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Technical Memorandum

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DATE: December 14, 2010

SUBJECT: Sub-basin Evaluation for use in the Accelerated Source Tracing Study

1.0 Introduction

Science Applications International Corporation (SAIC) is assisting the Washington State Department of Ecology (Ecology) with the development of a study to evaluate stormwater contaminant concentrations and identify potential sources in two Lower Duwamish Waterway (LDW) sub-basins. NewFields provides project support as a subcontractor to SAIC. The Accelerated Source Tracing Study consists of simultaneously measuring contaminant concentrations associated with stormwater discharges at multiple locations in two sub-basins of the Duwamish/Diagonal storm drain basin. This study will assess the practicality and effectiveness of an "up-the-pipe" approach to source tracing, where stormwater sampling data throughout a drainage sub-basin will be used to prioritize the further investigation of potential contaminant sources. Results of this study will also be used to evaluate stormwater source tracing sampling techniques. To facilitate this process, Ecology has tasked SAIC with the collection of stormwater, storm drain solids, and continuous flow measurements from a total of eight locations along two different LDW storm drain lines.

A wide range of contaminants are present in a 5.5-mile reach of the LDW, including polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), and metals. High concentrations of these contaminants have made this portion of the LDW a Federal Superfund and state Model Toxic Control Act (MTCA) site. Ecology supports the Environmental Protection Agency (EPA) efforts on the LDW Remedial Investigation/Feasibility Study (RI/FS) and is leading source control efforts in coordination with local governments. Ecology and EPA are currently implementing a two-phase RI/FS with the potentially responsible parties (PRPs), collectively known as the Lower Duwamish Waterway Group (LDWG). The LDWG members are: City of Seattle, The Boeing Company, Port of Seattle, and King County.

In order to aid in the identification of contaminant sources to the LDW, Ecology plans to measure contaminant concentrations in stormwater and storm drain solids at multiple locations in two LDW sub-basins.

The objectives of the Accelerated Source Tracing Study include:

- Evaluating the usefulness of the "up-the-pipe" source tracing approach;
- Collecting data necessary to trace and identify potential sources of LDW sediment contamination from two storm drain sub-basins of the LDW drainage basin;
- Correlating in-line sediment trap, filtered suspended solids, and catch basin solids data with stormwater data, to the extent possible; and
- Comparing different sampling methods to determine whether sediment traps or grab samples are useful and inexpensive tools to conduct source tracing at other locations.

The purpose of this Technical Memorandum is to evaluate LDW sub-basins that could potentially be sampled as a part of the Accelerated Source Tracing Study.

2.0 Sub-basin Evaluation

Ideal LDW sub-basins for applying the Accelerated Source Tracing Study methodology would:

- Consist of predominantly industrial land use types,
- Have storm drain lines that are subject to minimal tidal influence,
- Consist of a large enough area to support the stormwater volume needed for the multiple sample types,
- Have drain lines configured in a manner that four sampling locations isolate different potential sources within the drainage,
- Have well-defined GIS shapefiles of the drain line system, and
- Contain manhole vaults large enough to accommodate all sampler types.

Numerous sub-basins were investigated through both field reconnaissance and GIS analysis of the drain line shapefiles. The outfalls of the sub-basins evaluated are shown in Figure 1.

2.1 Recommended Sub-basin and Sampling Locations

The eight locations recommended to be sampled as a part of the Accelerated Source Tracing Study are all found along storm drain lines that flow to the Diagonal Avenue S combined sewer overflow/storm drain (CSO/SD) outfall (Outfall 2155), owned by the City of Seattle. Four sampling locations each are found in the S Snoqualmie Street sub-basin and the S Dakota Street sub-basin. Sampling within a sub-basin will take place at drain line access locations (manholes) staggered along the main drain line. Field reconnaissance conducted during September and October 2010 identified access locations appropriate for sampling. All sampling locations were observed during base flow conditions during different tidal heights. Figures 2 and 3 display the

drain lines and sampling access locations for the S Snoqualmie Street and S Dakota Street sub-basins, respectively.

S Snoqualmie Street Sub-basin

The S Snoqualmie Street sub-basin is almost entirely industrial (Figure 2). The most upstream sampling location (SQ1) incorporates stormwater draining from Airport Way S. Sampling locations SQ2, SQ3, and SQ4 each integrate stormwater drainage from different industrial properties located along 7th Avenue S, 6th Avenue S, and 4th Avenue S, respectively.

S Dakota Street Sub-basin

The S Dakota Street sub-basin is located just north of the S. Snoqualmie Street sub-basin. Sampling of this sub-basin will help differentiate contaminant concentrations associated with residential, I-5, and industrial stormwater. The most upstream sampling location (DK1) incorporates stormwater drainage from a section of the Beacon Hill neighborhood, including the VA Medical Center (Figure 3). Sample location DK2 is located downstream from an I-5 drain line connection. Sample locations DK3 and DK4 integrate drainage from two different industrial areas located along S Dakota Street and 6th Avenue S, respectively.

2.2 LDW Sub-basins Not Selected for Current Study

Before the decision was made to proceed with sampling of the S Snoqualmie Street and S Dakota Street sub-basins, several other LDW sub-basins were evaluated during field reconnaissance and were not selected for sampling. Below is a list of sub-basins evaluated and the reasoning for their elimination:

Highland Way SW SD (Outfall 2125)

Four accessible sampling locations within this sub-basin were identified. Most of this sub-basin consists of residential land use. The drain line on T-115 property is located below LDW mean lower low water (MLLW), which would prevent the collection of unaffected stormwater samples. Moving sampling locations inland to where the drain line is not flooded most of the time would result in samples of predominantly residential drainage, and would miss industrial sources.

I-5 Storm Drain (Outfall 2046)

The drain line is tidally influenced far upstream, from Slip 4 to I-5. The sub-basin upstream of Ellis Avenue is very steep, where catch basin samples have contained mostly gravel. Many of the drain line access locations downstream of I-5 are located in the middle of busy roadways. A potential sampling location is at the northern end of King County International Airport.

SW Idaho Street SD / Puget Ridge (Outfall 2147)

Although this sub-basin is of significant size (412 acres), the majority of the drainage basin is residential with only a small amount of industrial drainage along West Marginal Way.

S Myrtle Street SD (Outfall 2026)

This drainage sub-basin is too small to accommodate four sampling locations. The manhole access location nearest the outfall would make a good candidate for stormwater lateral loading sampling.

S Garden Street SD (Outfall 2035)

This drainage sub-basin is too small to accommodate four sampling locations. Stormwater from the likely source property along this drain line enters the drain line system downstream of the single accessible access site.

Terminal 115 CSO / SW Kenney Street SD (Outfall 2127)

A likely contaminant source area is located downstream of a CSO service area. The remaining drainage sub-basin is small with few potential industrial sources.

2nd Avenue S SD (Outfall 2118)

This is a small drainage sub-basin with drain lines that are poorly defined in GIS shapefiles.

7th Avenue S SD (Outfall 2112)

This drain line remains at MLLW throughout the majority of the sub-basin. Tidal infiltration would greatly restrict the length of sampling intervals.

S 96th Street SD (Outfall 2100)

This drainage sub-basin is within unincorporated King County. GIS shapefiles of drain lines within this sub-basin are either poorly defined or unavailable.

3.0 Summary

After GIS and field investigation, two sub-basins within the LDW Diagonal Avenue S drainage were deemed the best candidates for sampling as a part of the Accelerated Source Tracing Study. These sub-basins drain along S Snoqualmie Street and S Dakota Street. The identified sampling locations within these sub-basins provide access to the stormwater drain lines for the collections of whole water, filtered suspended solids, sediment trap, and catch basin grab samples.

Figures

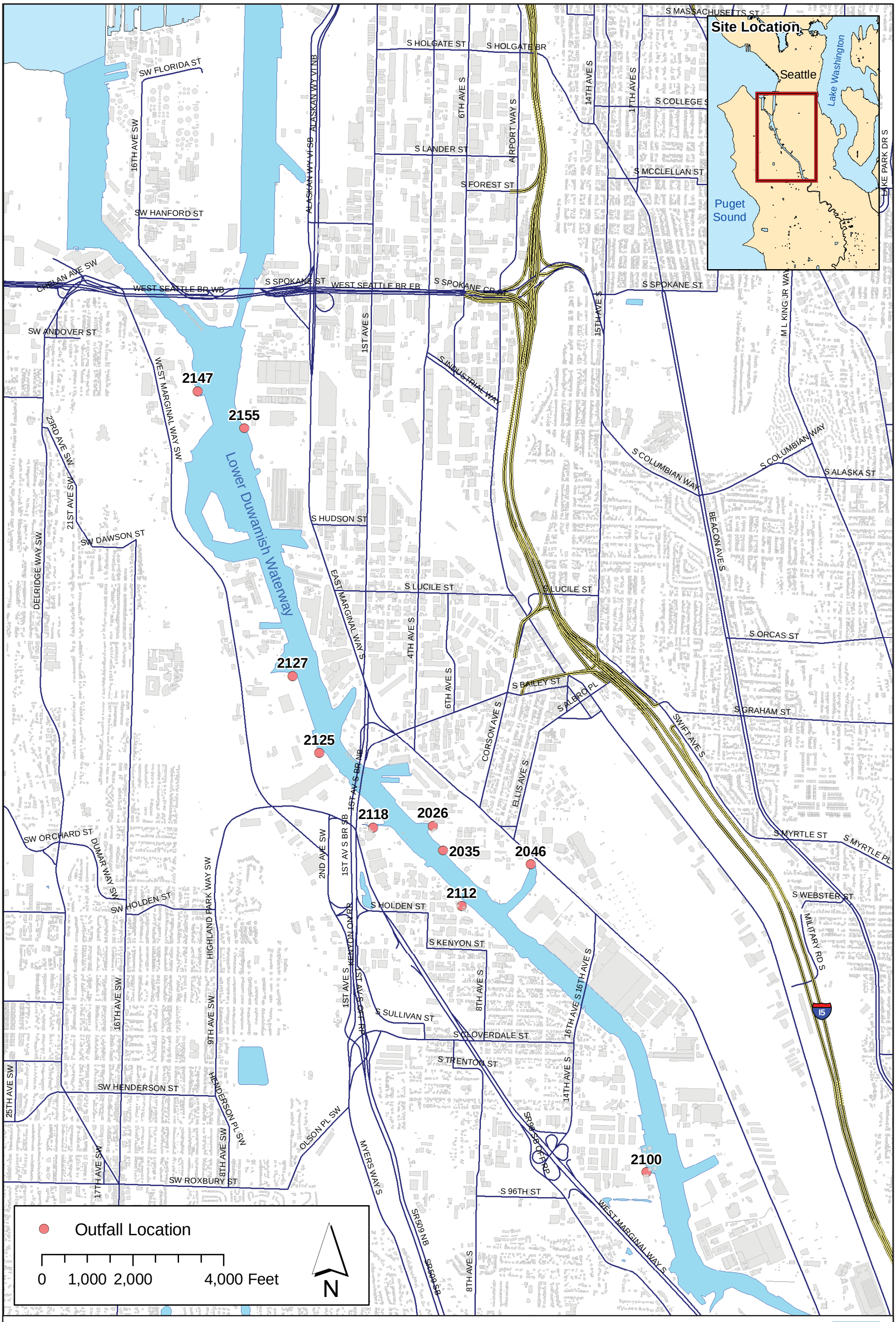

Figure 1. Lower Duwamish Waterway and Surveyed Outfalls

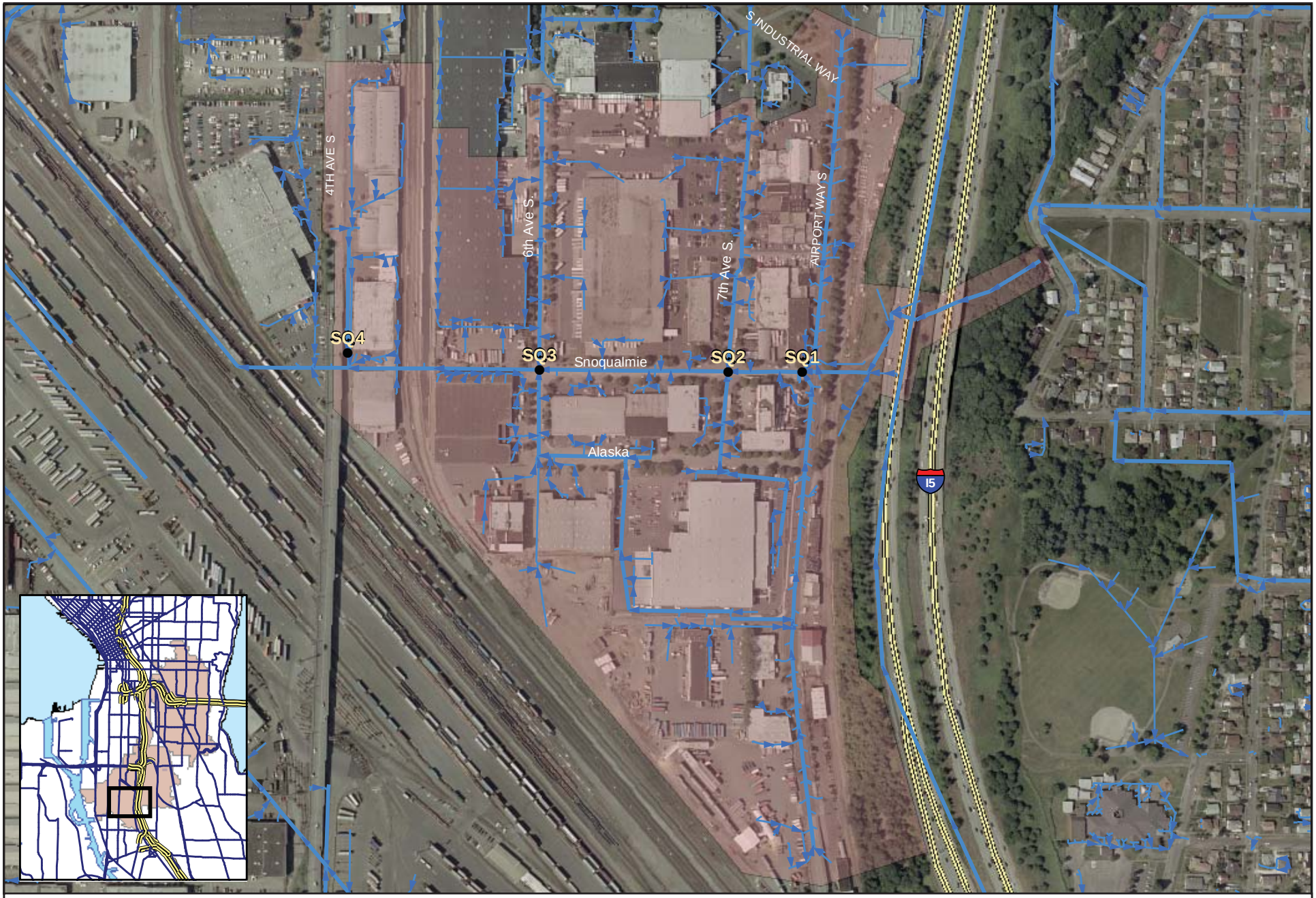

Figure 2. S Snoqualmie Street Drainage Area and Sampling Locations

0 200 400 800 Feet

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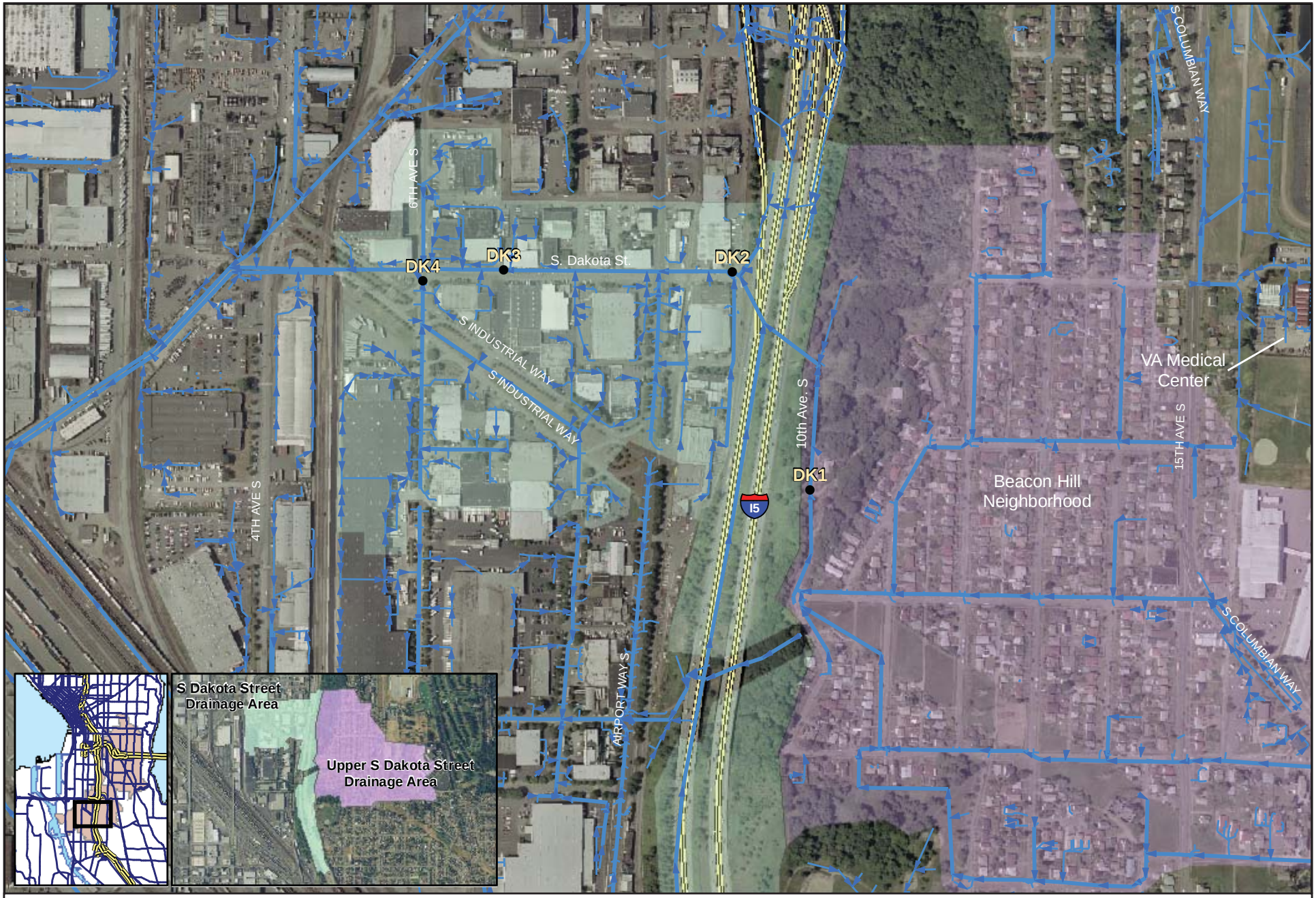

Figure 3. S Dakota Street Drainage Area and Sampling Locations

0 200 400 800 Feet

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