
**CSO Sampling and Monitoring Data Inventory
Task 5 Report
Sediment Management Plan**

Prepared by the
**Sediment Management Plan Project Team
King County Department of Natural Resources**



Final Draft 08/04/98

1 Introduction

This report presents an inventory of sampling and monitoring data collected in the vicinity of seven King County combined sewer overflow (CSO) outfall locations. Each of the CSO outfall locations noted below is included on the Washington State Department of Ecology (Ecology) contaminated sediment site list (Ecology, 1996).

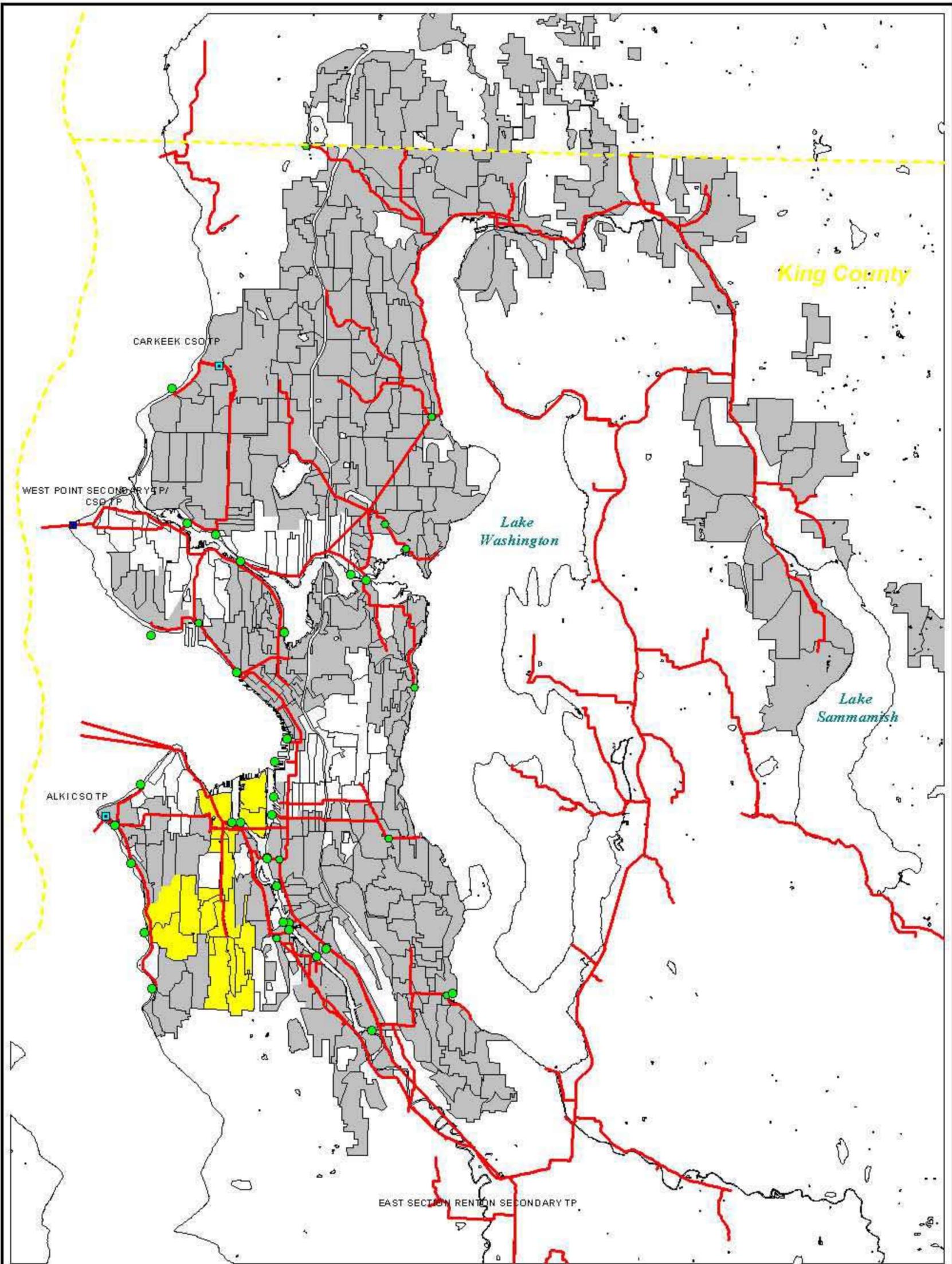
- Brandon Street
- Chelan Avenue
- Denny Way
- Duwamish Pump Station/Diagonal Avenue
- Hanford Street
- King Street
- Lander Street

A map of King County CSO locations is presented in Figure 1-1, on the following page.

Included in the inventory are chemical, bacteriological, toxicological, and biological data for sediment, CSO effluent, and receiving water. Also included are special studies such as hydrodynamic data collection or habitat assessment. Table 1-1 summarizes the sediment chemical constituents regulated under Ecology's Sediment Management Standards (Chapter 173-304 WAC).

The inventories of data from King County's database encompass the ten-year period from 1988 to 1998 and are provided in tabular format in Tables 2-1 through 8-1. Sampling locations are shown in Figures 2-1 through 8-1. Data from studies performed by other agencies or the private sector are included by reference only. When available, sampling locations for non-King County studies have been included in Figures 2-1 through 8-1. Chemistry and most bacteriological data are maintained on King County's Laboratory Information Management System (LIMS) database. Other King County data are maintained in hard copy reports and Excel® spreadsheets.

Sections 2 through 8 of this report each include a brief description of the CSO, a narrative of sampling and/or monitoring performed by King County, references to studies performed by other agencies or the private sector, a spreadsheet table of King County data, and a map showing both King County and other sampling locations. CSO information and structural diagrams are included as Appendix A to this report.



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Figure 1-1

Map produced by GIS staff, Wastewater Treatment Division (WTD), King County Department of Natural Resources. WTD disclaims any warranty for use of this digital product beyond that for which it was designed. Neither this digital product nor any portion thereof may be reproduced in any form or by any means without the expressed written authorization of WTD. This document includes data copyrighted by the KrollMap Company and is being used with their permission. Use is restricted.



King County
Department of Natural Resources

0.8 0 0.8 1.6 2.4 Miles



April 8, 1999

Legend

- CSO Treatment Plant
- King County CSOs
- County Boundaries
- King County Conveyance Lines

Table 1-1
Regulated Sediment Chemical Constituents
Sediment Management Standards
Chapter 173-204 WAC

Metals

Arsenic
 Cadmium
 Chromium
 Copper
 Lead
 Mercury
 Silver
 Zinc

LPAHs

Acenaphthene
 Acenaphthylene
 Anthracene
 Fluorene
 2-Methylnaphthalene
 Phenanthrene

HPAHs

Benzo(a)anthracene
 Benzo(a)pyrene
 Benzofluoranthenes
 Benzo(g,h,i)perylene
 Chrysene
 Dibenzo(a,h)anthracene
 Fluoranthene
 Indeno(1,2,3-c,d)pyrene
 Pyrene

Chlorobenzenes

1,2-Dichlorobenzene
 1,4-Dichlorobenzene
 1,2,4-Trichlorobenzene
 Hexachlorobenzene

Phthalates

Benzyl Butyl Phthalate
 Bis(2-ethylhexyl) Phthalate
 Diethyl Phthalate
 Dimethyl Phthalate
 Di-N-butyl Phthalate
 Di-N-octyl Phthalate

Miscellaneous Organics

Dibenzofuran
 Hexachlorobutadiene
 N-Nitrosodiphenylamine
 Total PCBs

Ionizable Organics

Benzoic Acid
 Benzyl Alcohol
 2,4-Dimethylphenol
 2-Methylphenol
 4-Methylphenol
 Pentachlorophenol
 Phenol

Notes

LPAHs - Low Molecular Weight Polynuclear Aromatic Hydrocarbons
 HPAHS - High Molecular Weight Polynuclear Aromatic Hydrocarbons
 PCBs - Polychlorinated Biphenyls

2 Brandon Street CSO

The Brandon Street CSO regulator and outfall stations are located at 5241 East Marginal Way South. The outfall for this CSO discharges along the eastern shoreline of the main channel of the Duwamish River. This outfall is exposed during normal low tides and, during extremely low tides, can discharge directly across exposed intertidal sediment. Sampling locations in the vicinity of the Brandon Street CSO outfall are shown in Figure 2-1.

2.1 King County Data

An inventory of King County data collected near this CSO is provided in Table 2-1.

Sediment samples were collected for chemical analysis from one station in 1990 for the sediment baseline monitoring requirement of the King County's NPDES permit. Sediment samples were collected from four stations in 1992 as part of the Elliott Bay/Duwamish Restoration Program. Sediment samples were collected weekly at one station for 17 weeks during 1997 for the King County CSO Water Quality Assessment (WQA) project. Chemical analysis of these samples included parameters regulated under Ecology's sediment management standards (Ecology, 1995)

CSO effluent samples were collected in 1990 as part of the NPDES permit baseline monitoring program. CSO effluent was also sampled extensively during 1996 and 1997 for the WQA project. These samples were analyzed for chemical and bacteriological parameters as well as microtox bioassays and low-level mercury.

Receiving water was sampled weekly for 26 weeks at six locations near the outfall in 1996 and 1997 as part of the WQA project. In addition to standard chemical analysis of receiving water, semipermeable membrane devices (SPMD) were deployed just offshore of the outfall to collect time-integrated samples for organic analysis. Low-level mercury analysis was also performed on samples from one location offshore of the CSO.

Tissue samples were collected for chemical analysis from both transplanted and wild mussels located near the outfall. Mussel samples were also analyzed for bacteriological parameters prior to, during, and just following a discharge event. Tissue samples were collected offshore of the outfall during a fish sampling program performed in mid-river channel by the Washington State Department of Fish and Wildlife. The fish sampling program was undertaken using an otter trawl from the Fish and Wildlife research vessel. Dungeness crab, English sole, and Shiner perch were analyzed for organics, metals, and lipid content.

2.2 Other Sources of Data

One sediment station in the center channel of the Duwamish River near the Brandon Street CSO was sampled in 1988 for the Elliott Bay Action Program (Puget Sound Estuary Program, 1988). Five sediment stations were sampled in 1997 for the NOAA Duwamish River sediment study (National Oceanographic and Atmospheric Administration, 1997). Additional sediment stations will be sampled in 1998 as part of a large EPA investigation of the Duwamish River.

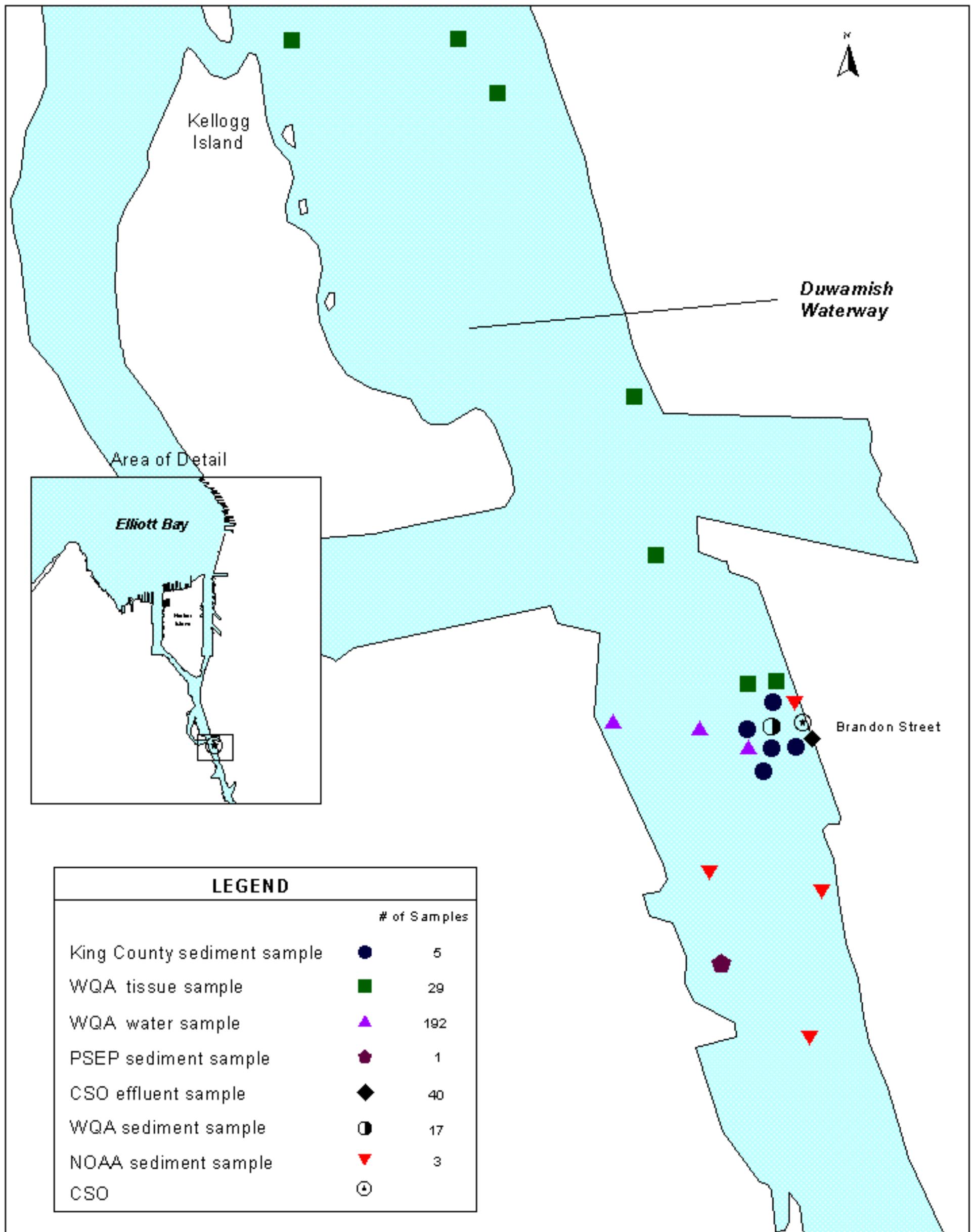


Figure 2-1

**Table 2-1
Inventory of King County Data
Brandon Street CSO**

Sediment Chemistry

Study	Year	Number of Samples												
		Ammonia	BNAs	Butyltin	Mercury	Metals	Methyl Hg	PCBs	Pesticides	PSD	Solids	Sulfides	TOC	Volatiles
NPDES CSO Sediment Baseline Study (1 grab)	1990	0	1	0	1	1	0	1	1	0	1	1	1	0
EB/DRP CSO Sediment Baseline Study (4 grabs)	1992	0	4	0	4	4	0	4	4	0	4	0	4	4
CSO Water Quality Assessment (17 grabs)	1997	17	12	13	17	17	17	12	0	17	17	17	17	0

CSO Effluent Chemistry and Microbiology

Study	Year	Number of Samples														
		Ammonia	BNAs	Conductivity	Demands	Fec. Coliform	Hardness	Mercury	Metals	Microtox	Nitrate/Nitrite	PCBs	Pesticides	pH	Solids	Temperature
NPDES CSO Baseline Monitoring	1990	0	1	0	4	4	0	4	4	0	0	4	4	0	4	0
CSO Water Quality Assessment	1996-97	34	31	58	35	35	34	89	81	105	16	10	9	57	71	59

Receiving Water Chemistry and Microbiology

Study	Year	Number of Samples														
		Ammonia	BNAs	Conductivity	Diss. Oxygen	Demands	Fec. Coliform	Hardness	Mercury	Metals	Nitrate/Nitrite	PCBs	Pesticides	pH	Solids	Temperature
CSO Water Quality Assessment	1996-97	192	36	216	120	6	192	6	24	244	132	2	2	192	384	216

Tissue Chemistry

Study	Year	Number of Samples							
		BNAs	Butyltin	Lipids	Mercury	Metals	PCBs	Pesticides	Solids
CSO Water Quality Assessment (Total Samples)	1996-97	29	29	29	29	29	29	9	11
Dungeness Crab	1997	2	2	2	2	2	2	0	2
English Sole	1997	6	6	6	6	6	6	0	6
Shiner Perch	1997	3	3	3	3	3	3	0	3
Transplanted Mussels (dry season)	1996	6	6	6	6	6	6	6	0
Transplanted Mussels (wet season)	1997	6	6	6	6	6	6	0	0
Wild Mussels (dry season)	1996	3	3	3	3	3	3	3	0
Wild Mussels (wet season)	1997	3	3	3	3	3	3	0	0

Specialized Sampling

Semipermeable membrane devices (SPMD) were deployed in April, 1997, at two depths near the Brandon Street CSO outfall in association with the CSO Water Quality Assessment. The SPMD were analyzed for polynuclear aromatic hydrocarbon compounds, PCBs (Aroclors and congeners), and chlorinated pesticides.

Notes

- CSO - Combined Sewer Overflow
- BNAs - Base/Neutral/Acid Extractable Semivolatile Compounds
- Methyl Hg - Methyl Mercury
- PCBs - Polychlorinated Biphenyls
- PSD - Particle Size Distribution (Grain Size)
- TOC - Total Organic Carbon
- NPDES - National Pollutant Discharge Elimination System

3 Chelan Avenue CSO

The Chelan Avenue CSO regulator station is located at 3455 Chelan Avenue Southwest. The outfall for this CSO discharges into the West Waterway of the Duwamish River approximately 40 yards offshore of the west bank. This outfall is submerged at a depth of about 30 feet and is never exposed. Sampling locations in the vicinity of the Chelan Avenue CSO outfall are shown in Figure 3-1.

3.1 King County Data

An inventory of King County data collected near this CSO is provided in Table 3-1.

Sediment samples were collected in 1995 and 1996 as part of the NPDES permit baseline sediment monitoring program. Samples were collected from six locations in 1995 for chemical analysis only. Sediment samples were collected for toxicity testing in 1996 from the 1995 station locations where the concentration of one or more chemical constituents exceeded the sediment management standards chemical criteria for either the sediment quality standard (SQS) or cleanup screening level (CSL). Amphipod, echinoderm, and polychaete bioassays were performed on these samples. Subsequent chemical analysis was performed on archived sediment for samples that failed one or more bioassays.

A limited sediment study was performed for the Elliott Bay/Duwamish Restoration Program near the Chelan Avenue storm drain outfall which discharges stormwater from Harbor Island to the West Waterway near the Chelan Avenue CSO outfall. The storm drain outfall is located on the east bank of the waterway. Three samples were collected in 1995 at this location for chemical analysis only.

Effluent from the Chelan Avenue CSO regulator station was sampled in 1994 and 1995 as part of NPDES permit baseline monitoring. The effluent was also sampled in 1996 and 1997 as part of the WQA project. Receiving water was sampled weekly for 26 weeks at six locations near the outfall in 1996 and 1997 as part of the WQA project. These samples were analyzed for chemical and bacteriological constituents. King County has also sampled the West Waterway at one location just upstream of the CSO outfall as part of their Stream Monitoring program.

Hydrodynamic data was collected near the CSO for a period of one year, from 1996 to 1997, as part of the WQA project. Current data were collected with an acoustic doppler velocity profiler and conventional water quality data were collected with an array of three Hydrolab® Datasondes.

3.2 Other Sources of Data

Seven sediment stations were sampled near the Chelan Avenue CSO in 1988 for the Elliott Bay Action Program (Puget Sound Estuary Program, 1988). Nine sediment stations, located in the West Waterway, were sampled in 1993 for the Harbor Island Superfund remedial investigation (Roy F. Weston, Inc., 1993).

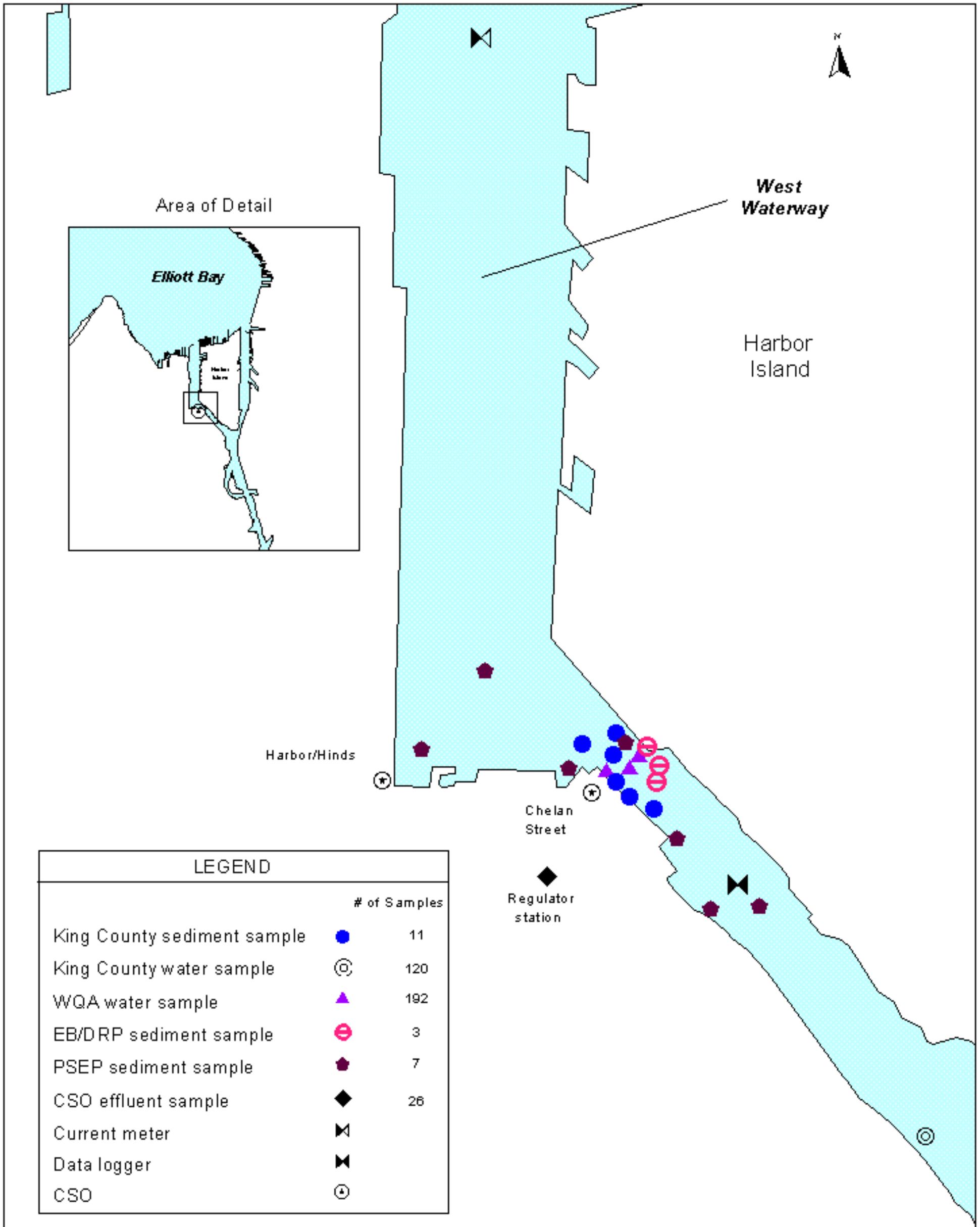


Figure 3-1

**Table 3-1
Inventory of King County Data
Chelan Avenue CSO**

Sediment Chemistry

Study	Year	Number of Samples											
		Ammonia	AVS/SEM	BNAs	Butyltin	Mercury	Metals	PCBs	Pesticides	PSD	Solids	Sulfides	TOC
NPDES CSO Baseline Sediment Study (6 grabs)	1995	6	1	6	0	6	6	6	6	6	6	6	6
EB/DRP Chelan Storm Drain Sediment Study (3 grabs)	1995	0	0	3	3	3	3	3	3	3	3	0	3
NPDES CSO Baseline Sediment Study (2 grabs)	1996	0	0	2	0	2	2	2	0	2	2	0	2

Sediment Bioassays

Study	Year	Number of Samples		
		Amphipod	Echinoderm	Polychaete
NPDES CSO Baseline Sediment Study (5 grabs)	1996	5	5	5

CSO Effluent Chemistry and Microbiology

Study	Year	Number of Samples														
		Ammonia	BNAs	Conductivity	Demands	Fec. Coliform	Hardness	Mercury	Metals	Microtox	Nitrate/Nitrite	PCBs	Pesticides	pH	Solids	Temperature
NPDES CSO Baseline Monitoring	1994-95	0	1	0	3	3	0	3	3	0	0	1	1	0	3	0
CSO Water Quality Assessment	1996-97	22	22	23	22	22	23	23	23	22	12	1	1	23	38	23

Receiving Water Chemistry and Microbiology

Study	Year	Number of Samples										
		Ammonia	BNAs	Conductivity	Diss. Oxygen	Fec. Coliform	Mercury	Metals	Nitrate/Nitrite	pH	Solids	Temperature
Stream Monitoring Station 0305	1988-98	120	0	119	61	118	0	0	119	118	120	118
CSO Water Quality Assessment	1996-97	192	42	234	120	192	121	234	22	192	192	240

Current Meters

An acoustic doppler velocity profiler (ADVP) current meter was deployed in the vicinity of the Chelan Avenue CSO for a period of 12 months from August, 1996 to August, 1997, in association with the CSO Water Quality Assessment.

Hydrolab® Datasondes

Three Hydrolab® Datasondes were deployed in the vicinity of the Chelan Avenue CSO to collect salinity, temperature, turbidity, and depth data for a period of 12 months from August, 1996 to August, 1997, in association with the CSO Water Quality Assessment.

Notes

- CSO - Combined Sewer Overflow
- AVS/SEM - Acid Volatile Sulfides/Simultaneously Extractable Metals
- BNAs - Base/Neutral/Acid Extractable Semivolatile Compounds
- PCBs - Polychlorinated Biphenyls
- PSD - Particle Size Distribution (Grain Size)
- TOC - Total Organic Carbon
- NPDES - National Pollutant Discharge Elimination System

4 Denny Way CSO

The Denny Way CSO regulator station is located at 3165 Alaskan Way. The outfall for this CSO discharges into Elliott Bay along the northeastern shoreline in Myrtle Edwards Park. This outfall is exposed during normal low tides and frequently discharges directly across exposed intertidal sediment. Sampling locations in the vicinity of the Denny Way CSO outfall are shown in Figure 4-1.

4.1 King County Data

An inventory of King County data collected near this CSO is provided in Table 4-1. This inventory does not include 30 pre-capping stations sampled in 1986.

Post-capping sediment monitoring has been conducted near the outfall in 1990, 1991, 1992, 1994, and 1996. The sediment cap was placed in March, 1990. Samples collected from four surface grab stations and three core stations on the cap plus a few off-cap surface grab stations have been analyzed for chemical constituents regulated under the sediment management standards. In each of the monitoring years, benthic taxonomy surveys have also been conducted at two stations on the cap plus one station inshore of the cap. In 1996, two samples were collected on the cap for toxicity testing by amphipod, echinoderm, and polychaete bioassays.

A pre-construction sediment characterization study was performed in 1997 under the Denny Way/Lake Union CSO Control Project to evaluate sediment quality prior to construction of the new Denny Way CSO outfall. Surface grabs from 28 stations and cores from 13 stations were collected and analyzed for chemical constituents.

CSO effluent samples were collected in 1992 and 1993 as part of the County's NPDES permit baseline monitoring requirement. Other effluent sampling efforts undertaken as part of the design of the new outfall include a vortex separator pilot project and a pre-construction monitoring program that evaluated bacteria, metals, and solids.

Receiving water near the Denny Way CSO outfall was sampled weekly for 26 weeks during the WQA project at two locations: just offshore of the outfall and directly over the sediment cap. These samples were analyzed for chemical and bacteriological constituents. Another location near the outfall has been sampled routinely for bacteria as part of the King County's Beach Monitoring program.

Tissue samples were collected in the vicinity of the outfall in 1997 for the WQA project. Dungeness crab, English sole, quillback rockfish, Shiner perch, squid, and wild mussel tissue samples were analyzed for organics and metals, as well as lipid content.

4.2 Other Sources of Data

One sediment station near the Denny Way CSO was sampled in 1988 for the Elliott Bay Action Program (Puget Sound Estuary Program, 1988).

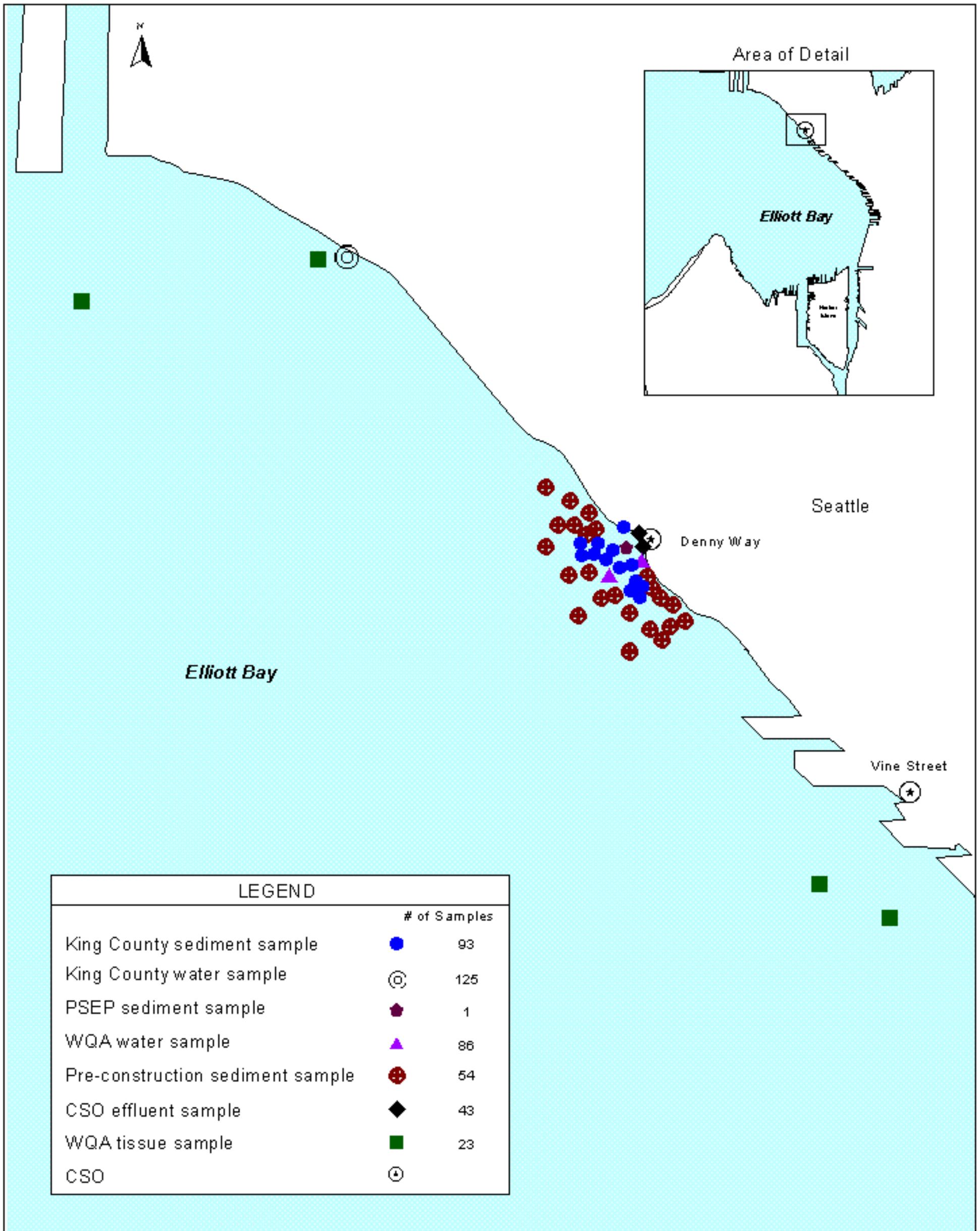


Figure 4-1

**Table 4-1
Inventory of King County Data
Denny Way CSO**

Sediment Chemistry

Study	Year	Number of Samples								
		BNAs	Mercury	Metals	PCBs	Pesticides	PSD	Solids	TOC	Volatiles
Post-Cap Sediment Monitoring (5 grabs/3 cores)	1990	21	21	21	21	21	21	21	21	6
Post-Cap Sediment Monitoring (5 grabs/3 cores)	1991	21	21	21	21	21	21	21	21	6
Post-Cap Sediment Monitoring (5 grabs/3 cores)	1992	21	21	21	21	21	21	21	21	6
Post-Cap Sediment Monitoring (9 grabs/3 cores)	1994	23	23	23	23	23	23	23	23	18
Post-Cap Sediment Monitoring (7 grabs)	1996	7	7	7	7	7	7	7	7	7
Pre-Construction Sediment Study (28 grabs/13 cores)	1997	54	54	54	54	54	54	54	54	0

Sediment Bioassays

Study	Year	Amphipod	Echinoderm	Polychaete
Post-Cap Sediment Monitoring (2 grabs)	1996	2	2	2

CSO Effluent Chemistry and Microbiology

Study	Year	Number of Samples							
		BNAs	Fec. Coliform	Mercury	Metals	PCBs	Pesticides	Solids	Volatiles
NPDES CSO Baseline Monitoring	1992-93	13	13	12	24	12	11	13	7
CSO Pre-Construction Effluent Monitoring Study	1996-97	0	30	17	29	0	0	68	0

Receiving Water Chemistry and Microbiology

Study	Year	Number of Samples										
		Ammonia	BNAs	Conductivity	Diss. Oxygen	Fec. Coliform	Mercury	Metals	Nitrate/Nitrite	pH	Solids	Temperature
Beach Monitoring Station LTAB01	1988-98	0	0	0	0	125	0	0	0	0	0	125
CSO Water Quality Assessment	1996-97	86	21	76	54	86	3	112	60	86	175	86

Tissue Chemistry

Study	Year	Number of Samples							
		BNAs	Butyltin	Mercury	Metals	PCBs	Pesticides	Lipids	Solids
CSO Water Quality Assessment (total samples)		23	23	23	23	23	23	23	17
Dungeness Crab	1997	2	2	2	2	2	2	2	2
English Sole	1997	6	6	6	6	6	6	6	6
Quillback Rockfish	1997	3	3	3	3	3	3	3	3
Shiner Perch	1997	3	3	3	3	3	3	3	0
Squid	1997	6	6	6	6	6	6	6	6
Wild Mussels (wet season)	1997	3	3	3	3	3	3	3	0

Benthic Surveys

Benthic taxonomy surveys have been completed for the post-cap monitoring program in 1990, 1991, 1992, 1994, and 1996. The surveys were performed on 5-station transects at each of three locations.

Specialized Sampling

A vortex separator pilot study was completed at the Denny Way CSO in 1995.

Notes

- CSO - Combined Sewer Overflow
- BNAs - Base/Neutral/Acid Extractable Semivolatile Compounds
- PCBs - Polychlorinated Biphenyls
- PSD - Particle Size Distribution (Grain Size)
- TOC - Total Organic Carbon
- NPDES - National Pollutant Discharge Elimination System

5 Duwamish Pump Station/Diagonal Avenue CSO/Storm Drain

The Duwamish Pump Station is located at 4501 East Marginal Way South, receiving flows from both the Elliott Bay Interceptor and the Duwamish Siphon. This location would only overflow in the event of an extremely large flow or during a power outage. The outfall for the pump station overflow structure is co-located with the City of Seattle Diagonal Way CSO and storm drain (SD) outfall. The CSO/SD outfall is totally exposed at low tide and can discharge directly onto exposed intertidal sediment. Sampling locations in the vicinity of the Duwamish Pump Station and Diagonal Avenue CSO/SD outfalls are shown in Figure 5-1.

5.1 King County Data

An inventory of King County data collected near this CSO/SD is provided in Table 5-1.

As a result of a 1991 consent decree, this location became a remediation site under the Elliott Bay/Duwamish Restoration Program. A limited number of sediment samples were collected for chemical analysis in 1992 and a large number of sediment samples were collected for chemical analysis and toxicity testing in 1994, 1995, and 1996. Toxicity testing was performed using amphipod, echinoderm, and polychate bioassays. Chemical analysis was also performed on sediment samples collected in 1997 as part of a benthic survey for the WQA project. CSO effluent and stormwater were sampled in 1995 at two sites in the drainage basin in conjunction with the sediment cleanup study at this site.

SPMD were deployed just offshore of the outfall to collect time-integrated samples for organic analysis. This sampling effort was performed in conjunction with the WQA project.

Tissue samples were collected for chemical analysis from both transplanted and wild mussels for the WQA project. Tissue samples were also collected offshore of the outfall during an otter trawl performed by the Washington State Department of Fish and Wildlife and were analyzed for organics and metals as well as lipid content. Species included Dungeness crab, English sole, and Shiner perch. A benthic taxonomy survey was conducted on subtidal sediments at the Diagonal Way CSO/SD for the WQA project. This survey compared the benthic community at this location with a reference site across the river at Kellogg Island. An assessment was conducted of the nearshore and upland habitats in the immediate vicinity of the outfalls as part of the Duwamish/Diagonal sediment cleanup study.

5.2 Other Sources of Data

Two sediment stations near the Duwamish/Diagonal CSO/SD were sampled in 1988 for the Elliott Bay Action Program (Puget Sound Estuary Program, 1988). One sediment station was sampled in 1993 for the Harbor Island Superfund remedial investigation (Roy F. Weston, Inc., 1993). Eight sediment stations were sampled in 1997 for the NOAA Duwamish River sediment study (National Oceanographic and Atmospheric Administration, 1997). Additional sediment stations near the Duwamish/Diagonal CSO/SD will be sampled in 1998 as part of a large EPA investigation of the Duwamish River.

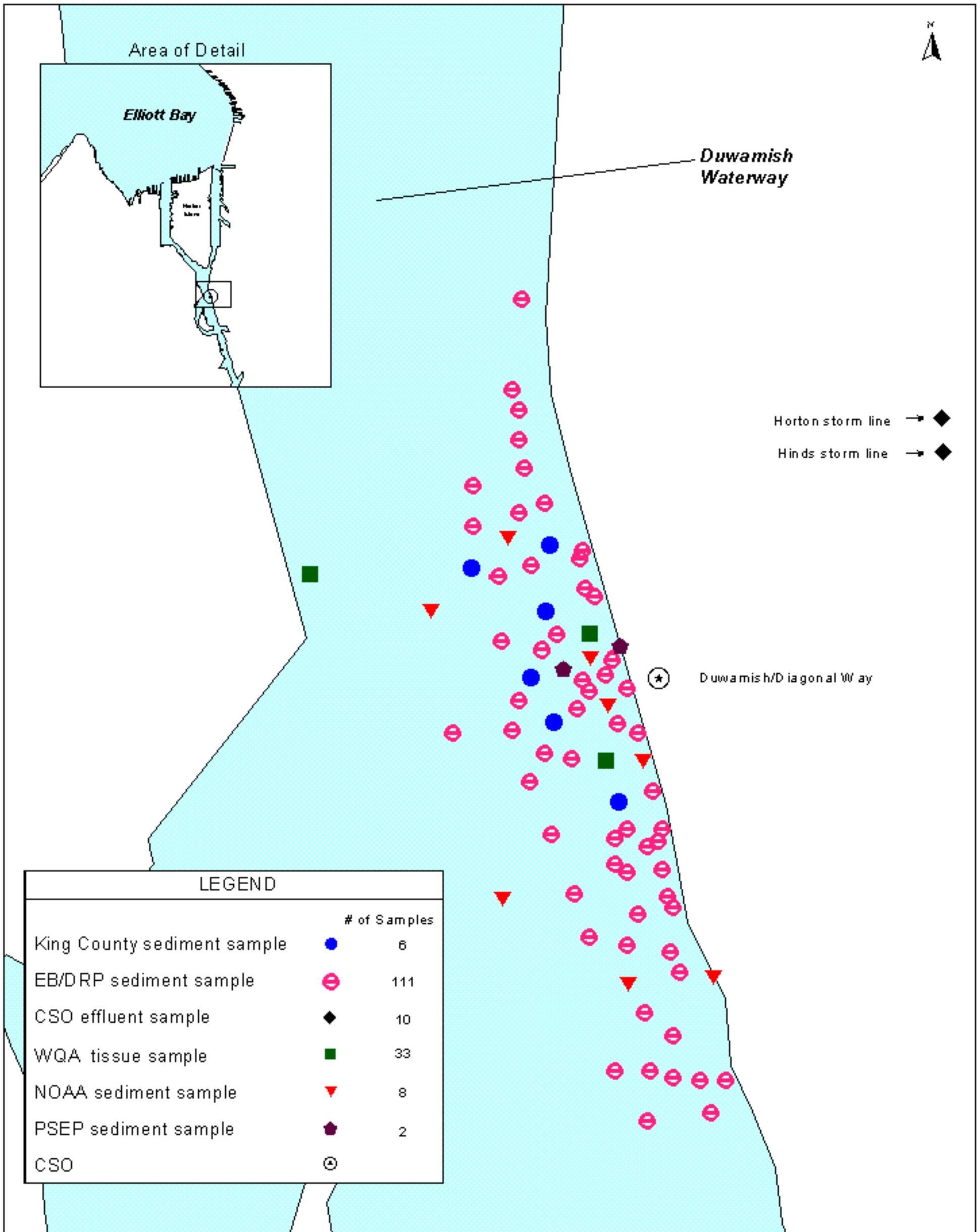


Figure 5-1

**Table 5-1
Inventory of King County Data
Duwamish/Diagonal CSO**

Sediment Chemistry

Study	Year	Number of Samples											
		AVS	BNAs	Butyltin	Mercury	Metals	Methyl Hg	PCBs	Pesticides	PSD	Solids	TOC	Volatiles
EB/DRP CSO Sediment Baseline Study (6 grabs)	1992	0	6	0	6	6	0	6	6	0	6	6	6
EB/DRP Sediment Cleanup Study (35 grabs/2 cores)	1994	55	55	41	55	55	12	55	55	55	55	55	0
EB/DRP Sediment Cleanup Study (14 grabs)	1995	14	14	14	14	14	0	14	0	14	14	14	0
EB/DRP Sediment Cleanup Study (11 grabs/16 cores)	1996	0	42	0	42	42	0	42	0	42	42	42	0
CSO Water Quality Assessment Benthic Study (18 grabs)	1997	0	18	18	18	18	0	18	0	18	18	18	0

Sediment Bioassays

Study	Year	Number of Samples		
		Amphipod	Echinoderm	Polychaete
EB/DRP Sediment Cleanup Study (12 grabs)	1994	12	12	12
EB/DRP Sediment Cleanup Study (7 grabs)	1996	7	7	7

CSO Effluent Chemistry and Microbiology

Study	Year	Number of Samples								
		BNAs	Conductivity	Mercury	Metals	PCBs	Pesticides	pH	Solids	Volatiles
EB/DRP Sediment Cleanup Study	1995	10	9	10	10	10	10	9	10	9

Tissue Chemistry

Study	Year	Number of Samples							
		BNAs	Butyltin	Lipids	Mercury	Metals	PCBs	Pesticides	Solids
CSO Water Quality Assessment (Total Samples)	1996-97	33	33	33	33	33	33	12	11
Dungeness Crab	1997	2	2	2	2	2	2	0	2
English Sole	1997	6	6	6	6	6	6	0	6
Shiner Perch	1997	3	3	3	3	3	3	0	3
Transplanted Mussels (dry season)	1996	7	7	7	7	7	7	7	0
Transplanted Mussels (wet season)	1997	7	7	7	7	7	7	0	0
Wild Mussels (dry season)	1996	5	5	5	5	5	5	5	0
Wild Mussels (wet season)	1997	3	3	3	3	3	3	0	0

Benthic Surveys

A benthic taxonomy survey was completed in September, 1996, for the CSO Water Quality Assessment on a 5-station transect near the Duwamish/Diagonal CSO outfall. A reference transect for this study was performed at the north end of Kellogg Island.

Specialized Sampling

Semipermeable membrane devices (SPMD) were deployed at two depths near the Duwamish/Diagonal CSO outfalls in March/April, 1997, in association with the CSO Water Quality Assessment. The SPMD were analyzed for polynuclear aromatic hydrocarbon compounds, PCBs (Aroclors and congeners), and chlorinated pesticides.

Habitat Assessment

Habitat assessments of the area surrounding the Duwamish/Diagonal CSO outfalls were performed in October, 1995, and July, 1996, as part of the EB/DRP Sediment Cleanup Study.

Notes

- CSO - Combined Sewer Overflow
- AVS - Acid Volatile Sulfides
- BNAs - Base/Neutral/Acid Extractable Semivolatile Compounds
- Methyl Hg - Methyl Mercury
- PCBs - Polychlorinated Biphenyls
- PSD - Particle Size Distribution (Grain Size)
- TOC - Total Organic Carbon
- NPDES - National Pollutant Discharge Elimination System

6 Hanford Street CSO

The Hanford Street CSO regulator and outfall stations are located at 2999 East Marginal Way South, within the trailer yard of the Port of Seattle Terminal 25. The outfall for this CSO discharges into the East Waterway of the Duwamish River, underneath the container pier. The outfall is located in a rip-rapped wall on the east bank and is exposed during very low tides. The original outfall extended to the middle of the East Waterway but, in the late 1970's, the outfall was shortened to the current location on the east bank. Sampling locations in the vicinity of the Hanford Street CSO outfall are shown in Figure 6-1.

6.1 King County Data

An inventory of King County data collected near this CSO is provided in Table 6-1.

Sediment samples were collected near the Hanford Street CSO in 1995 and 1996 as part of the NPDES permit baseline sediment monitoring. Samples collected in 1995 were analyzed for chemical parameters regulated under the sediment management standards. Sediment samples were collected for toxicity testing in 1996 from only the 1995 station locations where the concentration of one or more chemical constituents exceeded either the SQS or CSL for toxicity testing. Amphipod, echinoderm, and polychaete bioassays were performed on these samples. Subsequent chemical analysis was performed on archived sediment for samples that failed one or more bioassays.

CSO effluent was sampled in 1996 and 1997 from the Hanford Street CSO regulator station as part of the WQA project. The effluent samples were analyzed for chemical and bacteriological parameters as well as microtox bioassays.

Receiving water near this outfall was sampled weekly for 26 weeks during the WQA project from six locations. These samples were analyzed for chemical and bacteriological constituents.

Tissue samples were collected from wild mussels near the CSO in 1996 and 1997 as part of the WQA project. The samples were analyzed for metals, organics, and lipid content.

6.2 Other Sources of Data

Six sediment stations were sampled in the East Waterway near the Hanford Street CSO in 1988 for the Elliott Bay Action Program (Puget Sound Estuary Program, 1988). Eleven sediment stations were sampled in 1993 for the Harbor Island Superfund remedial investigation (Roy F. Weston, Inc., 1993). A large number of samples were also collected in 1997 during the Port of Seattle Terminal sediment characterization study, however, sediment in this area will be dredged in the near future (EVS Environmental Consultants, 1998).

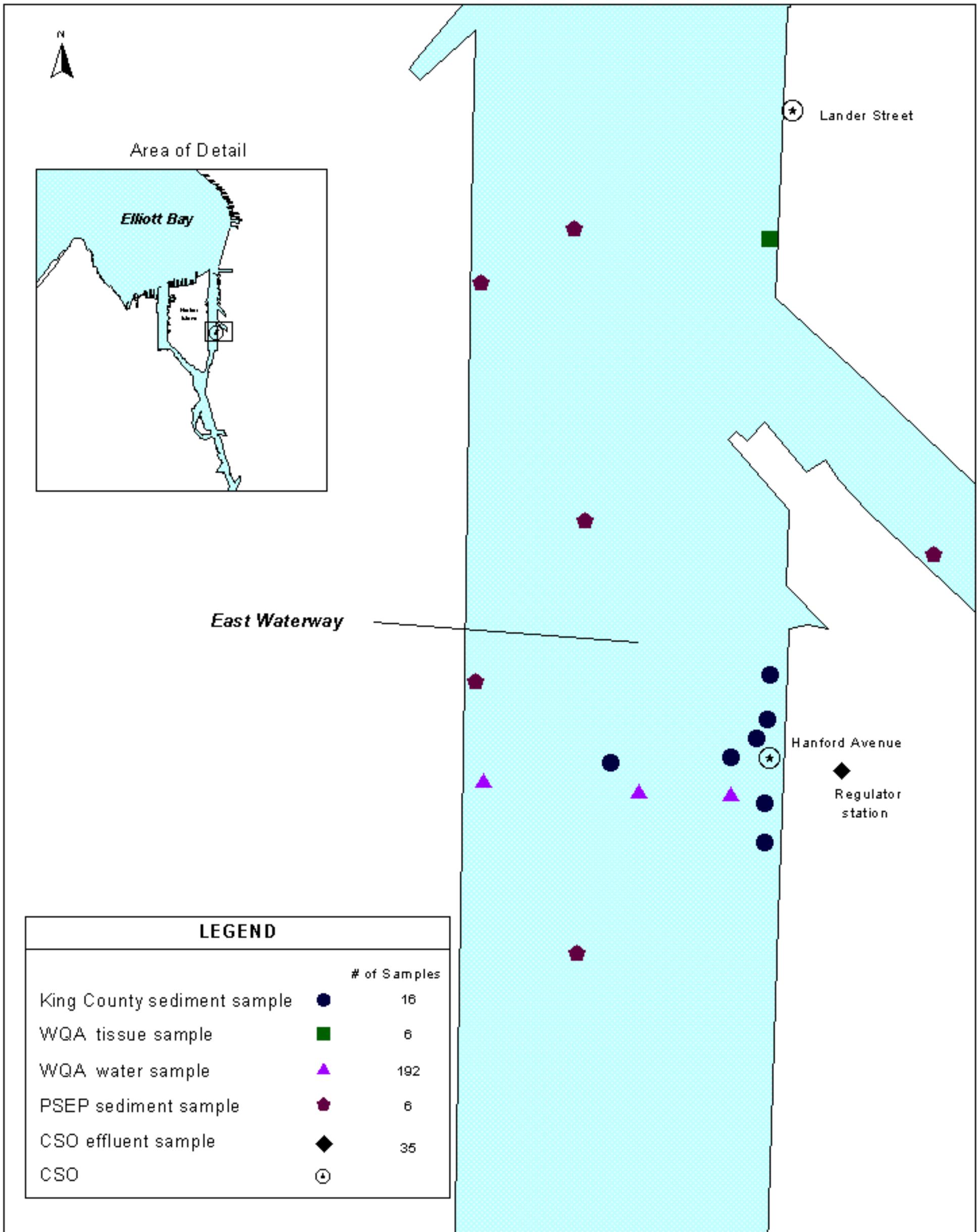


Figure 6-1

**Table 6-1
Inventory of King County Data
Hanford Street CSO**

Sediment Chemistry

Study	Year	Number of Samples										
		Ammonia	AVS/SEM	BNAs	Mercury	Metals	PCBs	Pesticides	PSD	Solids	Sulfides	TOC
NPDES CSO Baseline Sediment Study (7 grabs)	1995	7	1	7	7	7	7	7	7	7	7	7
NPDES CSO Baseline Sediment Study (3 grabs)	1996	0	0	3	3	3	3	0	3	3	0	3

Sediment Bioassays

Study	Year	Number of Samples		
		Amphipod	Echinoderm	Polychaete
NPDES CSO Baseline Sediment Study (6 grabs)	1996	6	6	6

CSO Effluent Chemistry and Microbiology

Study	Year	Number of Samples														
		Ammonia	BNAs	Conductivity	Demands	Fec. Coliform	Hardness	Mercury	Metals	Microtox	Nitrate/Nitrite	PCBs	Pesticides	pH	Solids	Temperature
CSO Water Quality Assessment	1996-97	24	24	35	29	20	24	57	63	99	13	6	6	35	62	39

Receiving Water Chemistry and Microbiology

Study	Year	Number of Samples											
		Ammonia	BNAs	Conductivity	Diss. Oxygen	Fec. Coliform	Mercury	Metals	Nitrate/Nitrite	pH	Solids	Temperature	
CSO Water Quality Assessment	1996-97	192	42	192	120	192	24	234	132	192	384	192	

Tissue Chemistry

Study	Year	Number of Samples						
		BNAs	Butyltin	Lipids	Mercury	Metals	PCBs	Pesticides
CSO Water Quality Assessment (Total Samples)	1996-97	6	6	6	6	6	6	3
Wild Mussels (dry season)	1996	3	3	3	3	3	3	3
Wild Mussels (wet season)	1997	3	3	3	3	3	3	0

Notes

- CSO - Combined Sewer Overflow
- AVS/SEM - Acid Volatile Sulfides/Simultaneously Extractable Metals
- BNAs - Base/Neutral/Acid Extractable Semivolatile Compounds
- PCBs - Polychlorinated Biphenyls
- PSD - Particle Size Distribution (Grain Size)
- TOC - Total Organic Carbon
- NPDES - National Pollutant Discharge Elimination System

7 King Street CSO

The King Street regulator station is located at 499 Alaskan Way South. The outfall for this CSO discharges into Elliott Bay at Pier 46. This outfall is located under the northeast edge of the pier and about half of the pipe is exposed at extreme low tides. Sampling locations in the vicinity of the King Street CSO outfall are shown in Figure 7-1.

7.1 King County Data

An inventory of King County data collected near this CSO is provided in Table 7-1.

Sediment data for the King Street CSO is limited to samples collected 10 years ago. Sediment samples were collected near the CSO outfall in 1988 as part of a sediment baseline study for the King County's NPDES permit. These samples were analyzed for chemical constituents.

CSO effluent samples were collected in 1996 and 1997 from the King Street CSO regulator station as part of the WQA project and were analyzed for chemical and bacteriological constituents as well as microtox bioassays.

The only receiving water station near this CSO is sampled as part of the King County's Beach Monitoring program. Samples collected from this location are analyzed for bacteria.

Tissue samples were also collected offshore of the outfall during an otter trawl performed by the Washington State Department of Fish and Wildlife and were analyzed for organics and metals as well as lipid content. Species included Dungeness crab, English sole, and Shiner perch.

7.2 Other Sources of Data

One sediment station on the south side of Pier 48 was sampled in 1988 as part of the Elliott Bay Action Program (Puget Sound Estuary Program, 1988).

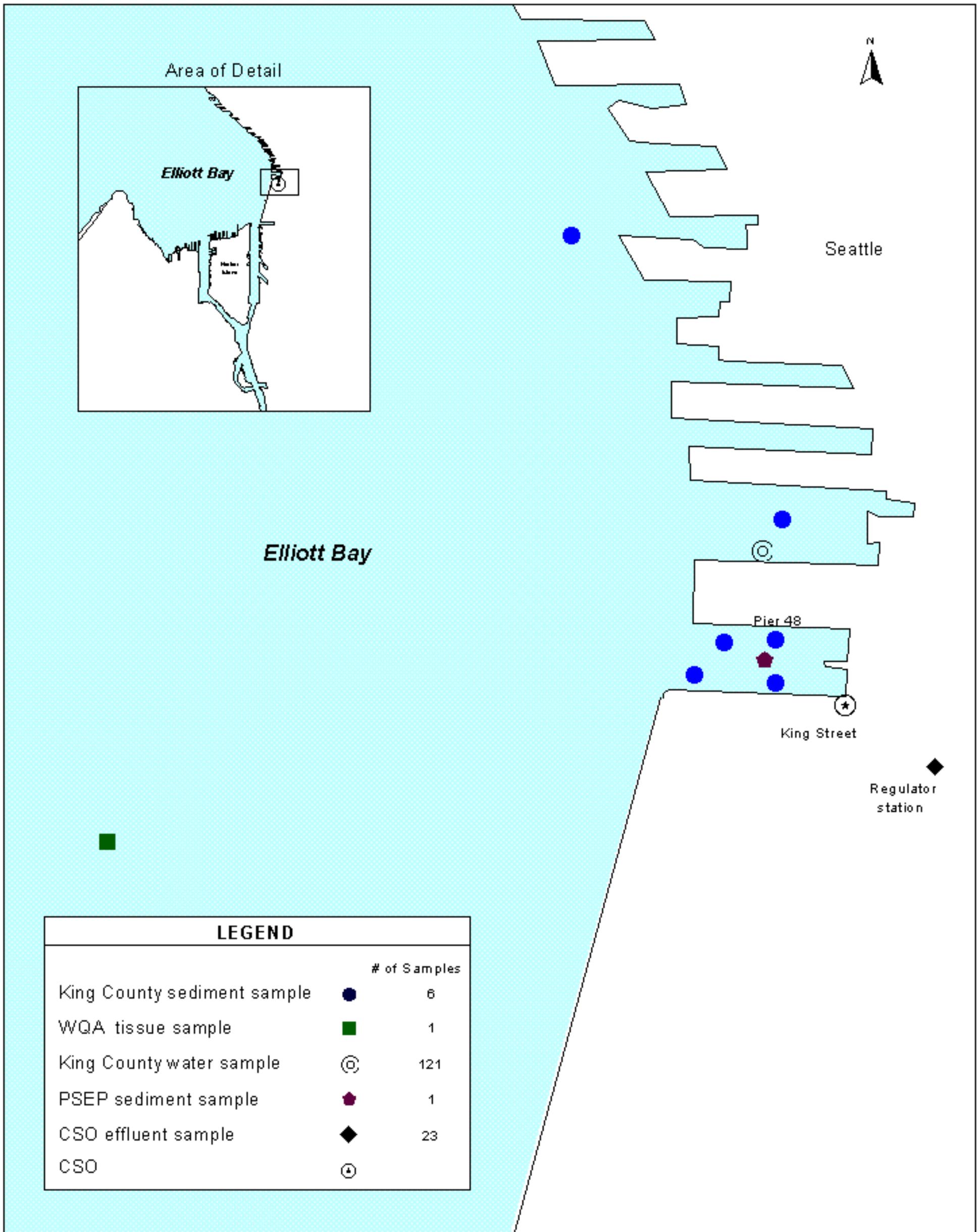


Figure 7-1

**Table 7-1
Inventory of King County Data
King Street CSO**

Sediment Chemistry

Study	Year	Number of Samples				
		BNAs	Mercury	Metals	PCBs	Solids
NPDES CSO Sediment Baseline Study (6 grabs)	1988	5	6	6	5	6

CSO Effluent Chemistry and Microbiology

Study	Year	Number of Samples														
		Ammonia	BNAs	Conductivity	Demands	Fec. Coliform	Hardness	Mercury	Metals	Microtox	Nitrate/Nitrite	PCBs	Pesticides	pH	Solids	Temperature
CSO Water Quality Assessment	1996-97	22	22	23	22	18	23	46	46	78	14	7	4	23	47	29

Receiving Water Chemistry and Microbiology

Study	Year	Number of Samples	
		Fec. Coliform	Temperature
Beach Monitoring Station LTEH02	1988-98	121	119

Tissue Chemistry

Study	Year	Number of Samples						
		BNAs	Butyltin	Lipids	Mercury	Metals	PCBs	Solids
CSO Water Quality Assessment	1997	1	1	1	1	1	1	1

Notes

- CSO - Combined Sewer Overflow
- BNAs - Base/Neutral/Acid Extractable Semivolatile Compounds
- PCBs - Polychlorinated Biphenyls

8 Lander Street CSO

The Lander Street CSO regulator station is located at Colorado Avenue South and South Lander Street. The outfall station is located at 2701 East Marginal Way South. The outfall for this CSO discharges into the East Waterway of the Duwamish River. The outfall is submerged and never exposed. Sampling locations in the vicinity of the Lander Street CSO outfall are shown in Figure 8-1.

8.1 King County Data

An inventory of King County data collected near this CSO is provided in Table 8-1.

The data inventory for the Lander Street CSO is limited. Several effluent samples were collected in 1988 as part of the Lander Street CSO pre-separation study. One effluent sample was also collected in 1988 as part of the NPDES permit baseline monitoring. Several effluent samples have been collected in 1997 and 1998 as part of a King County Industrial Waste storm drainage monitoring program.

Tissue samples were collected from wild mussels near the CSO in 1996 and 1997 as part of the WQA project. The samples were analyzed for metals, organics, and lipid content.

8.2 Other Sources of Data

Three sediment stations in the East Waterway near the Lander Street CSO were sampled in 1988 for the Elliott Bay Action Program (Puget Sound Estuary Program, 1988). Six sediment stations were sampled in 1993 for the Harbor Island Superfund remedial investigation (Roy F. Weston, Inc., 1993). A large number of samples were also collected in 1997 during the Port of Seattle Terminal sediment characterization study, however, sediment in this area will be dredged in the near future (EVS Environmental Consultants, 1998). In 1995, the Port of Seattle performed maintenance of the pier face and dredged sediment from around the outfall pipe.

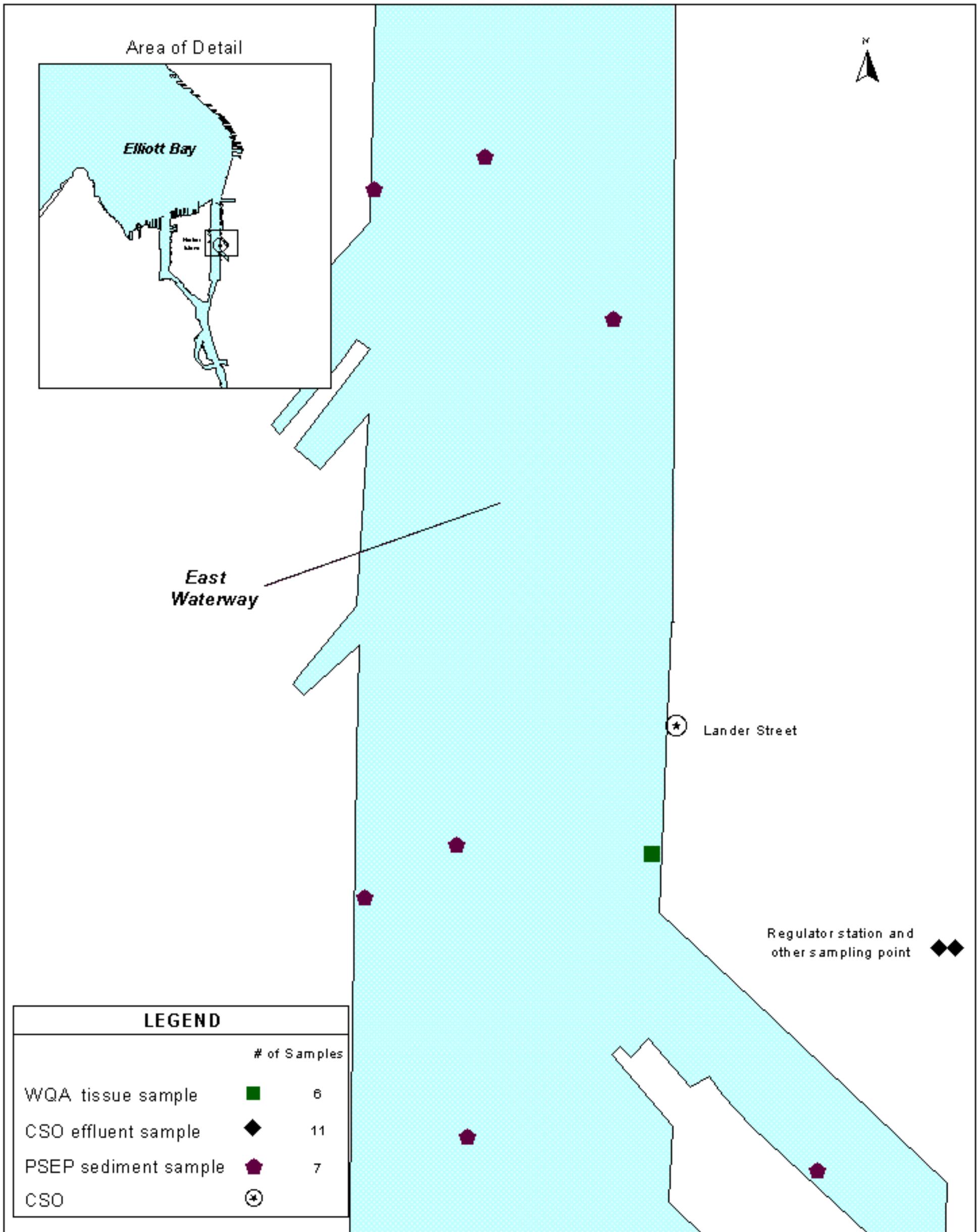


Figure 8-1

**Table 8-1
Inventory of King County Data
Lander Street CSO**

CSO Effluent Chemistry and Microbiology

Study	Year	Number of Samples											
		BNAs	Conductivity	Demands	Fec. Coliform	Hardness	Mercury	Metals	PCBs	Pesticides	Solids	Temperature	Volatiles
Lander Pre-Separation CSO Study	1988	7	0	1	6	0	7	7	6	6	8	0	0
NPDES CSO Baseline Monitoring	1988	1	0	1	1	0	1	1	1	1	1	0	1
Industrial Waste Storm Drainage Monitoring	1997-98	3	3	0	0	3	3	3	3	3	0	3	3

Tissue Chemistry

Study	Year	Number of Samples						
		BNAs	Butyltin	Lipids	Mercury	Metals	PCBs	Pesticides
CSO Water Quality Assessment (Total Samples)	1996-97	6	6	6	6	6	6	3
Wild Mussels (dry season)	1996	3	3	3	3	3	3	3
Wild Mussels (wet season)	1997	3	3	3	3	3	3	0

Notes

- CSO - Combined Sewer Overflow
- BNAs - Base/Neutral/Acid Extractable Semivolatile Compounds
- PCBs - Polychlorinated Biphenyls
- NPDES - National Pollutant Discharge Elimination System

9 References

King County Department of Metropolitan Services *Sediment Baseline Monitoring Plan* Seattle, WA (1995)

King County Department of Natural Resources *Duwamish/Diagonal Site Assessment Report* Seattle, WA (1997)

King County Department of Natural Resources *The Denny Way Sediment Cap 1994 Data* Seattle, WA (1996)

King County Department of Natural Resources *The Denny Way Sediment Cap 1996 Data* Seattle, WA (1998)

Municipality of Metropolitan Seattle *Offsite Facilities and Miscellaneous Structures Manual Volume 2, West Division* Seattle, WA (Revision B, 1993)

Striplin Environmental Associates *Denny Way/Lake Union CSO Control Project Proposed Marine Outfall Sediment Characterization* Prepared for King County Department of Natural Resources, Waste Treatment Division, Seattle, WA (1998)

Washington State Department of Ecology *Sediment Management Standards, Chapter 173-204 WAC* Olympia, WA (1995)

Washington State Department of Ecology *Sediment Management Standards Contaminated Sediment Site List* Olympia, WA (1996)

10 Bibliography of Other Data Sources

EVS Environmental Consultants *Port of Seattle Terminal 18 Sediment Characterization Sampling and Analysis Results* Prepared for the Port of Seattle, Seattle, WA (1998)

Hart Crowser *Technical Memorandum Sediment Quality Assessment Seattle Ferry Terminal Coleman Dock-South Area, Seattle, Washington* Prepared for the Washington State Ferries, Washington State Department of Transportation, Olympia, WA (1994)

National Oceanographic and Atmospheric Administration *Duwamish River Sediment Study Sampling and Analysis Plan* Prepared for the National Oceanographic and Atmospheric Administration Damage Assessment Center, Seattle, WA (1997)

Puget Sound Estuary Program *Elliott Bay Action Program: Analysis of Toxic Problem Areas* Prepared for the United States Environmental Protection Agency, Region 10, Seattle, WA (1988)

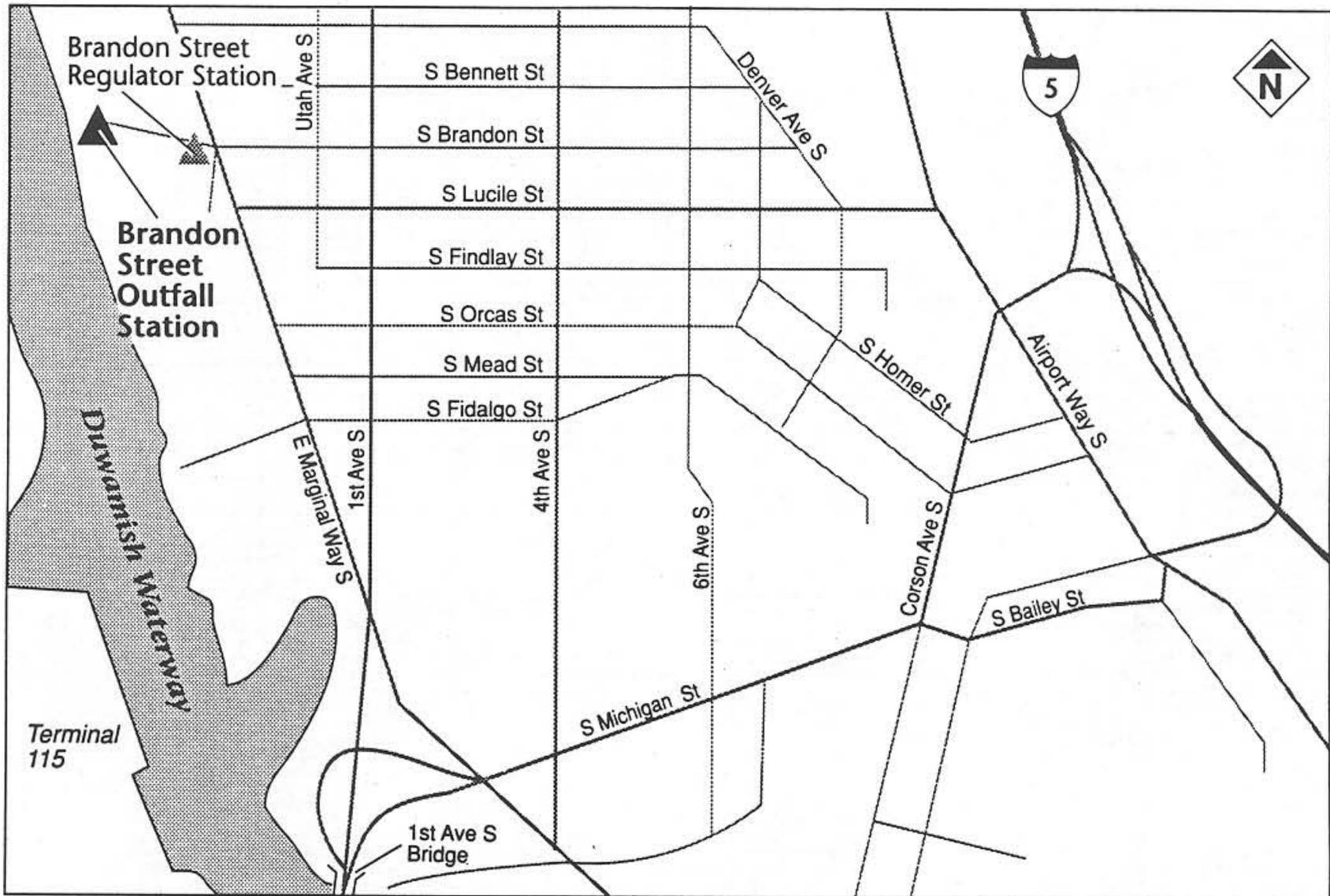
Roy F. Weston, Inc. *Remedial Investigation Report – Harbor Island, Part 2 – Sediment* Prepared for the United States Environmental Protection Agency, Region 10, Seattle, WA (1993)

Washington State Department of Ecology *Elliott Bay Waterfront Recontamination Study, Volume 1: Field Investigation and Volume 2: Data Evaluation and Remedial Design Recommendations Report* Prepared for the Elliott Bay/Duwamish Restoration Program Panel, Seattle, WA (1995)

Appendix A
CSO Information and Structure Diagrams

BRANDON STREET OUTFALL STATION

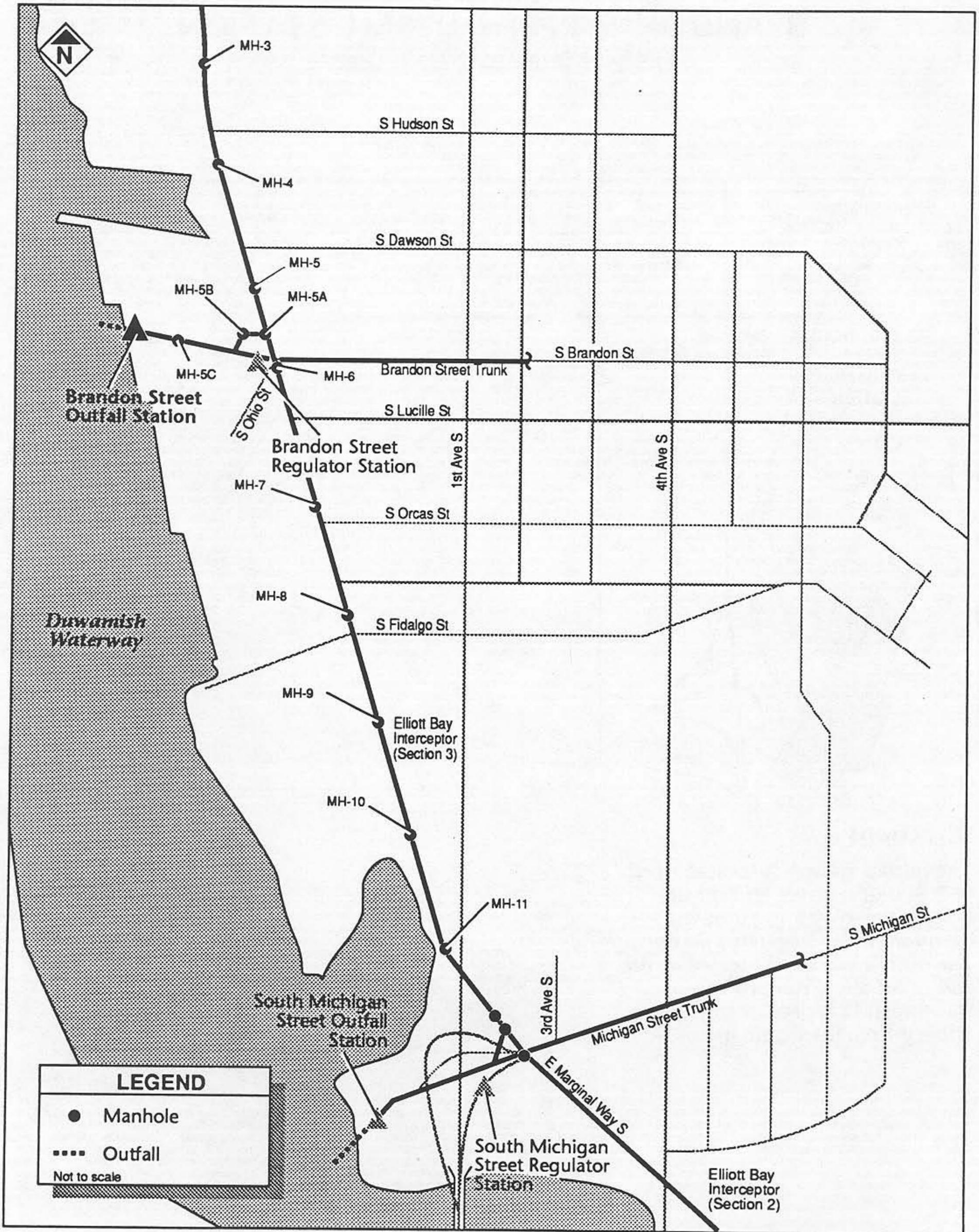
5241 E Marginal Way S, Seattle



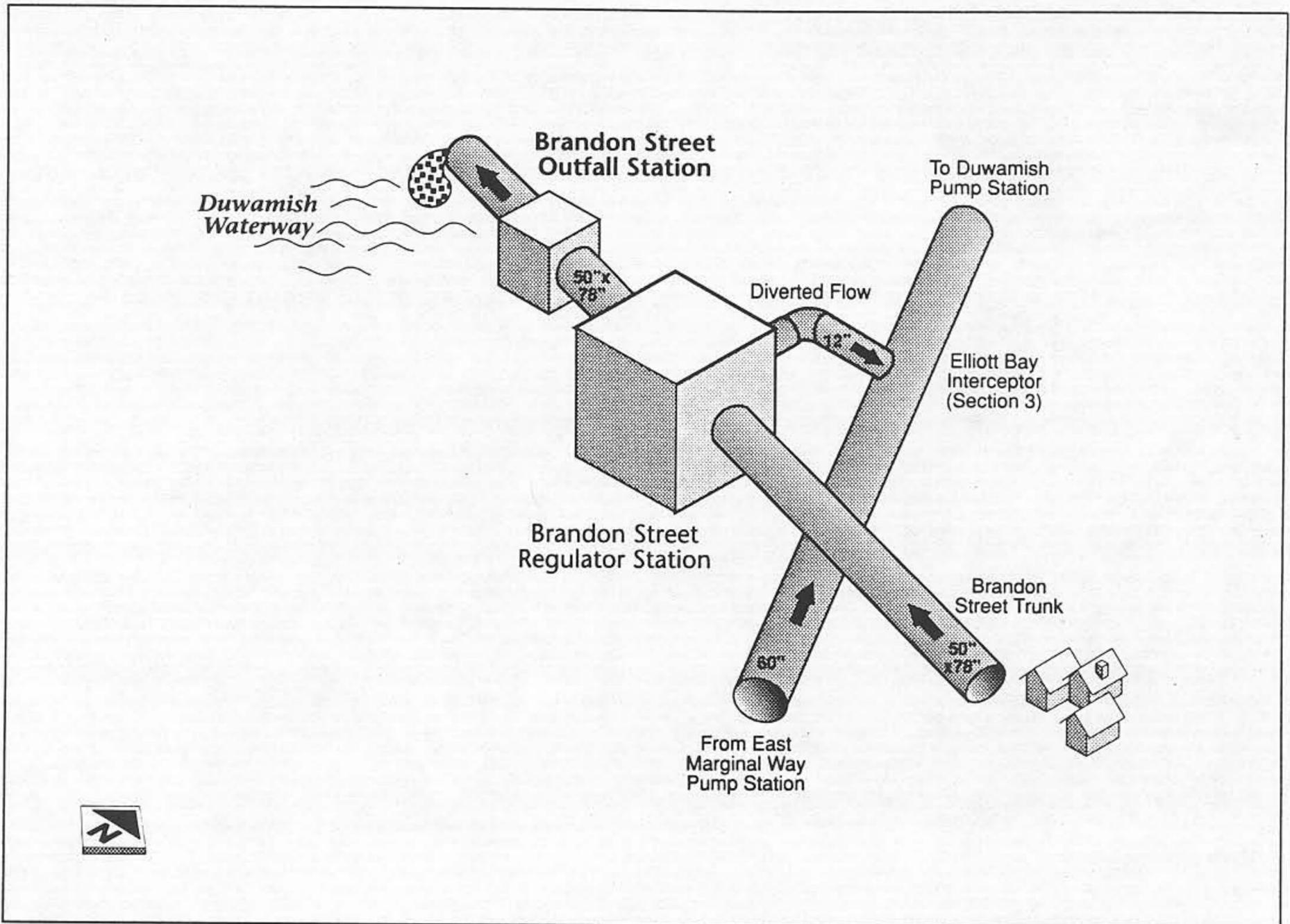
Directions

The outfall station is located north of S Brandon Street and off of E Marginal Way S (west of the Brandon Street Regulator Station). The outfall station is located at the end of an alley, next to the Duwamish River and south of the Tilbury Cement Company.





One-Line Drawing



Flow Schematic

System Relationship

The Brandon Street Outfall Station is part of the Elliott Bay Interceptor System. The Brandon Street Regulator Station controls flow from the Brandon Street Trunk into the Elliott Bay Interceptor. Excess flow goes through the Brandon Street Outfall Station into the Duwamish Waterway.

Critical Information

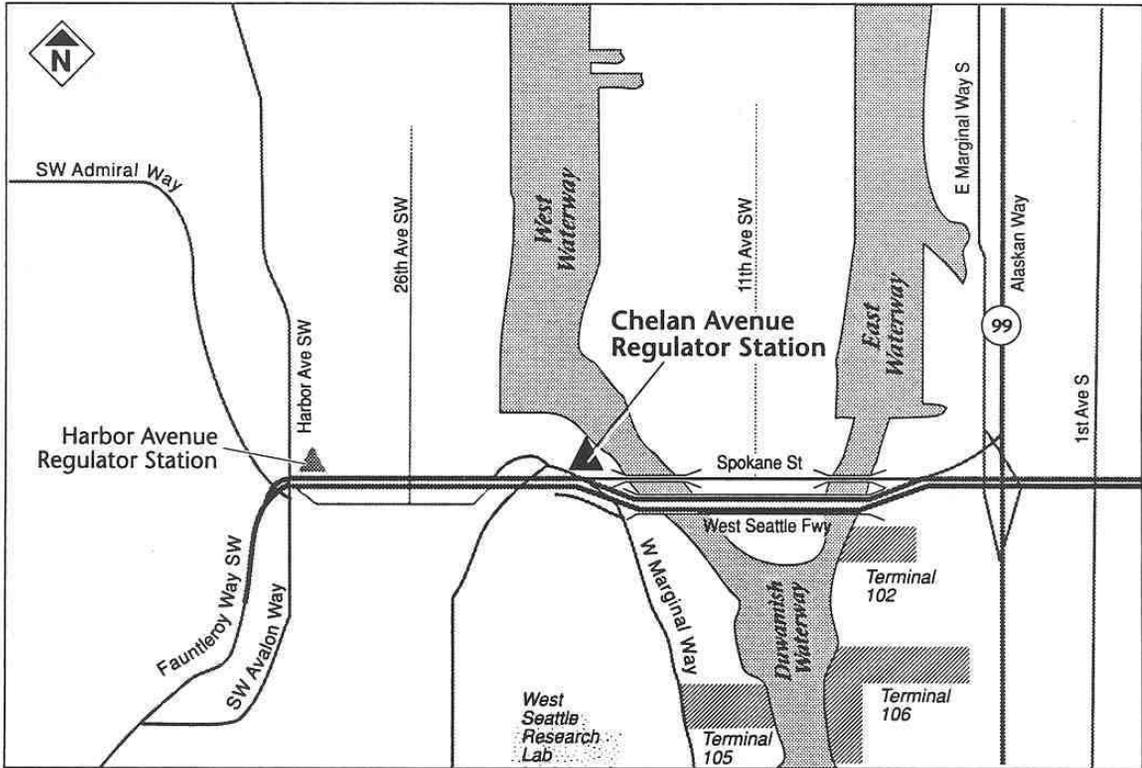
Emergency Power:	Standby Generator
Invert Elevation	
Outfall Gate:	101.93 feet
Overflow Location:	Duwamish Waterway; through 84 feet of submarine outfall

Flow/Construction Information

Brandon Street Regulator Station and Brandon Street Outfall Station are considered one system. See *Brandon Street Regulator Station* for information.

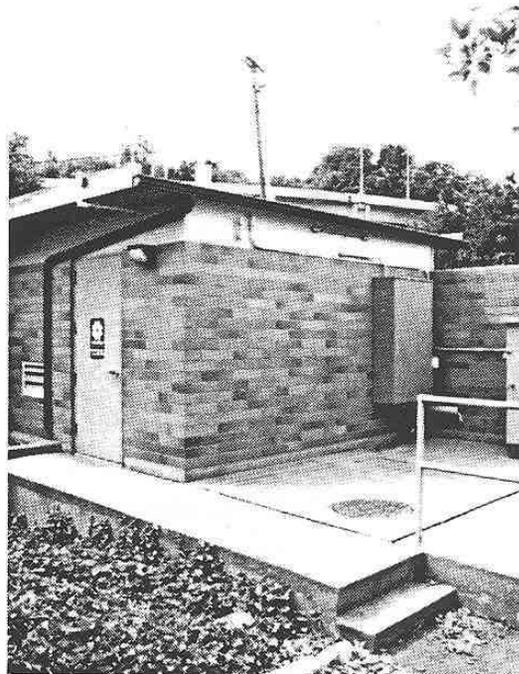
CHELAN AVENUE REGULATOR STATION

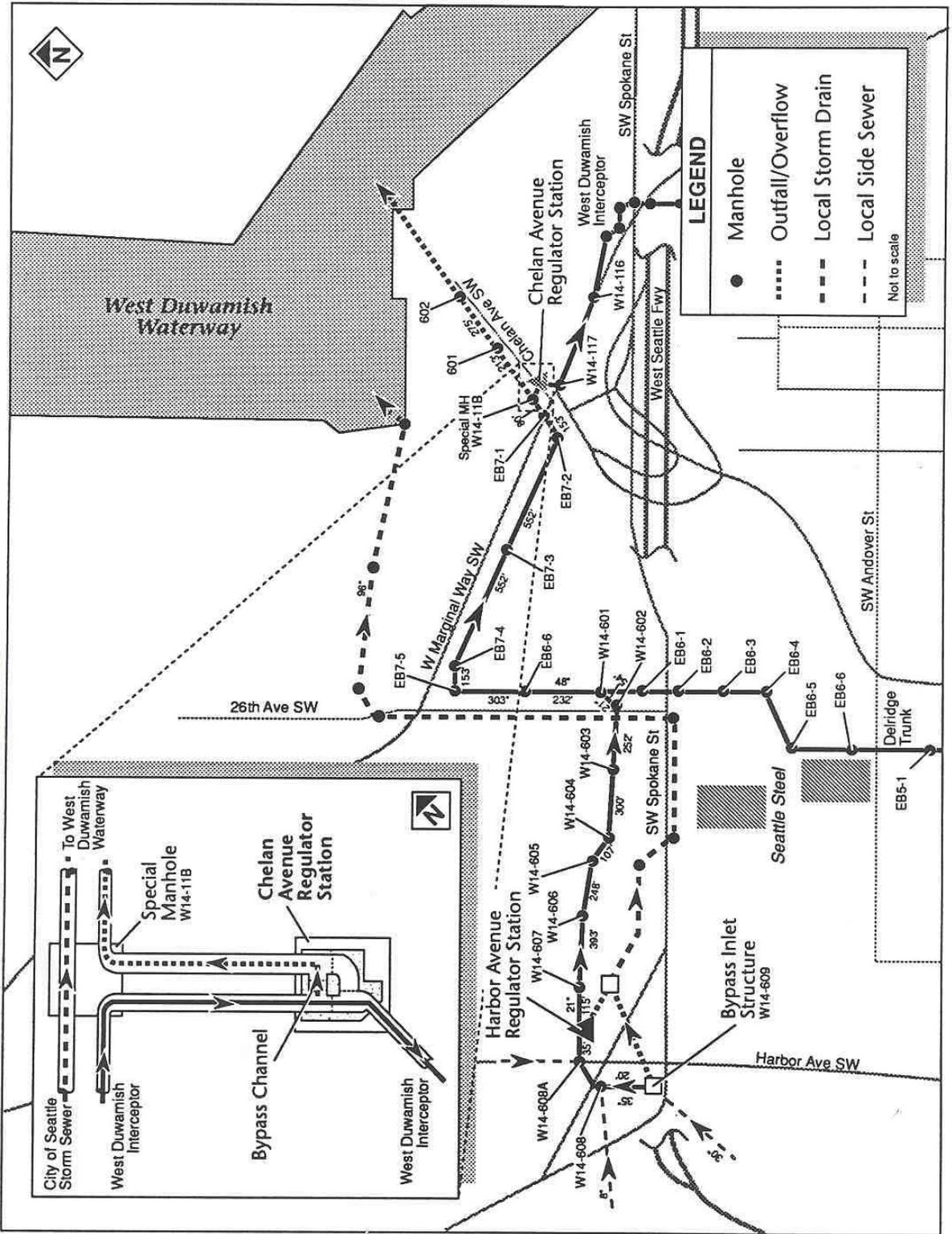
3455 Chelan Avenue SW, Seattle



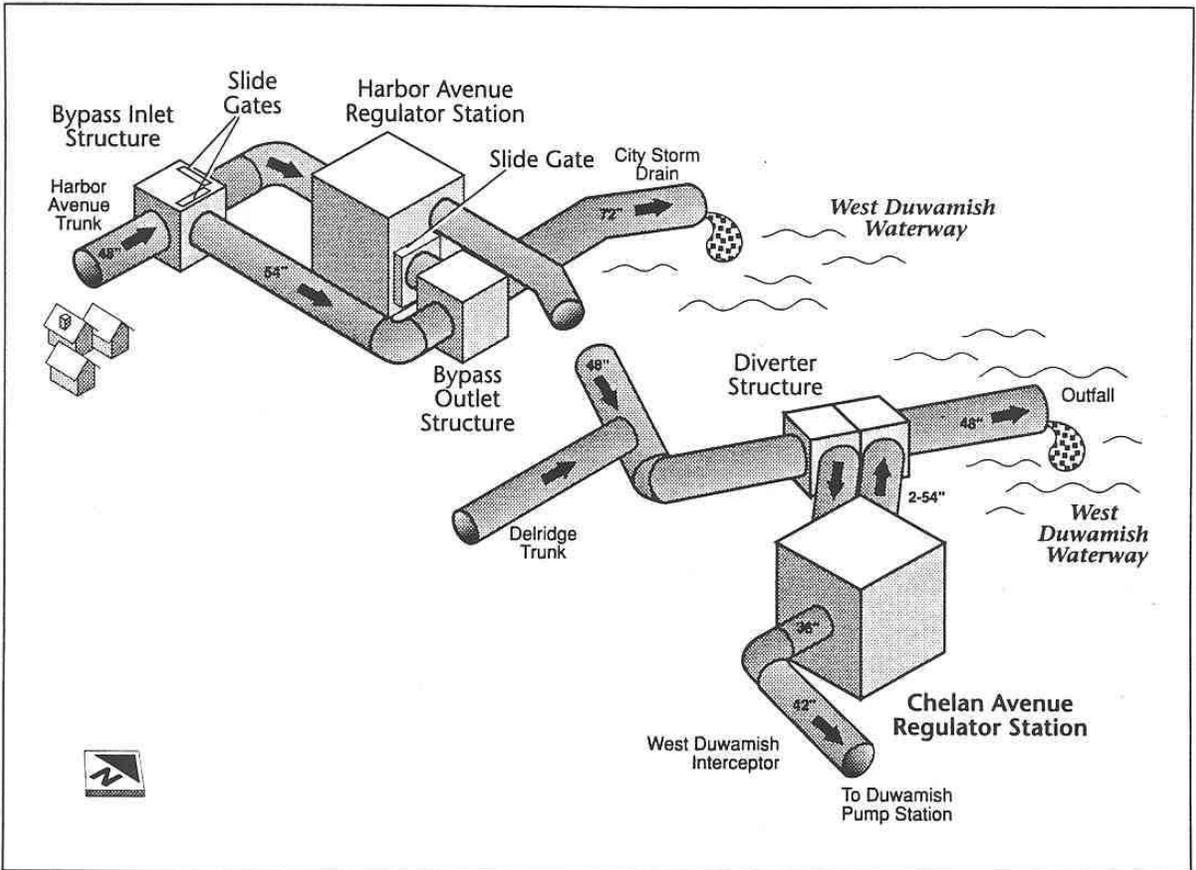
Directions

From the West Seattle Freeway, heading west, take the West Marginal Way Exit, and turn right onto Chelan Avenue SW. The station is located northeast of the intersection of Chelan Avenue SW and W Marginal Way.





One-Line Drawing



Flow Schematic

System Relationship

This station regulates flow from the Delridge Trunk, which serves the east side of West Seattle, into the West Duwamish Interceptor. Wastewater flows directly through the station into the interceptor.

Flow Information (mgd)

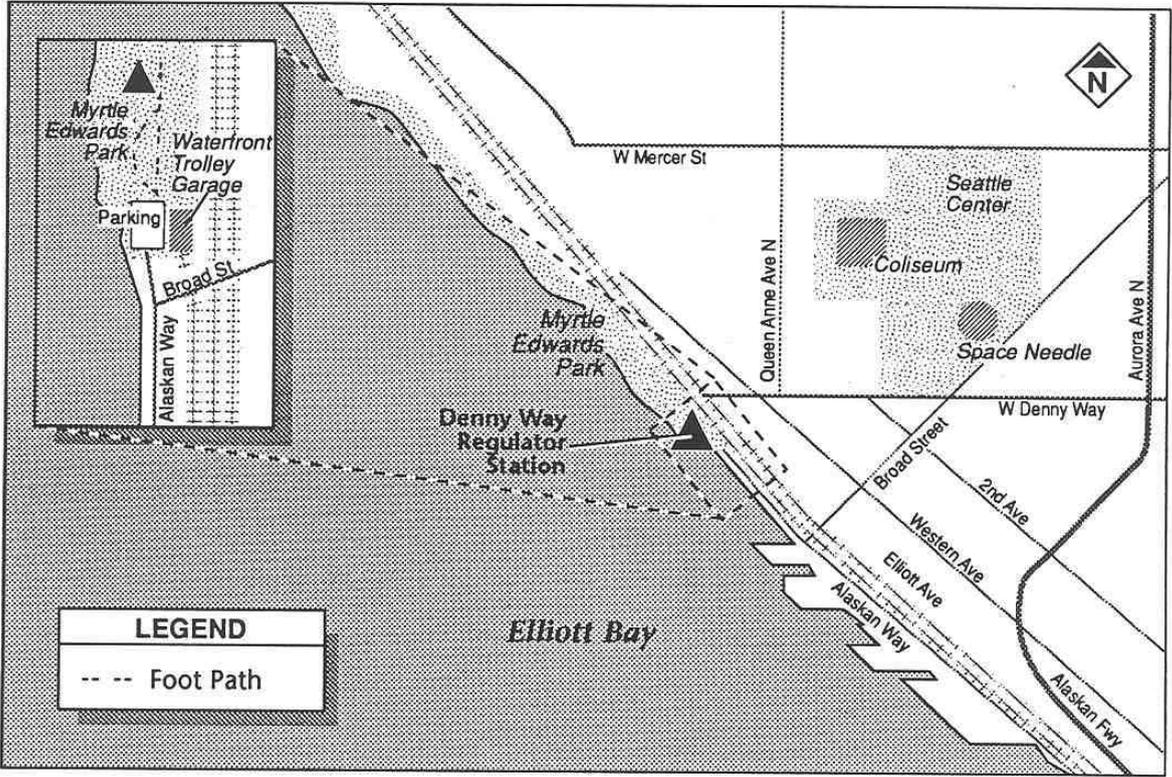
	<u>1980</u>	<u>2000</u>
Average Dry Weather:	3.6	3.6
Average Wet Weather:	5.4	5.4
Peak (not including Seattle stormwater inflow):	9.5	9.6

Critical Information

Emergency Power:	Standby Generator
Invert Elevations	
Regulator Gate:	100.13 feet
Outfall Gate:	99.56 feet
Emergency Overflow Weir:	108.50 feet
Outfall Location:	West Duwamish Waterway; through a 54-inch-diameter outfall channel to special manhole W14-118, 75 feet north of the station; then through parallel 48- and 30-inch-diameter outfalls

DENNY WAY REGULATOR STATION

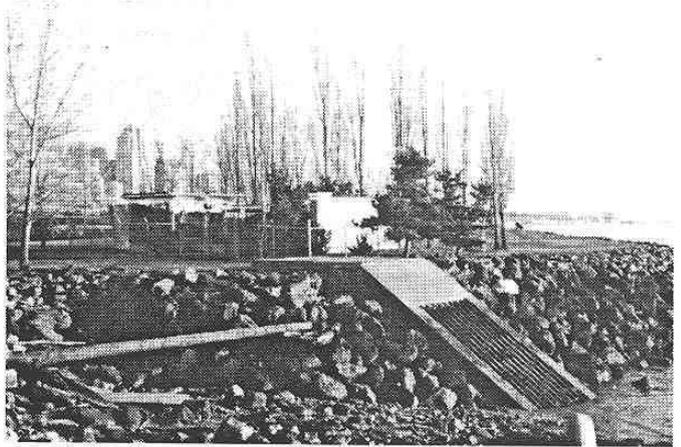
3165 Alaskan Way, Seattle

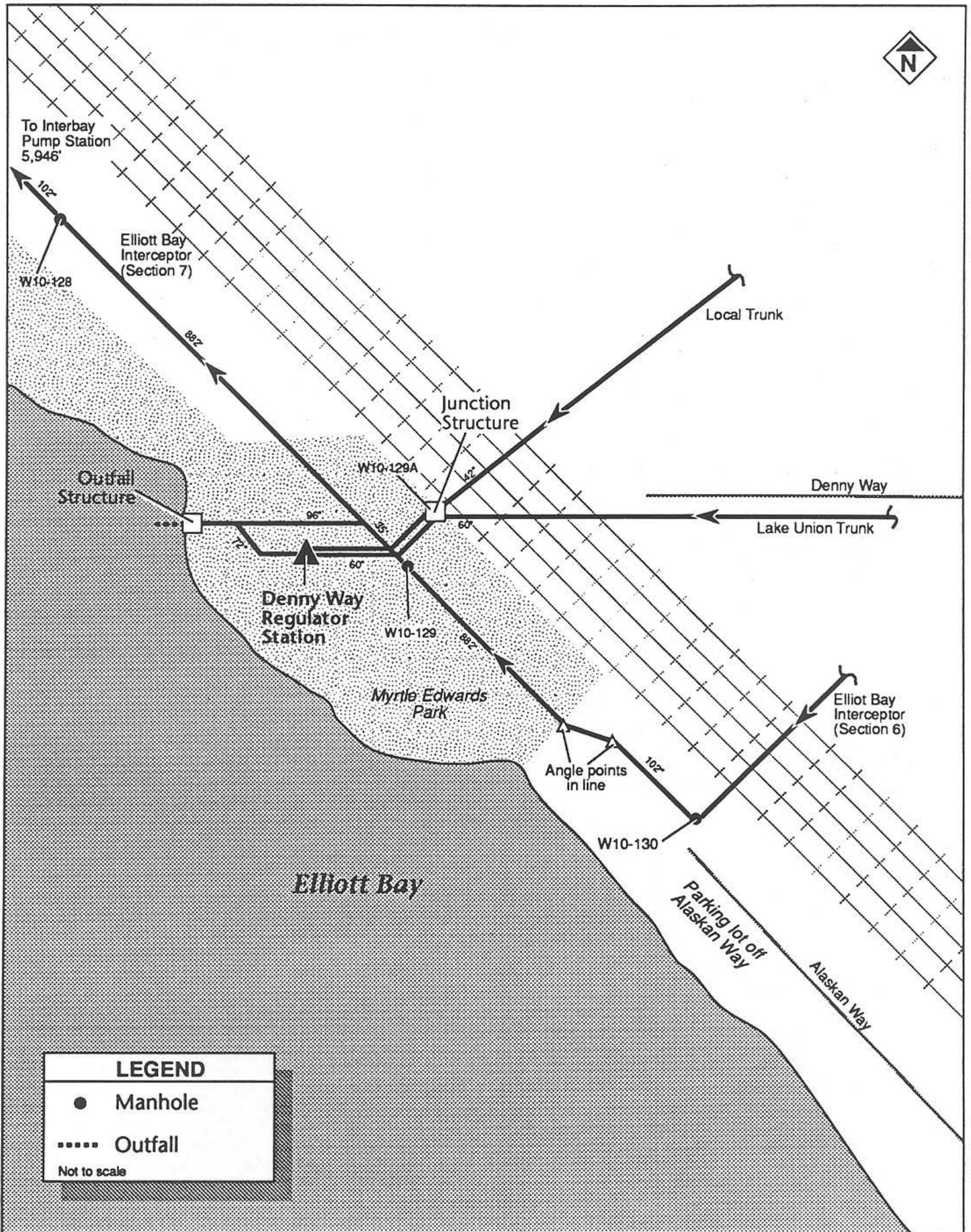


Directions

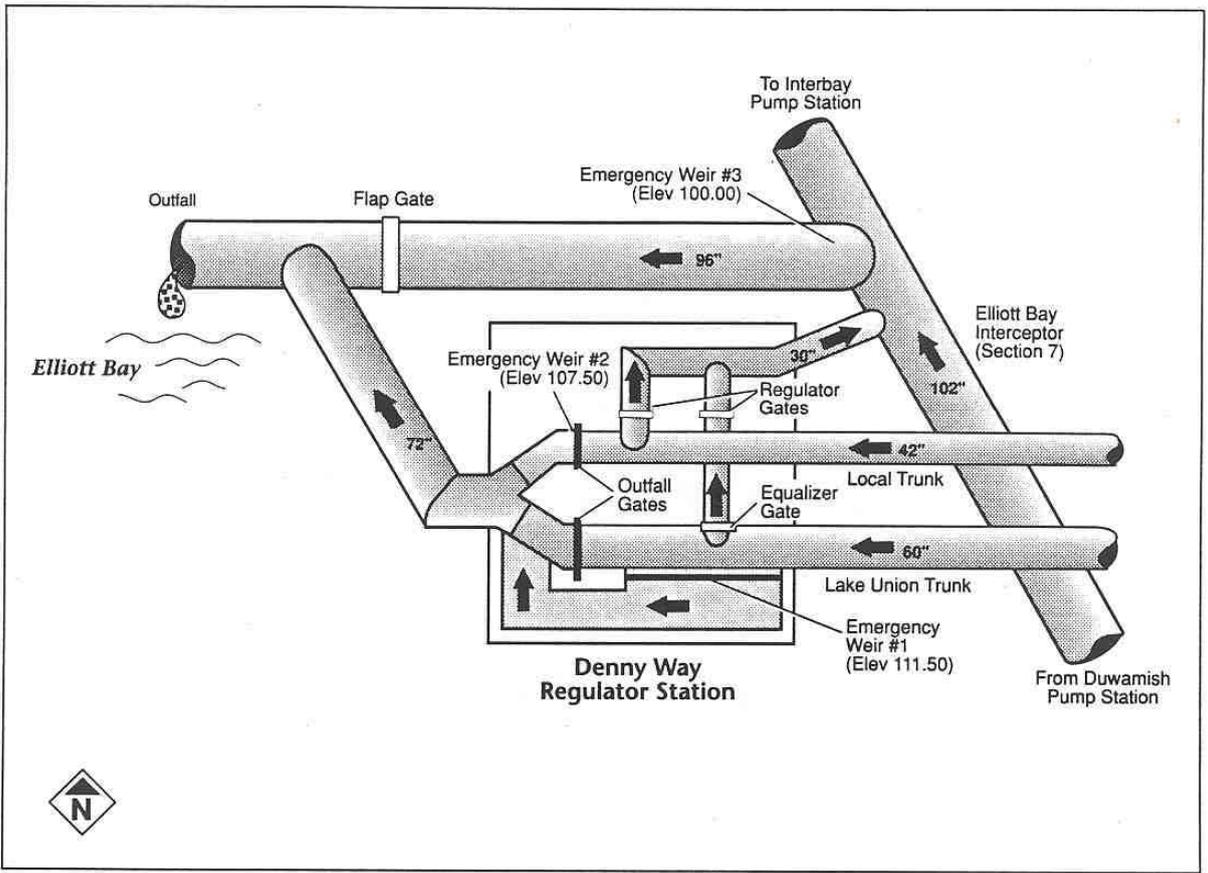
The station is located approximately 150 yards north of the southern entrance to the Myrtle Edwards Park.

To drive to the station, enter the Park's parking lot off of Alaskan Way, then unlock (with Met 1 key) the removable barriers at the entrance to the pedestrian/bike path before entering the park.





One-Line Drawing



Flow Schematic

System Relationship

The station is a dual regulator station that provides regulator and outfall gates, and emergency overflow weirs for the Lake Union Trunk and a local trunk. The regulator gates allow wastewater to flow into the Elliott Bay Interceptor. The outfall gates may be opened to relieve excess stormwater flow. Two emergency overflow weirs allow wastewater from the local and Lake Union trunks to bypass the outfall gates into the outfall line.

1991 Flow Information (mgd)

	Local Trunk	Lake Union Trunk
Average Dry Weather:	1.2	5.5
Average Wet Weather:	1.4	6.5
Peak (not including Seattle stormwater inflow):		12.0

Critical Information

Emergency Power: Standby Generator

Invert Elevations

Lake Union Trunk

Regulator Gate: 97.20 feet

Emergency Overflow Weir: 111.50 feet

Local Trunk

Regulator Gate: 99.70 feet

Emergency Overflow Weir: 107.50 feet

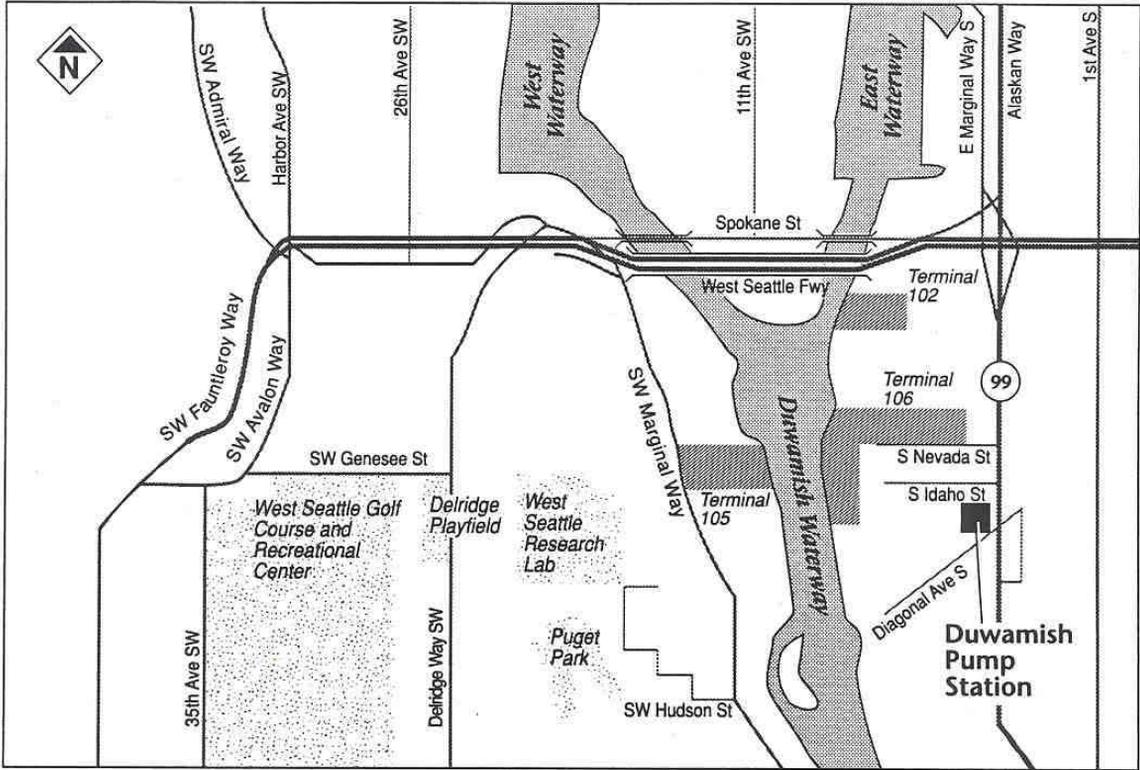
Interceptor

Emergency Overflow Weir: 100.00 feet

Outfall Location: Elliott Bay; through a 96-inch outfall line to the outfall structure at the shoreline

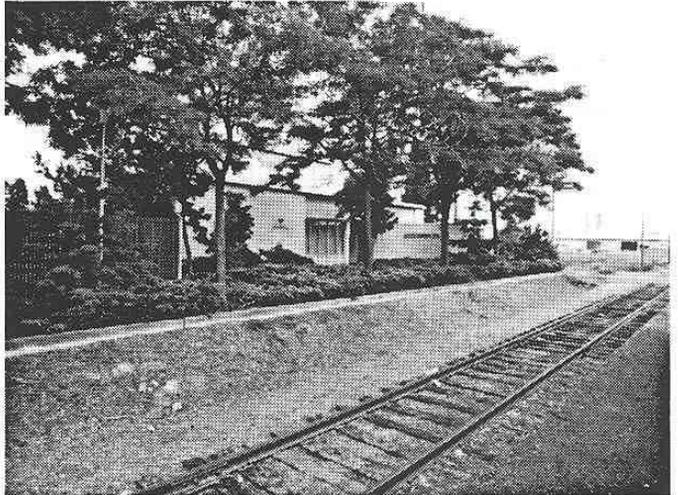
DUWAMISH PUMP STATION

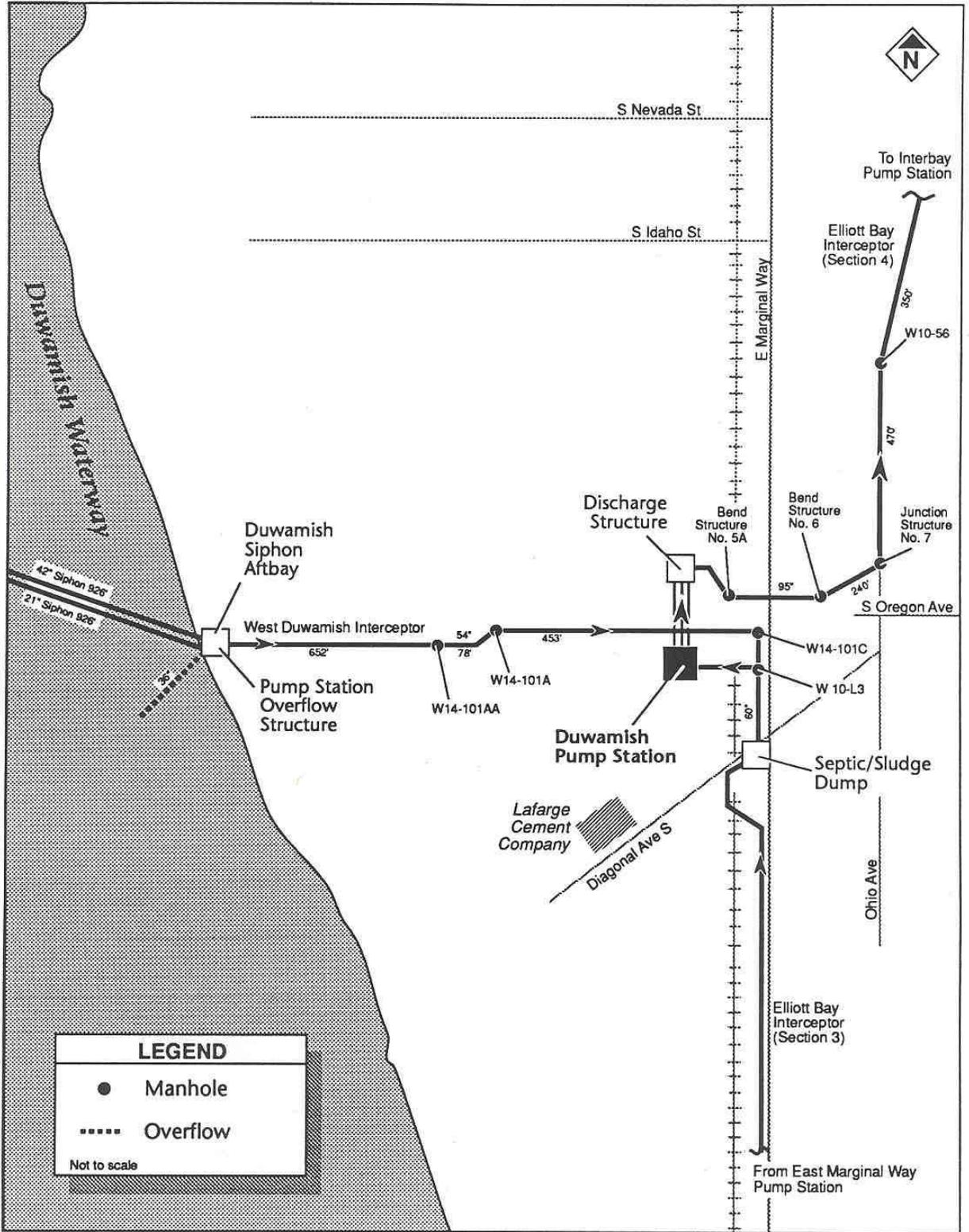
4501 E Marginal Way S, Seattle



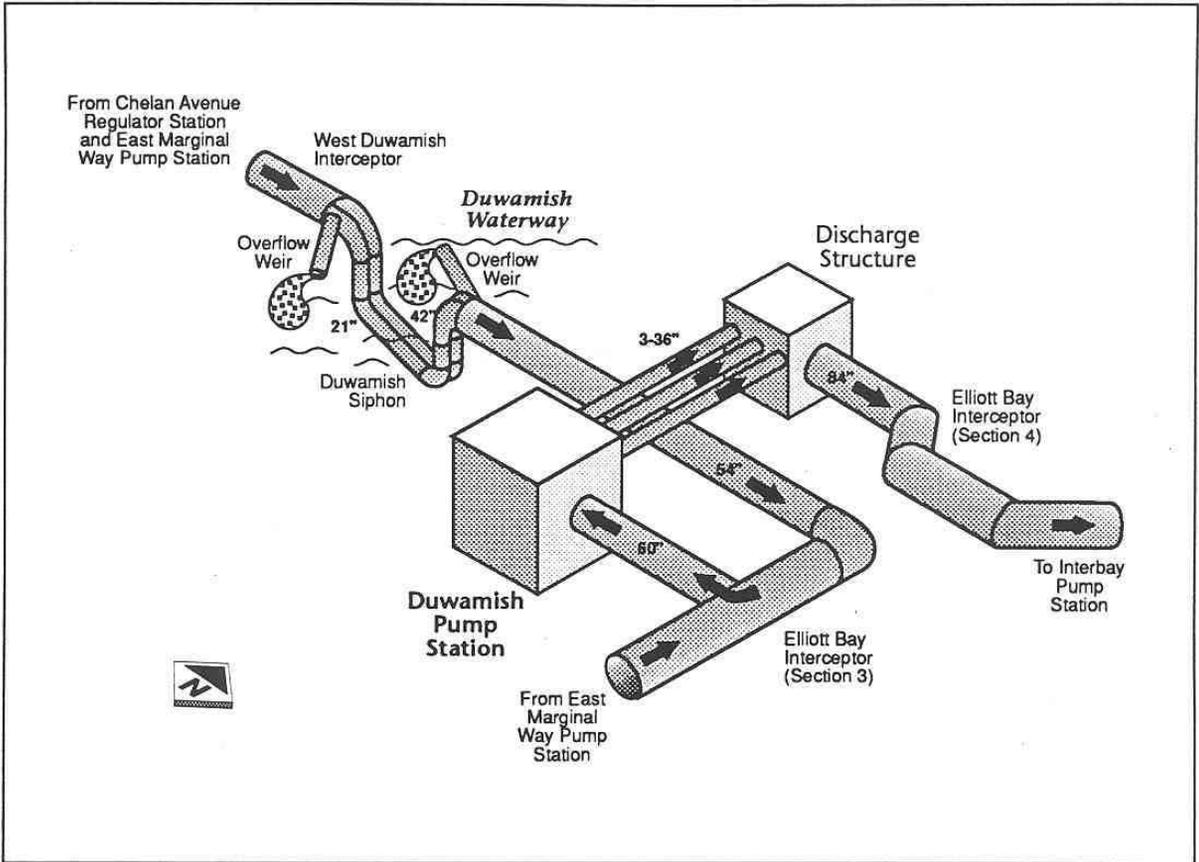
Directions

The station is located south of the West Seattle Freeway on the corner of Diagonal Avenue S and E Marginal Way S.





One-Line Drawing



Flow Schematic

System Relationship

This station receives flow from the south through the Elliott Bay Interceptor and from the West Duwamish Interceptor through the Duwamish Siphon. Wastewater pumped through the station continues through the Elliott Bay Interceptor to the Interbay Pump Station.

Flow Information (mgd)

	1980	2000
Average Dry Weather:	22.4	23.3
Average Wet Weather:	30.3	31.3
Peak (not including Seattle stormwater inflow):	59.5	62.5
Firm Pumping Capacity:	100.0	100.0

Overflow Cross Reference

See also *Duwamish Siphon Aftbay and Duwamish Pump Station Overflow Structure* in Section 2.

Critical Information

Emergency Power: None (generator receptacle)

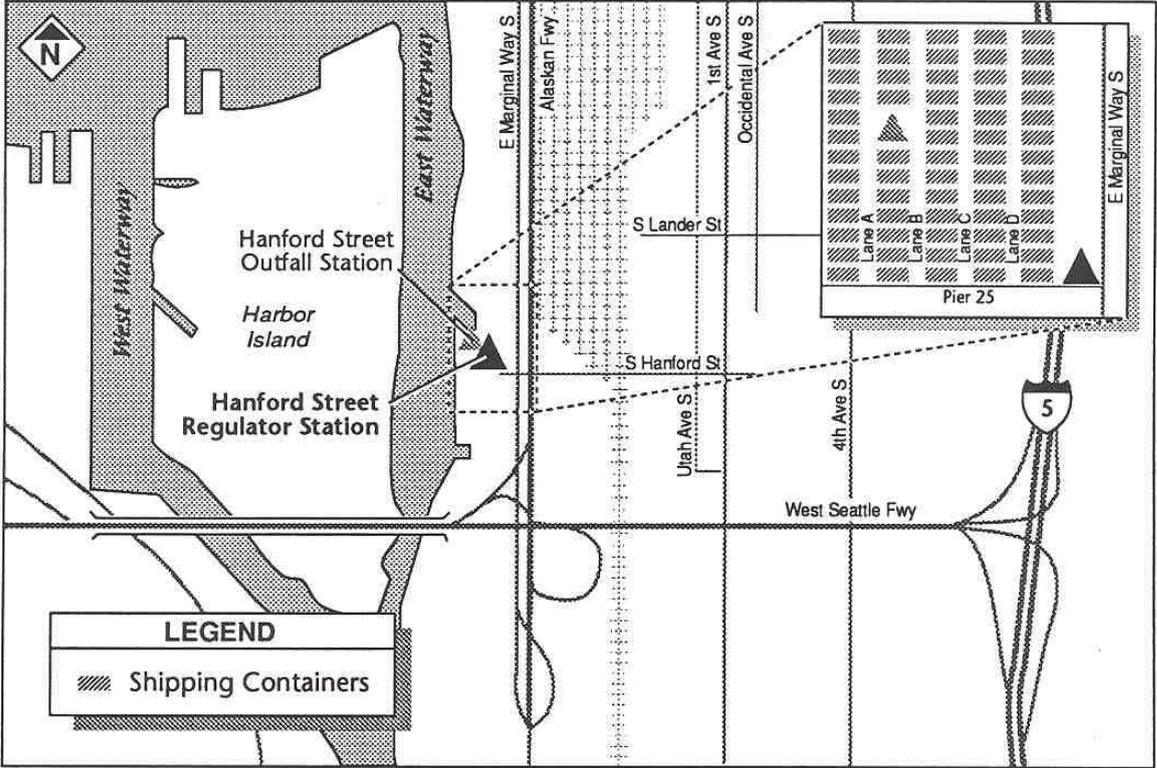
WARNING	
<i>Storage times represent the time allowed from shutdown to overflow under normal dry weather conditions. Storage times depend directly on weather conditions and condition of the pipes, and times must be adjusted accordingly.</i>	

Storage Time: 2 hours
 Overflow Elevation: 99.00 feet
 Overflow Location: Duwamish Waterway; at the Duwamish Siphon Aftbay through a 36-inch-diameter overflow line that is 50 feet long

Wet Well Grating Elevation: 99.18 feet

HANFORD STREET REGULATOR STATION

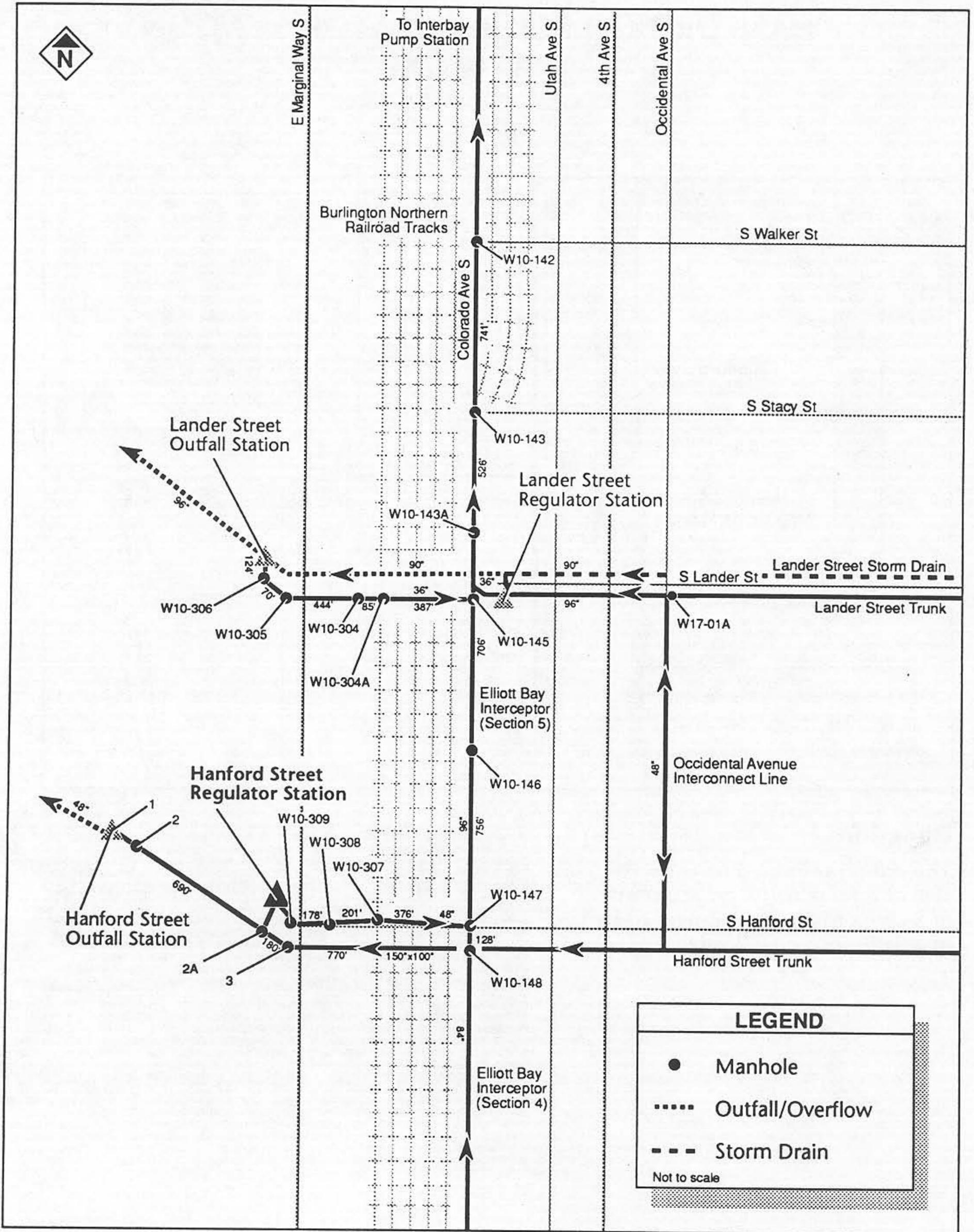
2999 E Marginal Way S, Seattle



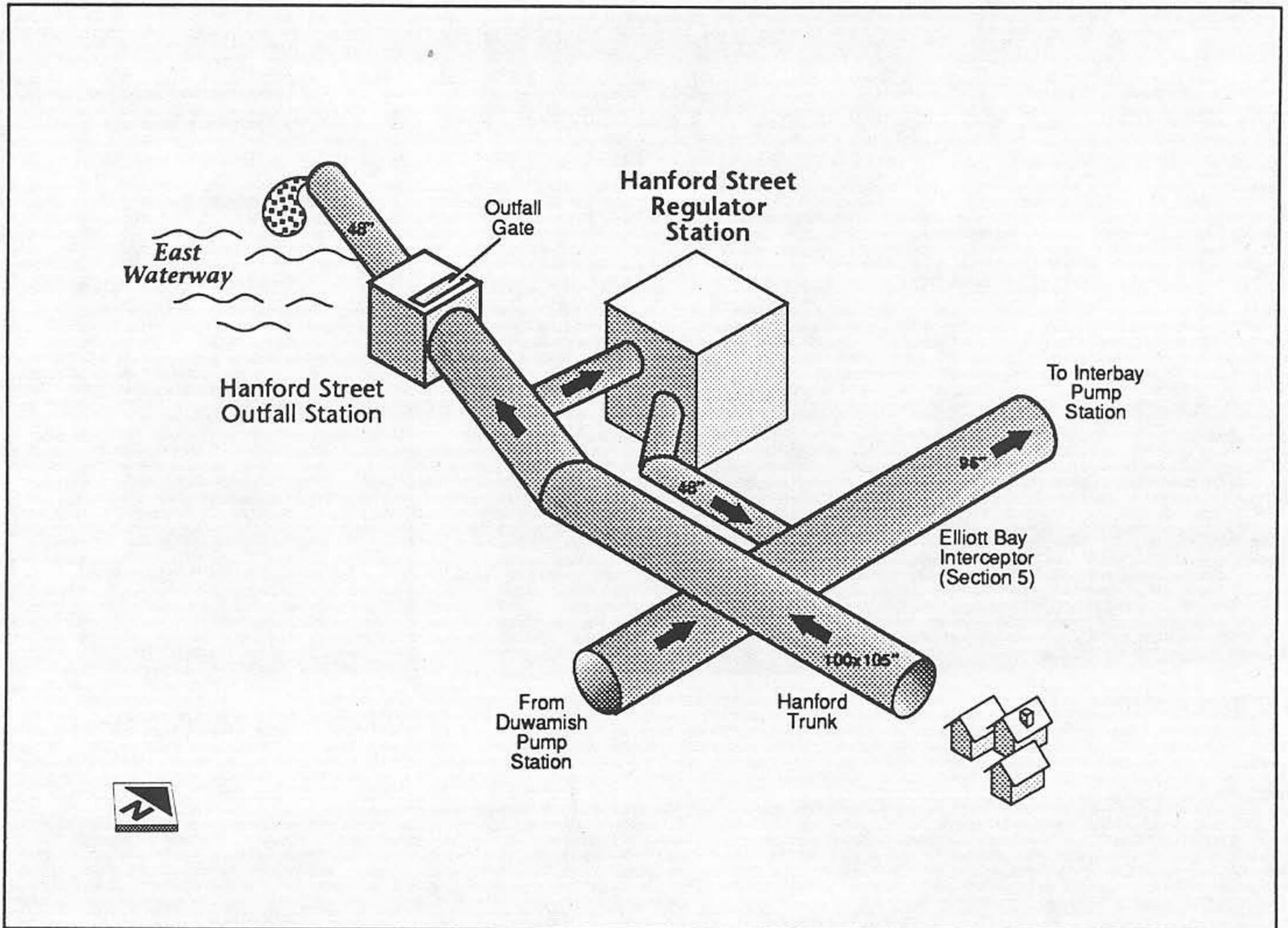
Directions

The station is located on the west side of E Marginal Way, just north of S Hanford Street, and next to Port of Seattle, Terminal 25 sign.





One-Line Drawing



Flow Schematic

System Relationship

This station regulates flow from the Hanford Trunk into the Elliott Bay Interceptor through 700 feet of 48-inch-diameter line. Excess stormwater overflows through the outfall station into the East Duwamish Waterway.

Critical Information

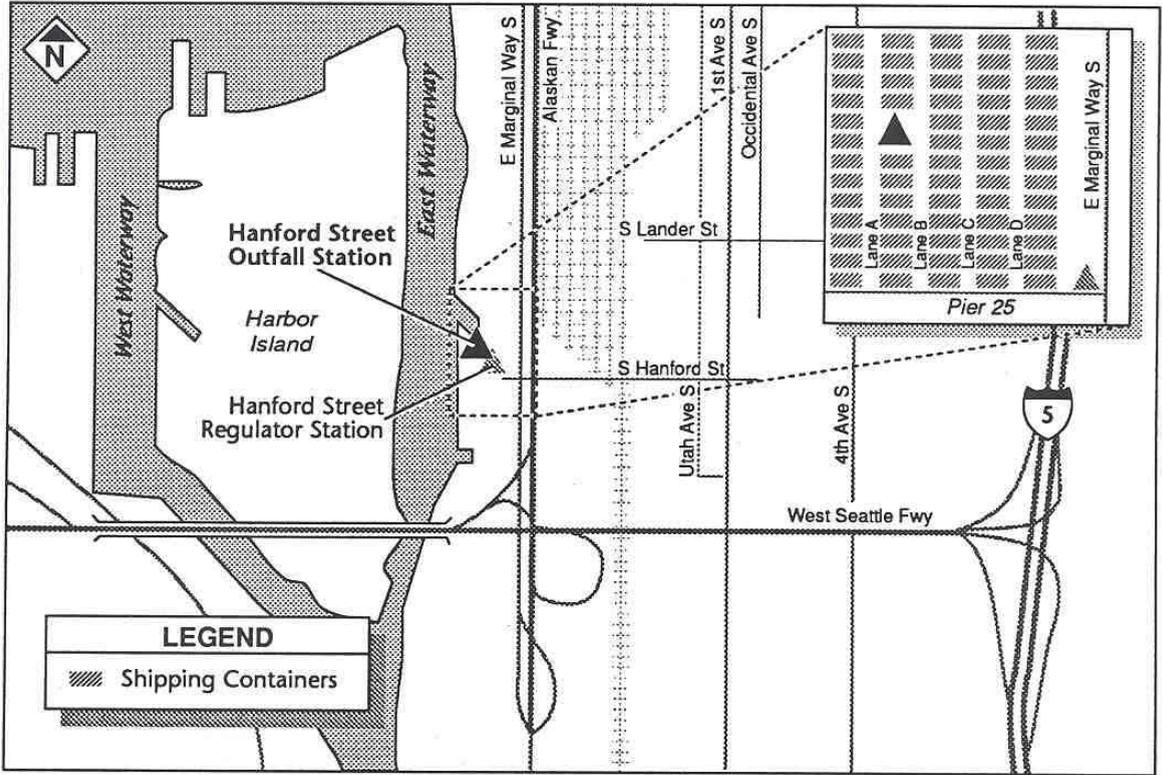
Emergency Power: Standby Generator
 Invert Elevation
 Regulator Gate: 99.50 feet
 Overflow Location: Duwamish Waterway; through the Hanford Street Outfall Station

Flow Information (mgd)

	<u>1980</u>	<u>2000</u>
Average Dry Weather:	6.5	6.3
Average Wet Weather:	9.5	9.3
Peak (not including Seattle stormwater inflow):	16.5	15.9

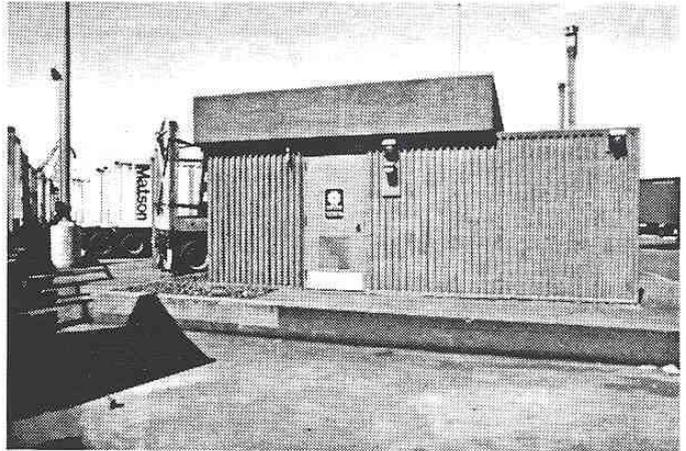
HANFORD STREET OUTFALL STATION

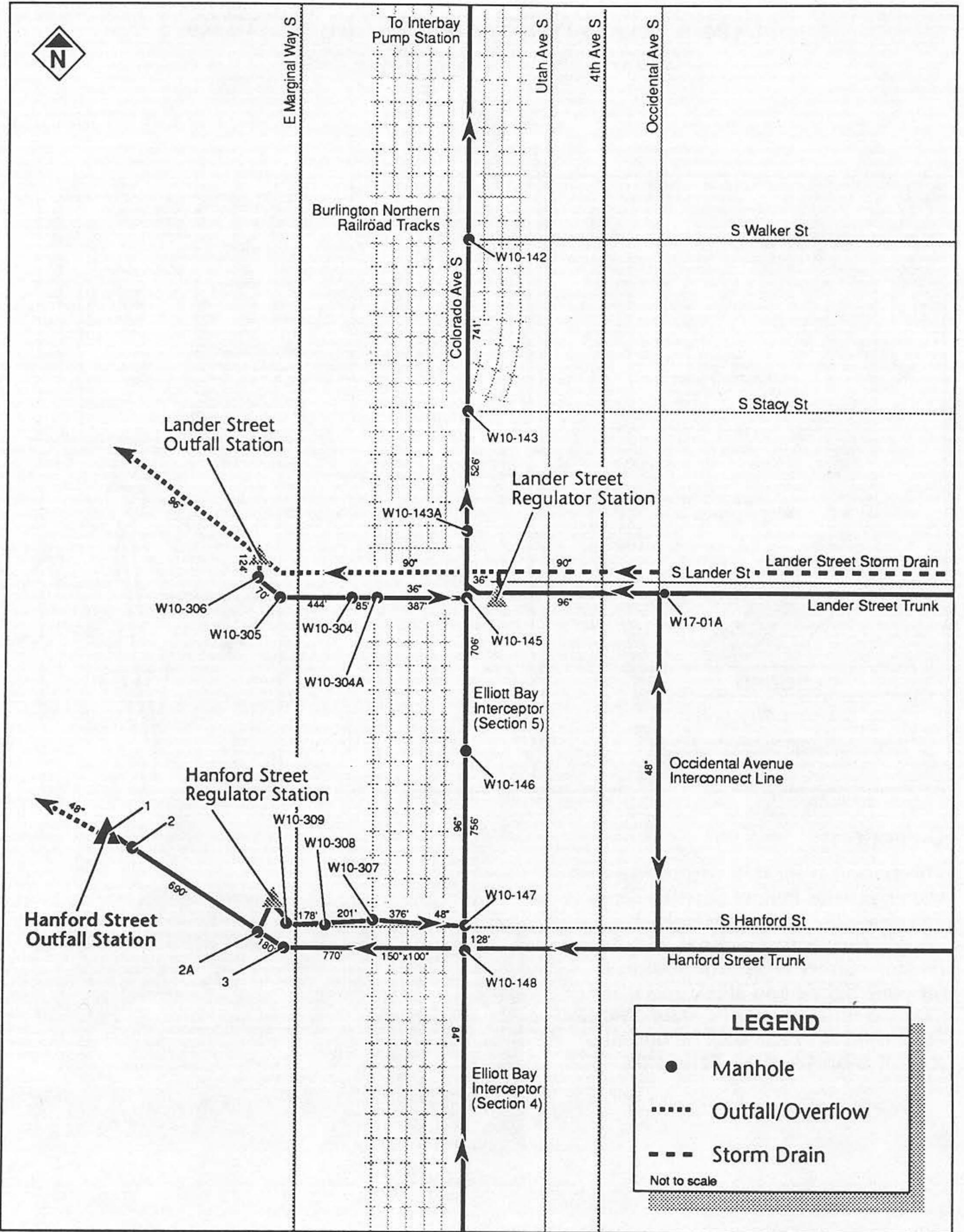
2999-1/2 E Marginal Way S, Seattle



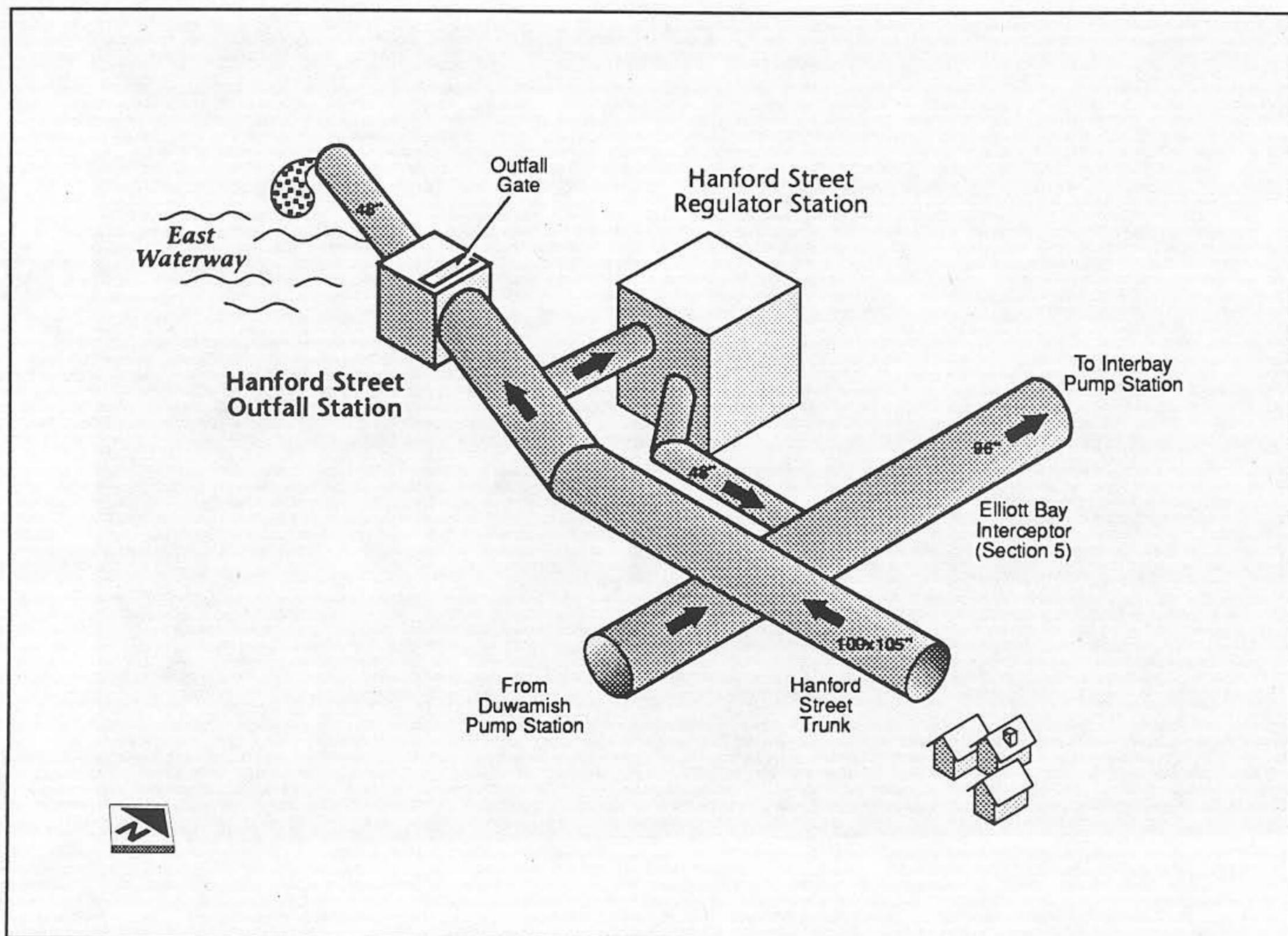
Directions

The station is located within the trailer yard of Port of Seattle, Terminal 25. From E Marginal Way S, turn into Terminal 25 (the Hanford Street Regulator Station is on your right-hand side), and drive past the entrance to the trailer yard. Turn right on Lane B. The outfall station is on your left-hand side.





One-Line Drawing



Flow Schematic

System Relationship

Excess stormwater overflows from Hanford Street Regulator Station through the station's outfall gate into the East Duwamish Waterway.

Flow/Construction Information

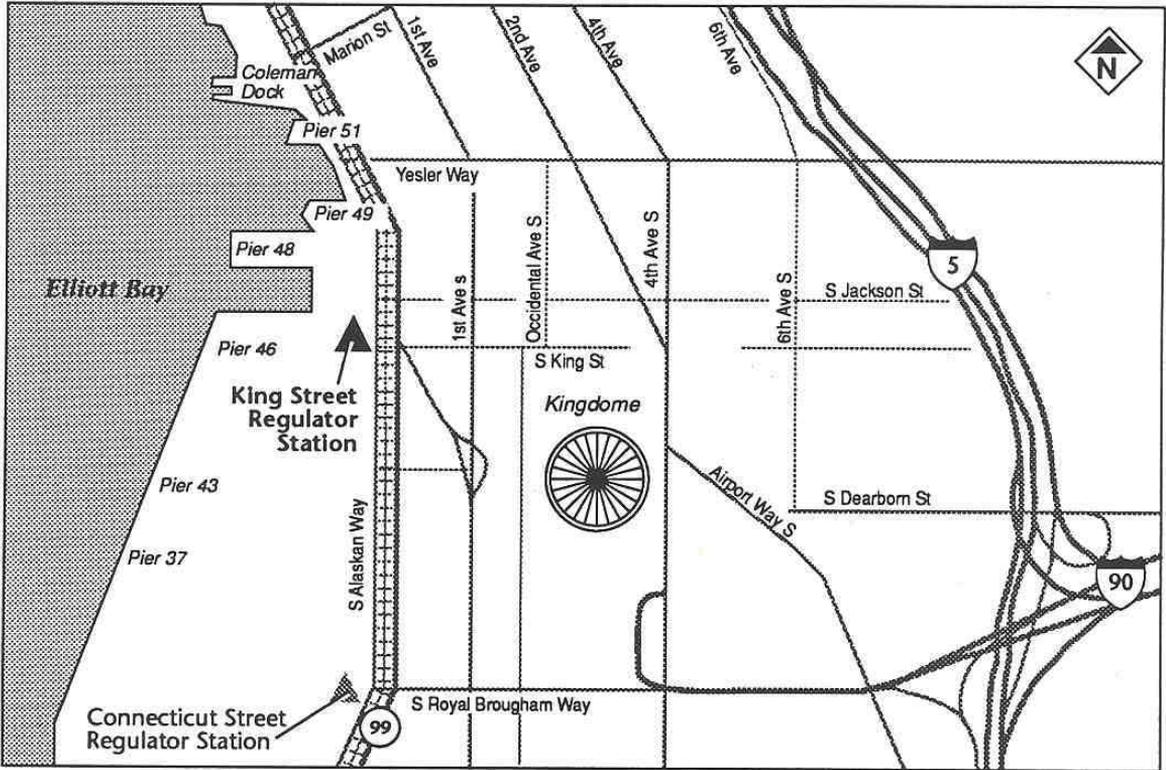
The Hanford Street Regulator Station and Hanford Street Outfall Station are considered one system. See *Hanford Street Regulator Station* for information.

Critical Information

Emergency Power:	Standby Generator
Invert Elevation	
Outfall Gate:	98.00 feet
Overflow Location:	Duwamish East Waterway; through a 144- by 96-inch-diameter outfall gate into a 48-inch-diameter submarine outfall 150 feet long

KING STREET REGULATOR STATION

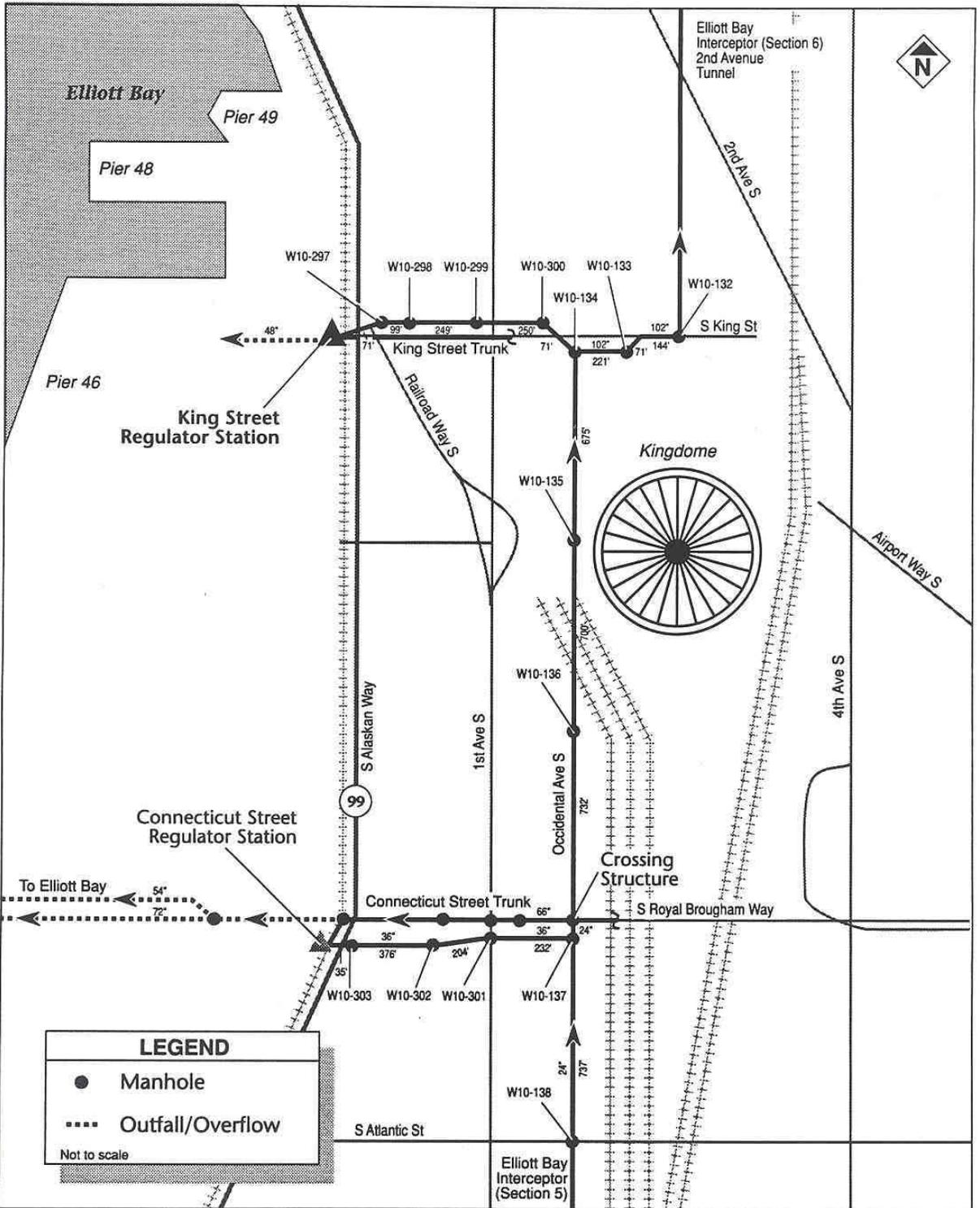
499 Alaskan Way S, Seattle



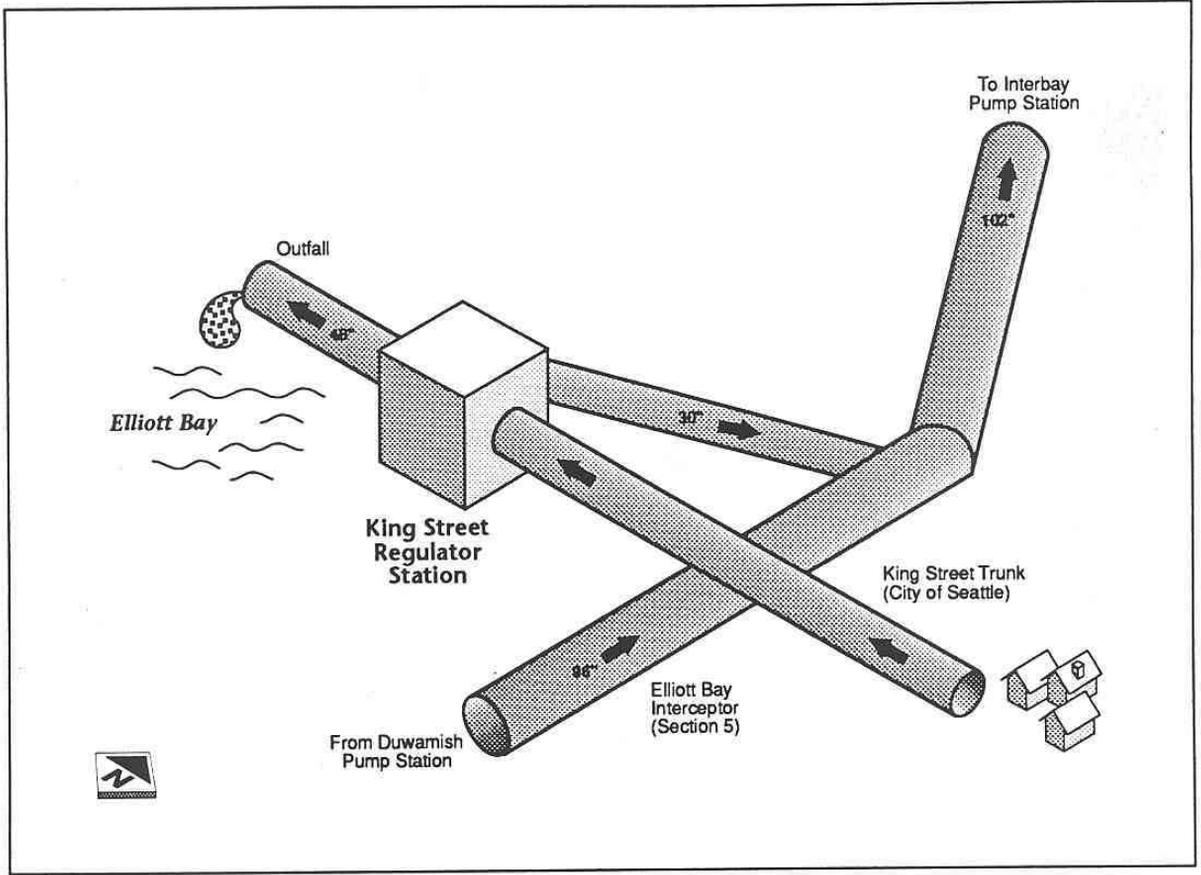
Directions

The station is located on the west side of Alaskan Way S, just north of S King Street. Pier 46 is to the south of the station.





One-Line Drawing



Flow Schematic

System Relationship

This station regulates flow from the waterfront area between King and Columbia streets through 734 feet of 42-inch-diameter line into the Elliott Bay Interceptor.

Flow Information (mgd)

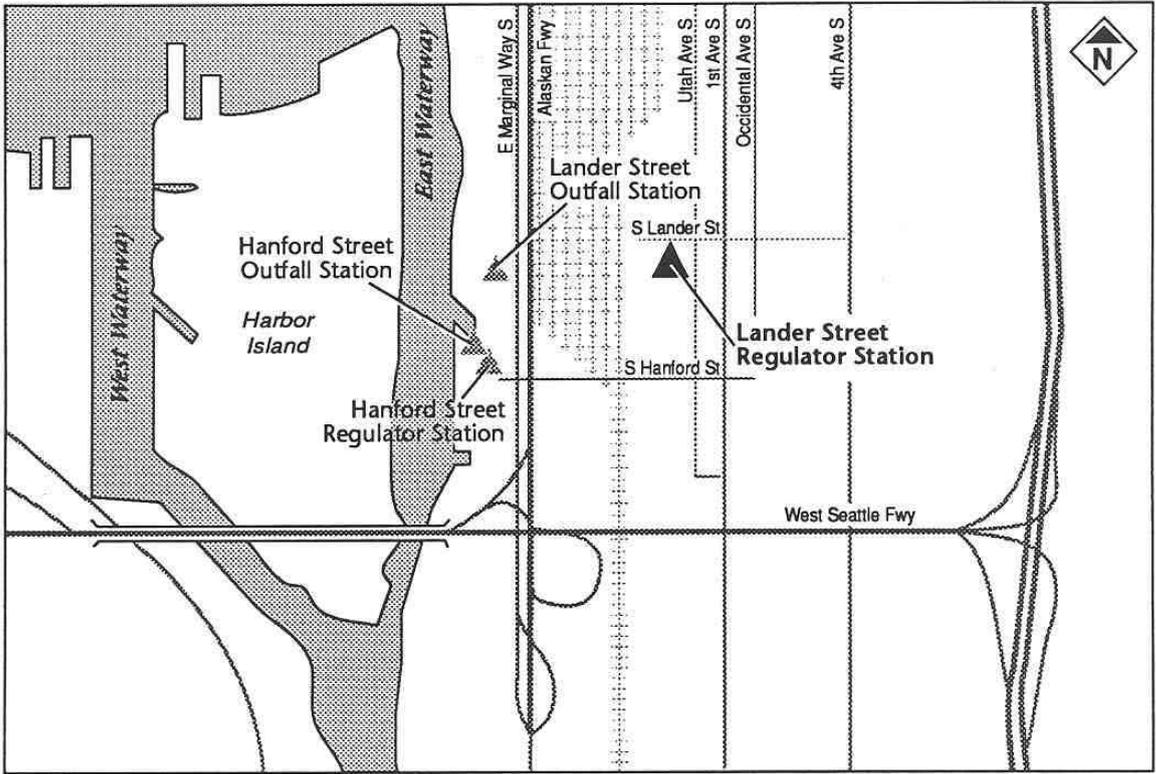
	1980	2000
Average Dry Weather:	2.1	1.9
Average Wet Weather:	2.2	2.0
Peak (not including Seattle stormwater inflow):	5.7	4.6

Critical Information

Emergency Power:	Standby Generator
Invert Elevations	
Regulator Gate:	104.50 feet
Outfall Gate:	103.95 feet
Emergency Overflow Weir:	108.02 feet
Overflow Location:	Elliott Bay; through a 48-inch-diameter outfall line that discharges 150 feet offshore at a depth of 20 feet

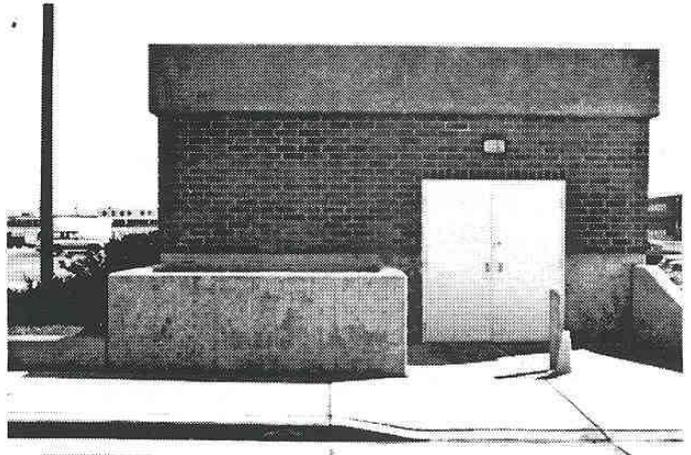
LANDER STREET REGULATOR STATION

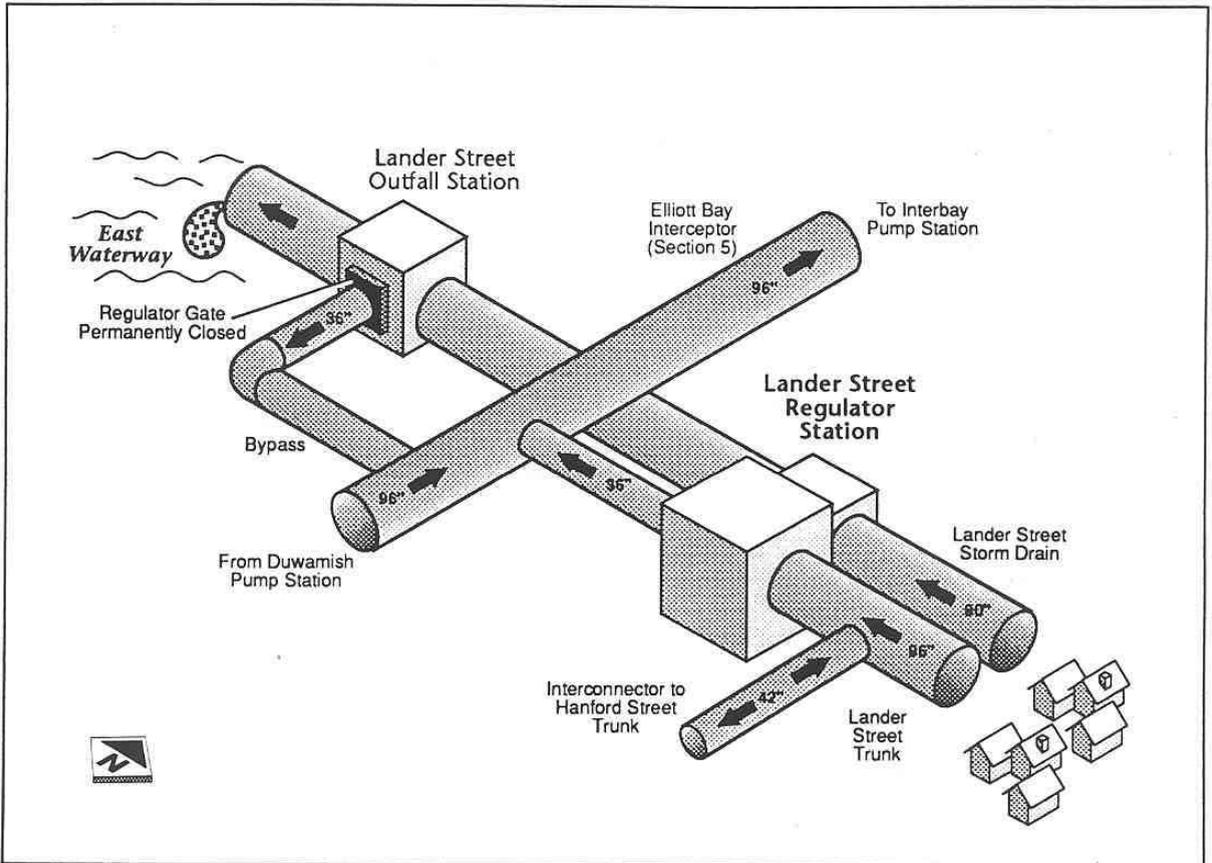
Colorado Avenue S and S Lander Street, Seattle



Directions

From 1st Avenue S, turn onto S Lander Street heading west. The station is located at the end of the street, on the left-hand side and next to the railroad tracks. Next to the station is the Sears and SODO Building.





Flow Schematic

System Relationship

The Lander Street Regulator Station works in conjunction with the Hanford Street Regulator Station to regulate the flow of wastewater and stormwater from the Lander and Rainier Valley Basins into the Elliott Bay Interceptor (EBI). The Lander Street Regulator Station collects flows from the Lander Street Trunk and, when storm flows are low, from the Lander Street Storm Drain, which parallels the trunk. As flows increase, the station sends stormwater to the Duwamish East Waterway via the storm drain and outfall, and restricts wastewater flow to the EBI by storing it in upstream lines. When the storage capacity is exceeded, the excess wastewater is diverted to the storm drain and a combined sewer overflow occurs.

Flow Information

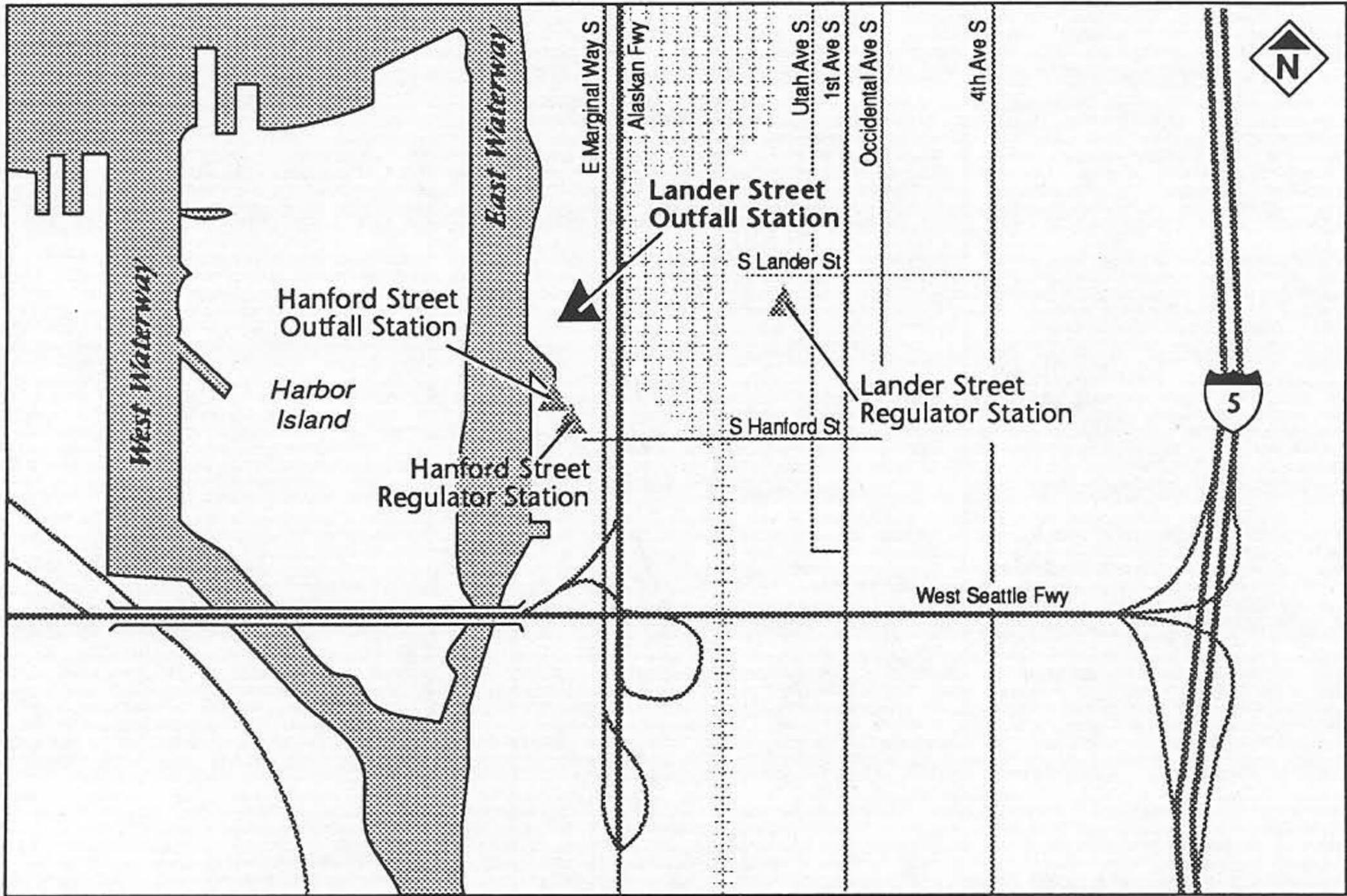
	<u>Current</u>
Average Dry Weather:	___ mgd/99.05 feet
Average Wet Weather:	___ mgd/101.20 feet
Peak:	___ mgd/107.00 feet

Critical Information

Emergency Power:	Standby Generator
Invert Elevations	
Regulator Gate:	98.50 feet
Overflow Weir:	108.00 feet
Overflow Location:	Duwamish East Waterway; through the 90-inch-diameter Lander Street Storm Drain to the Lander Street Outfall Station and out through a 96-inch-diameter outfall line

LANDER STREET OUTFALL STATION

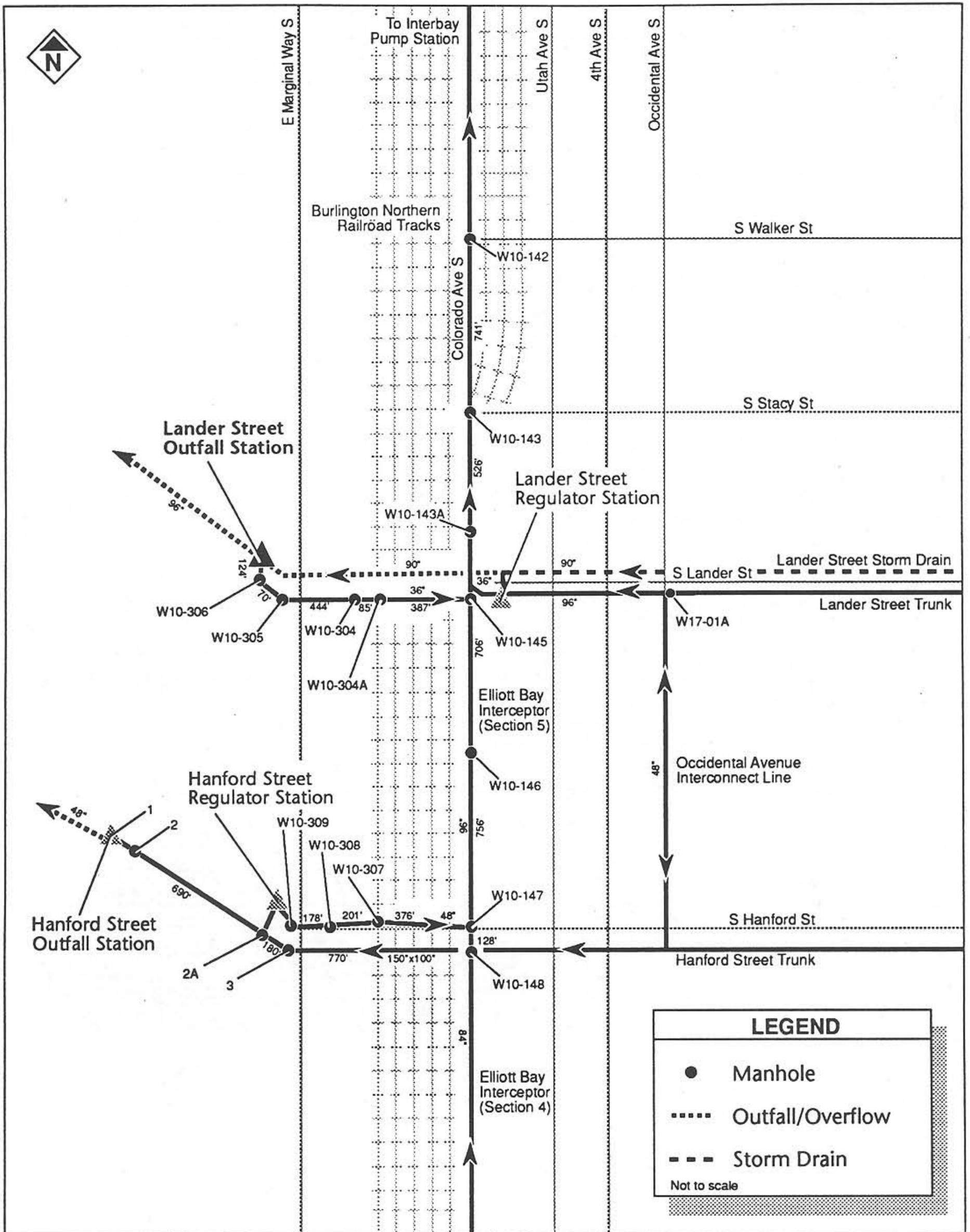
2701 East Marginal Way S, Seattle



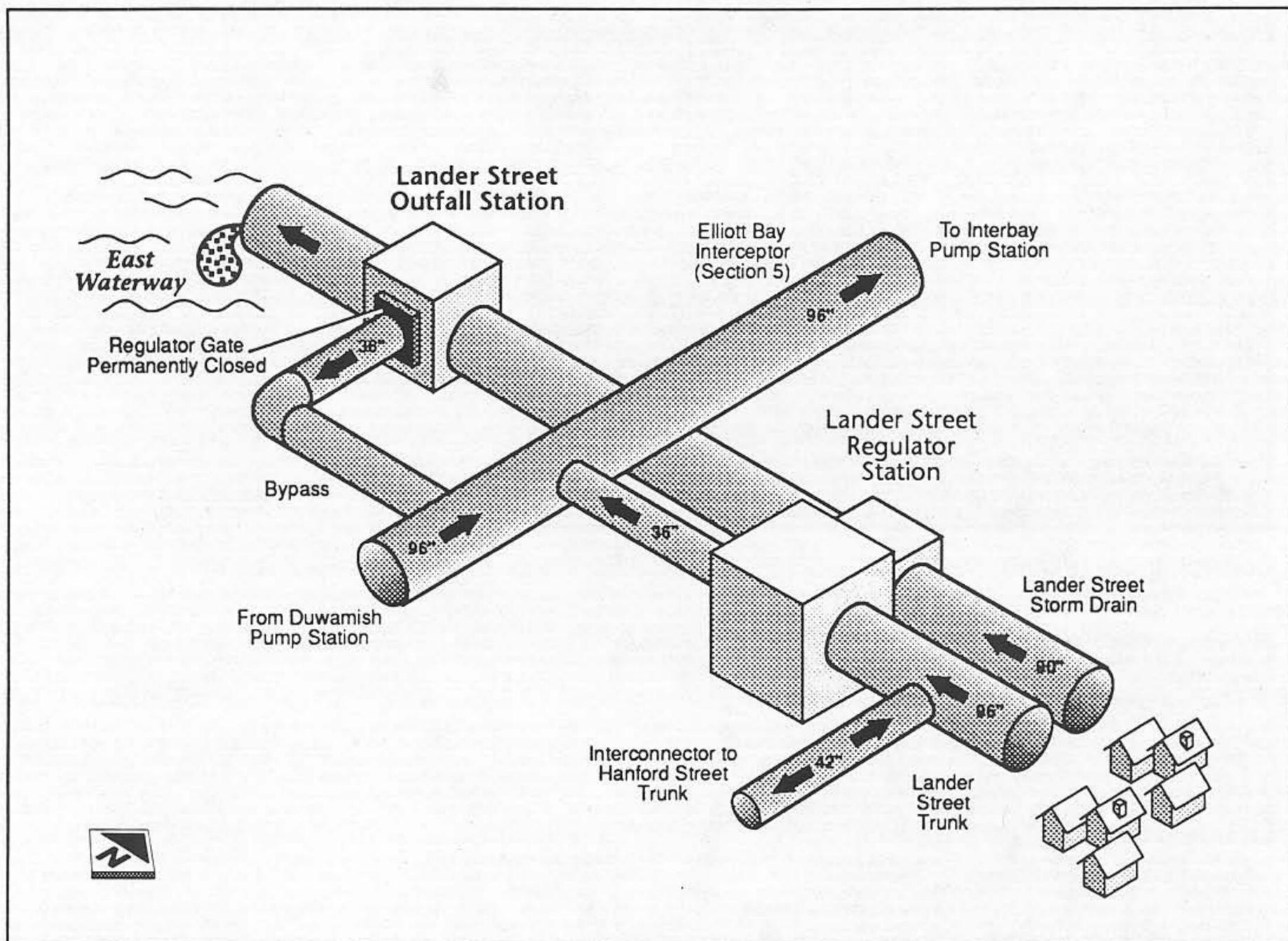
Directions

This station is located on the west side of East Marginal Way S and approximately five blocks north of the West Seattle Freeway.





One-Line Drawing



Flow Schematic

System Relationship

This station discharges flows from the Lander Street Storm Drain to the Duwamish East Waterway via an 96-inch-diameter outfall line.

See *Lander Street Regulator Station* for more information.

NOTE

This station is the old Lander Street Regulator Station. It used to regulate flow from the Lander Street Trunk into the Elliott Bay Interceptor. Although the station is equipped with a regulator, bypass and outfall gate, only the outfall gate is used.

Flow Information

See *Lander Street Regulator Station* for information.

Critical Information

Emergency Power:	Standby Generator
Invert Elevation	
Outfall Gate:	99.92 feet
Overflow Location:	Duwamish East Waterway; through a 96-inch-diameter outfall line that discharges 150 feet offshore at a depth of 20 feet