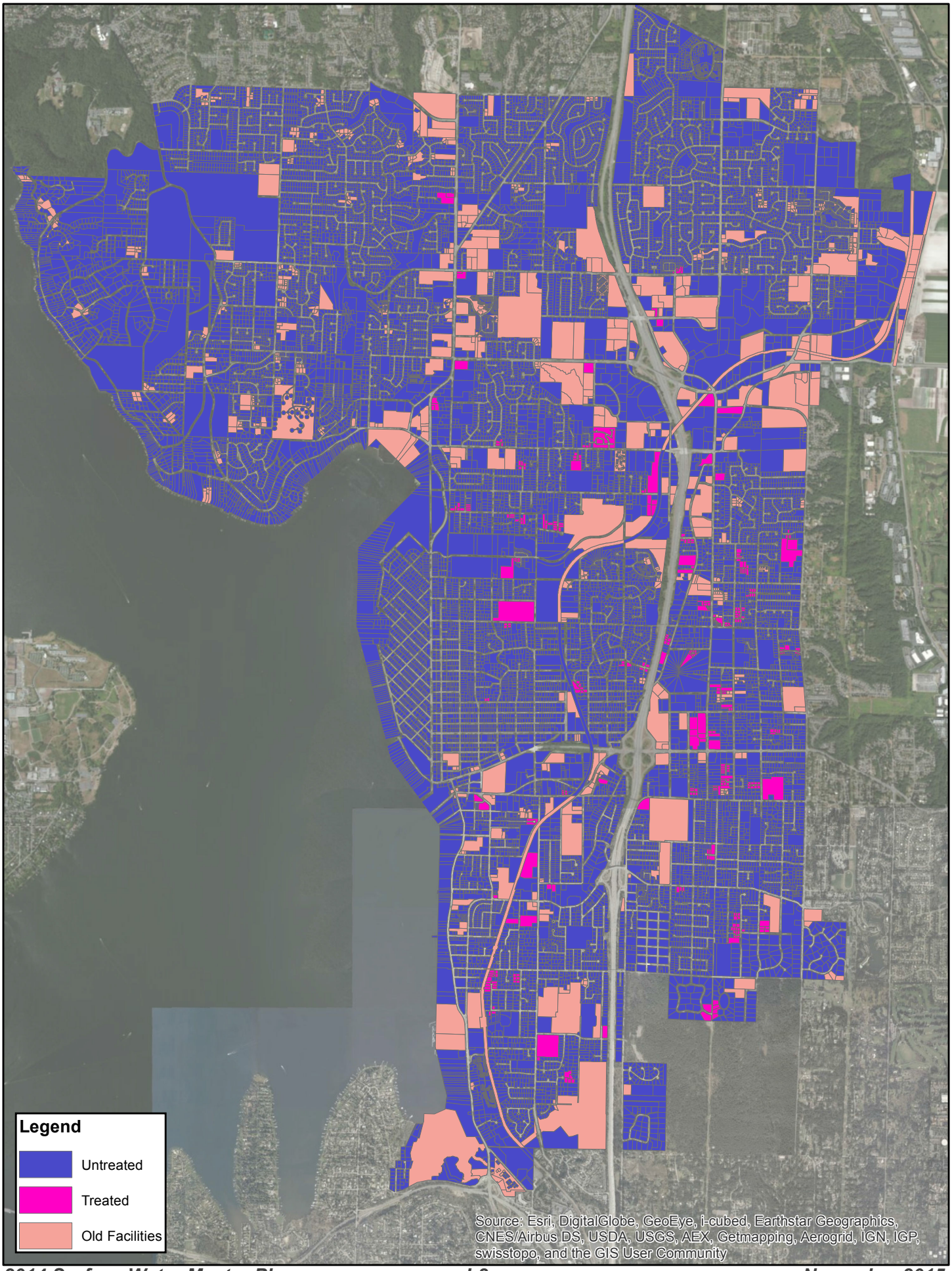
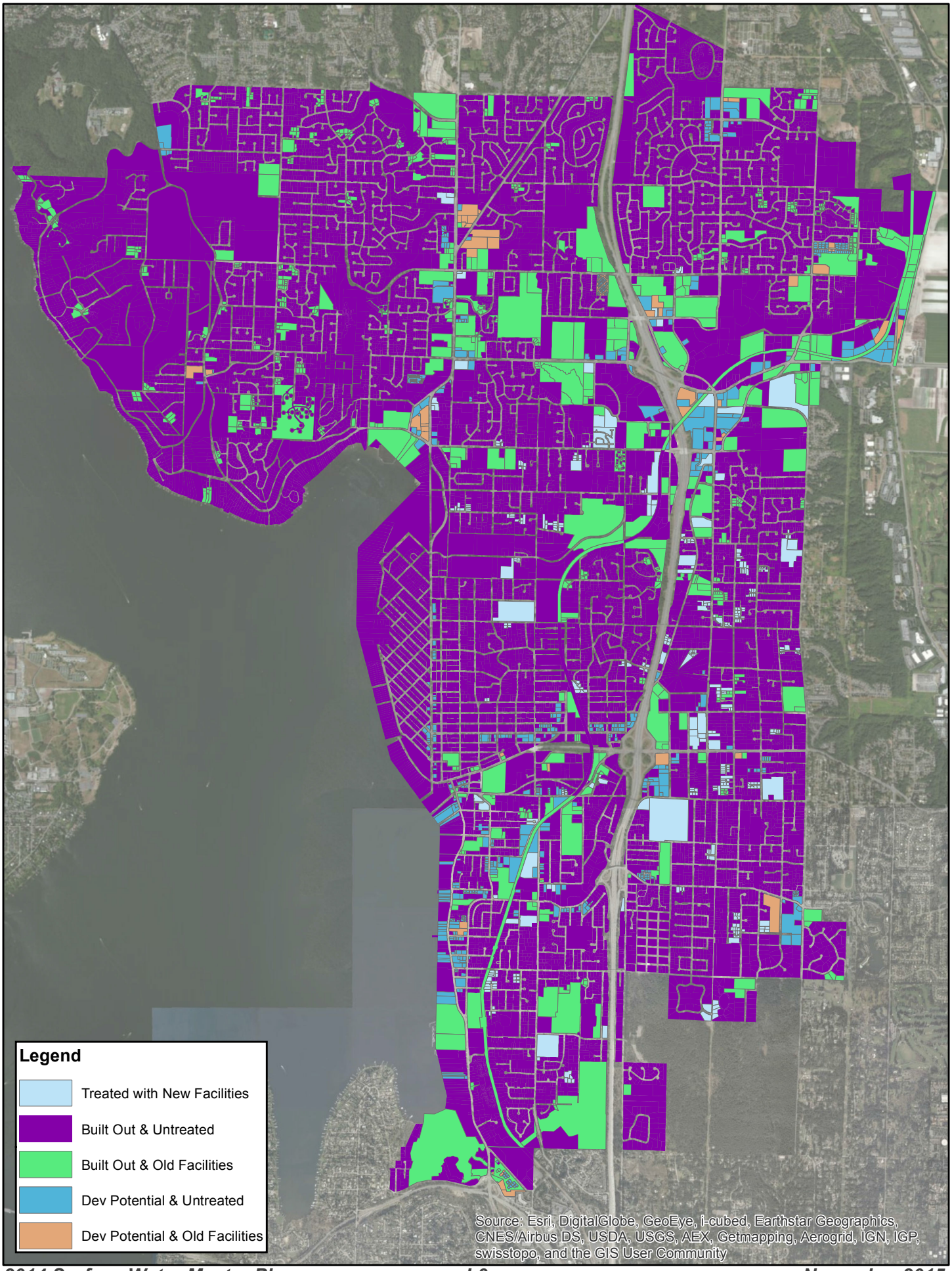


Figure 4: Retrofit Layer



RETROFIT ANALYSIS

Using the layers developed above, OCI reviewed ponds, vaults, and swales within the Built Out & Old Facilities, and Dev. Potential & Old Facilities parcels to identify retrofit possibilities. Facilities within these parcels were analyzed for space and functionality of a retrofit project. Three potential retrofit projects are outlined below.

Champagne Creek Basin Retrofit

There is minimal stormwater infrastructure upstream of Champagne Creek. Runoff reaching the creek at Juanita Dr. NE has not been treated, and high flows are eroding the creek channel. An existing ditch and pipe system carries some of the runoff along NE 123rd St. and NE 122nd Pl. toward Juanita Dr. NE. OCI proposes to install a rain garden in the right-of-way at 80th Ave. NE and NE 122nd Pl. to provide flow control and water quality for Champagne Creek. See **Figure 5** for the proposed retrofit project.

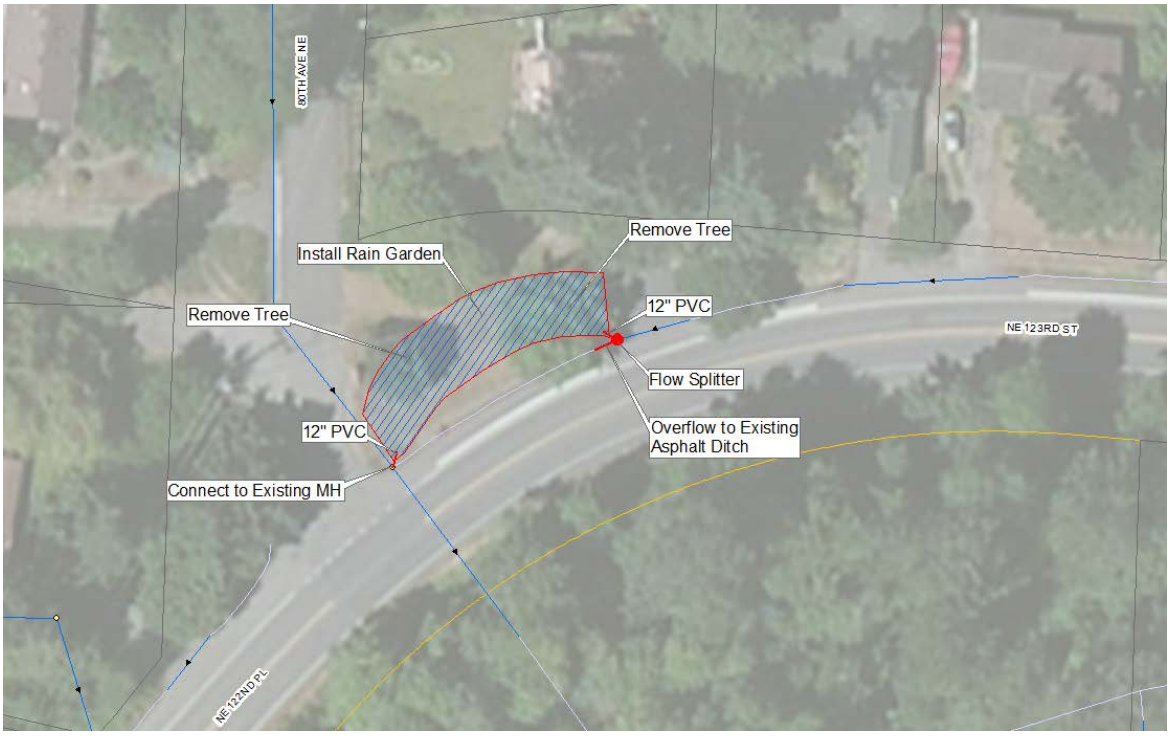


Figure 5: Champagne Creek Rain Garden

Flow Control

An existing stormwater pond was installed in 1988 at the northeast corner of NE 94th Way and 126th Ave NE. The pond is on City owned land and serves the surrounding neighborhood. Feeding the pond is a tributary to Forbes Creek, which meets up with the creek just downstream of Forbes Lake. A few properties downstream of the pond, a homeowner has complained of the stream overflowing and flooding his crawl space (complaints were filed in 2000, 2003, and 2012). There is an opportunity here to increase storage in the pond to reduce flooding downstream, as well as bring the facility up to current stormwater flow control standards and add water quality. See **Figure 6** for the pond location.

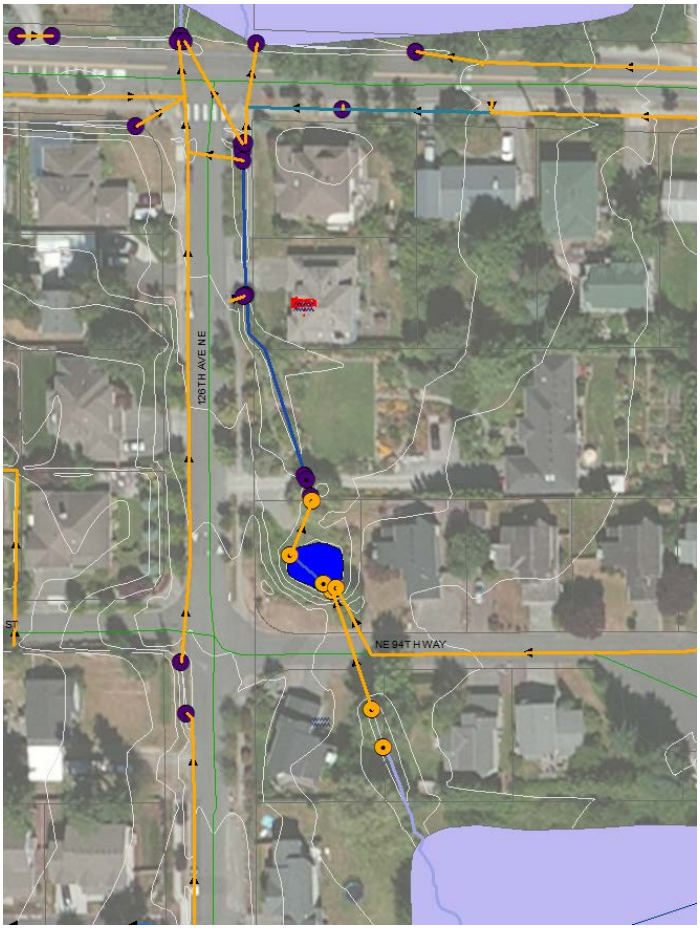


Figure 6: Stormwater Pond with Increased Flow Control Potential

Water Quality

An existing stormwater pond adjacent to 10125 NE 126th St. was installed in 1985. Flow from the pond leads to Juanita Creek, west of 100th Ave NE. The pond sits on property owned by the City, adjacent to the North Kirkland Community Center. There is an opportunity to replace the existing riser with an up to date facility and add water quality features to the pond. See **Figure 7** for the pond location.

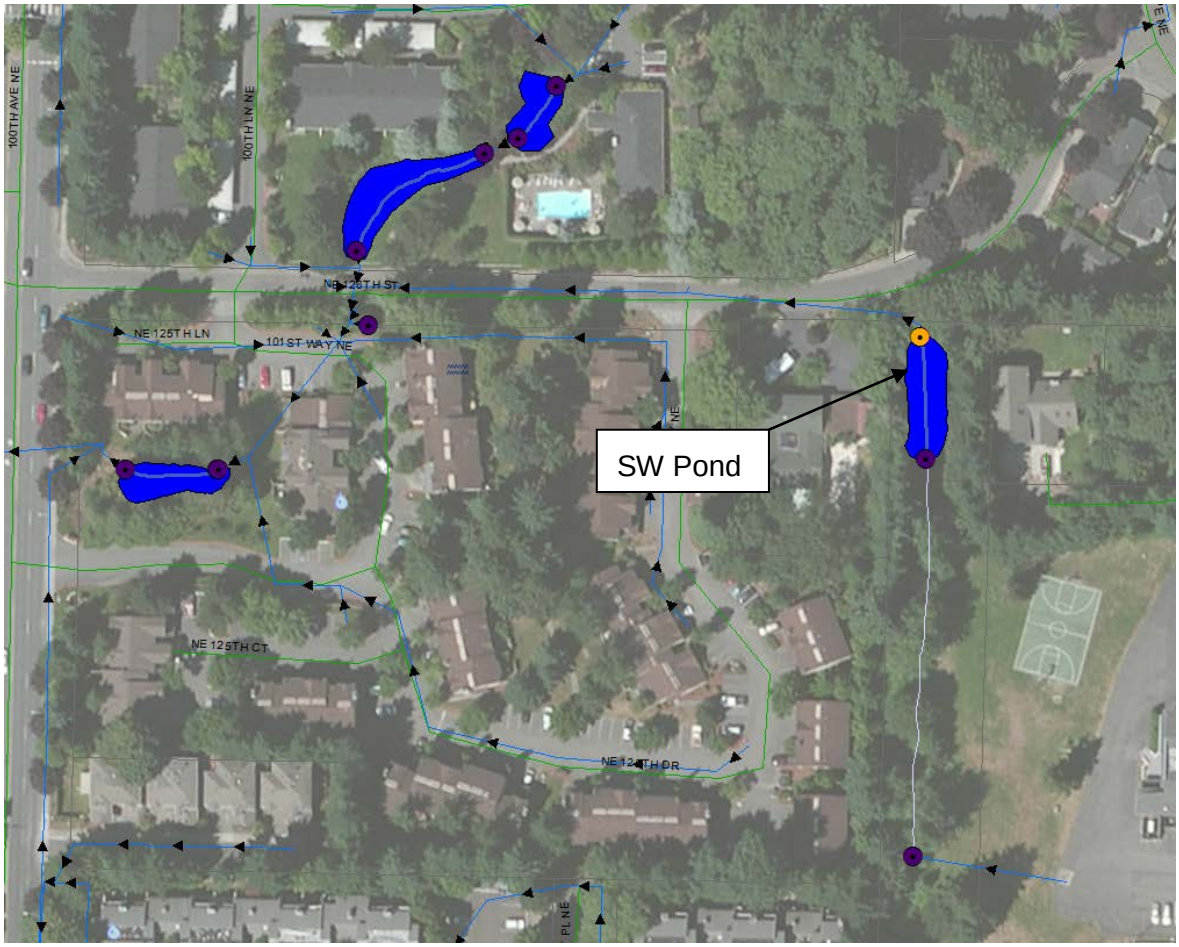


Figure 7: Stormwater Pond with Increased Water Quality Potential