

Quality Assurance Project Plan

South Puget Sound Fish and Shellfish Tissue Verification of 303(d) Listings

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303(d) Listings Addressed in this Study:

Waterbody Name	New Waterbody ID	Old Waterbody ID	303(d)-Listed Parameter
Budd Inlet (Inner)	47122A8F9	WA-13-0030	Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene
Squaxin, Peale, and Pickering Passages	47122B9F0	WA-14-0010	Total PCBs
Squaxin, Peale, and Pickering Passages	47122C8J7	WA-14-0010	Total PCBs & Bis(2-ethylhexyl)phthalate
Case Inlet and Dana Passage	47122D8D0	WA-PS-0090	Bis(2-ethylhexyl)phthalate
Case Inlet and Dana Passage	47122B7J9	WA-PS-0090	Total PCBs & Bis(2-ethylhexyl)phthalate
Puget Sound (South)	47122B6G6	WA-PS-0300	Total PCBs & Bis(2-ethylhexyl)phthalate
Carr Inlet	47122C6B2	WA-15-0060	Total PCBs
Hale Passage (South)	47122C6G0	WA-15-0130	Total PCBs
Commencement Bay (Outer)	47122C4I2	WA-10-0010	Total PCBs & Bis(2-ethylhexyl)phthalate
Dalco Passage/Poverty Bay	47122D4C7	WA-PS-0280	Total PCBs
Dalco Passage/Poverty Bay	47122D4A5	WA-PS-0280	Total PCBs
Tacoma Narrows	47122D5C6	WA-PS-0070	Total PCBs
Puget Sound (South)	47122C5E6	WA-PS-0300	Total PCBs

Project Code: 06-094

Quality Assurance Project Plan

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Approvals

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Approved by: _____ Brandee Era-Miller, Project Manager, Watershed Ecology Section	November 15, 2005 _____ Date
Approved by: _____ Dale Norton, Unit Supervisor, Toxics Studies Unit	November 15, 2005 _____ Date
Approved by: _____ Will Kendra, Section Manager, Watershed Ecology Section	November 16, 2005 _____ Date
Approved by: _____ Stuart Magoon, Director, Manchester Environmental Laboratory	November 16, 2005 _____ Date
Approved by: _____ Stewart Lombard, Ecology Quality Assurance Coordinator	November 16, 2005 _____ Date

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A. 303(d) Listing Matrices

Abstract

Twelve open-water sites in the South Puget Sound and one intertidal area in lower Budd Inlet are listed on the Federal Clean Water Act, Section 303(d) List for violations of water quality standards. Listings include total PCBs and bis(2-ethylhexyl)phthalate in muscle tissue from English sole and rockfish and several polynuclear aromatic hydrocarbons in clams from the former Cascade Pole site in lower Budd Inlet.

These sites will be assessed to determine whether or not they should remain on Category 5 of the 303(d) List. The listed parameters will be analyzed in tissue and the results compared to the human health criteria specified by Ecology's Water Quality 303(d) Listing Policy.

Background

The Washington State Department of Ecology's (Ecology) Water Quality (WQ) Program has requested that twelve open-water sites in the South Puget Sound and one intertidal area in lower Budd Inlet be re-assessed for violations of water quality standards. These sites are listed on the Federal Clean Water Act, Section 303(d) List, for exceeding the National Toxics Rule (NTR) human health criteria for contaminants in bottom fish and clam tissue. The individual listing decisions for each site are shown in Appendix A.

These 303(d) listings are based on data older than nine years that, as a result, may no longer be indicative of current contaminant levels in bottom fish and clam tissue. The data collected in this study will be used in conjunction with existing information to evaluate current contaminant levels in tissue from 303(d) listed grids in South Puget Sound. Recommendations will be provided on the appropriate listing category for these grids. The data will also be useful in prioritizing areas to focus future efforts to reduce target contaminant levels.

South Puget Sound

The 303(d) listings for South Puget Sound came from a long-term fish tissue monitoring program conducted by the Washington State Department of Fish and Wildlife (West, et al., 2001) as part of the Puget Sound Ambient Monitoring Program (PSAMP). There are a total of twelve grid sites scattered throughout southern Puget Sound (see Figure 1 and Table 1).

These sites are listed for either total PCBs or bis(2-ethylhexyl)phthalate or both in English sole (*Pleuronectes vetulus*), copper rockfish (*Sebastes caurinus*), and quillback rockfish (*Sebastes maliger*) muscle tissue. These species were collected multiple times between 1992 and 1996 and the data were pooled in the final report. Table 1 compares the historic contaminant concentrations to the NTR human health criteria and shows the exceedances of the NTR criteria.

The Washington State Department of Fish and Wildlife is currently working on a conservation plan for copper rockfish and quillback rockfish (Sandie O'Neill, personal communication). These populations have been over-fished and, as a consequence, are dwindling in the Puget Sound. Ecology will, therefore, not re-sample the four grids listed for contaminants in rockfish tissue (see Figure 1). This leaves eight sites listed for English sole for Ecology to re-sample.

Total PCBs were historically used in the following ways: as insulating fluids, plasticizers, and pesticide extenders; in inks and carbonless paper; and as heat transfer and hydraulic fluids. PCBs were phased out of use and manufacture by EPA between 1977 and 1985 (EPA, 1992). They are considered to be probable human carcinogens. PCBs are commonly elevated in urban waterways and ports. Many areas of Puget Sound are influenced by cities and by urban stormwater runoff.

Bis(2-ethylhexyl)phthalate or BEHP is a manufactured chemical commonly added to plastics, principally PVC products, to make them flexible. It is in use today and is ubiquitous in the environment because of its use in plastics. There is a likelihood that the BEHP data from the PSAMP study reflect laboratory contamination (Jim West, WDFW, personal communication).

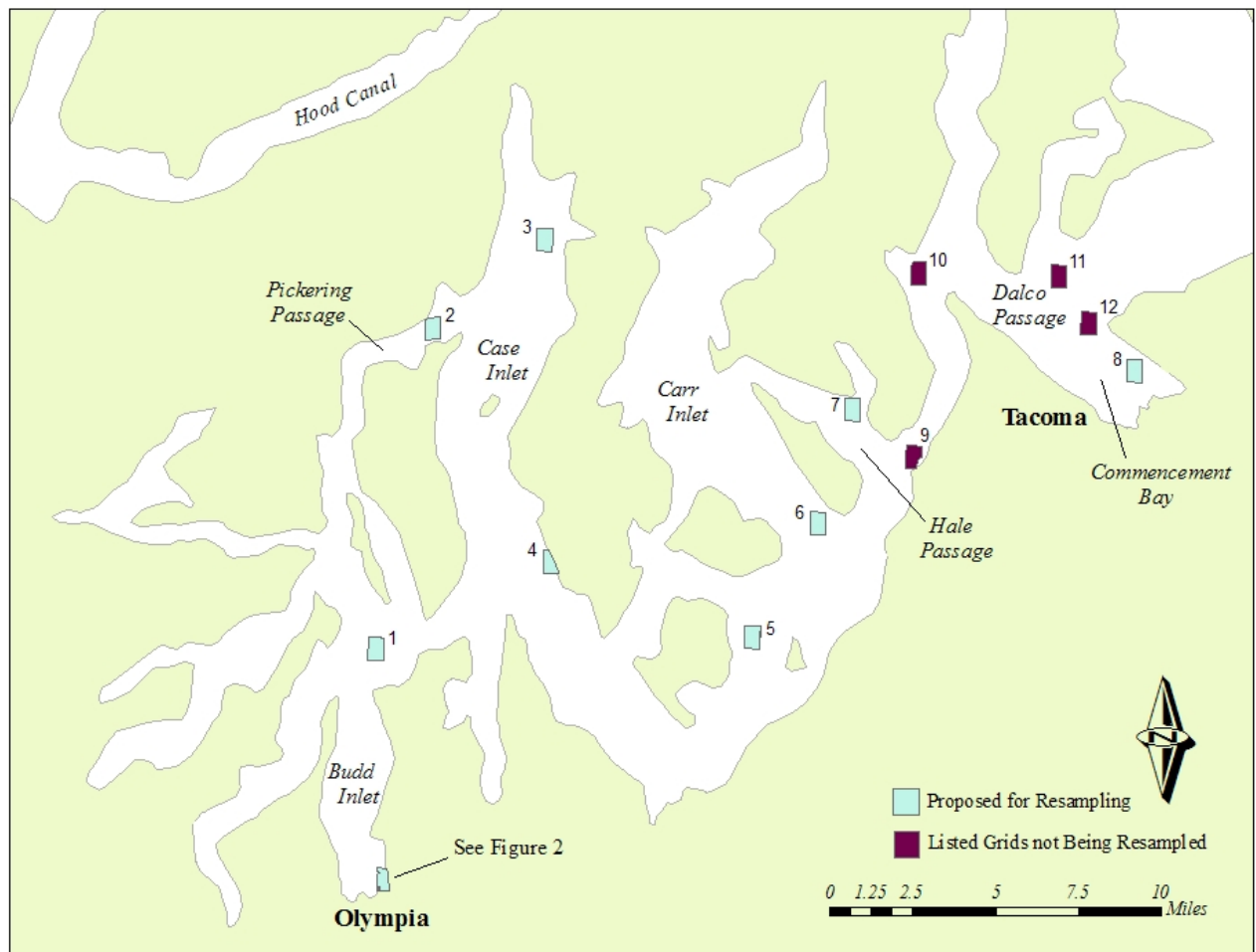


Figure 1. South Puget Sound Grids Listed for Toxics in Fish Tissue.

Table 1. Historic (1992 - 1996) Concentrations of 303(d) Listed Chemicals for South Puget Sound Bottom Fish

Site No. ¹	303(d) Waterbody Name	303(d) Listing ID	Historic PSAMP* Station Name	Waterbody ID	Species	303(d)-listed Parameter	Contaminant Concentrations (ug/kg ww)**			NTR Human Health criteria (ug/Kg ww)
							mean	min	max	
1	Squaxin, Peale, and Pickering Passages	35941	BDDINLET	47122B9F0	English Sole	Total PCB aroclors	8.7	4.3	17.5	5.3
2	Squaxin, Peale, and Pickering Passages	36025	PICKERNG	47122C8J7	English Sole	Total PCB aroclors	8.8	4	13.4	5.3
2	Squaxin, Peale, and Pickering Passages	35987	PICKERNG	47122C8J7	English Sole	Bis(2-ethylhexylphthalate)	727.7	100	1983	767
3	Case Inlet and Dana Passage	35988	CASEIN3	47122D8D0	English Sole	Bis(2-ethylhexylphthalate)	427.7	100	1083	767
4	Case Inlet and Dana Passage	36342	CASEIN1	47122B7J9	English Sole	Total PCB aroclors	15.3	9.5	21.9	5.3
4	Case Inlet and Dana Passage	36237	CASEIN1	47122B7J9	English Sole	Bis(2-ethylhexylphthalate)	622	100	1383	767
5	Puget Sound (South)	36340	NISQUALY	47122B6G6	English Sole	Total PCB aroclors	20.92	9.01	44.5	5.3
5	Puget Sound (South)	36340	NISQUALY	47122B6G6	English Sole	Total PCBs congeners	5.8	2.7	9.5	5.3
5	Puget Sound (South)	36235	NISQUALY	47122B6G6	English Sole	Bis(2-ethylhexylphthalate)	627.7	100	1683	767
6	Carr Inlet	36343	CARINLT1	47122C6B2	English Sole	Total PCB aroclors	13.6	7.1	19.3	5.3
7	Hale Passage (South)	36344	WOLLCHET	47122C6G0	English Sole	Total PCB aroclors	25.4	14.4	43.8	5.3
8	Commencement Bay (Outer)	35739	OUTRCOMM	47122C4I2	English Sole	Total PCBs aroclors	41.2	6	81.2	5.3
8	Commencement Bay (Outer)	35739	OUTRCOMM	47122C4I2	English Sole	Total PCB congeners	33.4	21.7	49.9	5.3
8	Commencement Bay (Outer)	35655	OUTRCOMM	47122C4I2	English Sole	Bis(2-ethylhexylphthalate)	1422	100	3683	767
9	Puget Sound (South)	35829	DAYISLND	47122C5E6	Copper rockfish	Total PCB aroclors	6.2	3.9	12	5.3
10	Tacoma Narrows	36346	GIGHARBR	47122D5C6	Quillback rockfish	Total PCBs aroclors	77.1	46.4	140.4	5.3
11	Dalco Passage/Poverty Bay	36345	DALCOPAS	47122D4C7	Quillback rockfish	Total PCB aroclors	64.2	4	124.4	5.3
12	Dalco Passage/Poverty Bay	35743	BNSPNT	47122D4A5	Quillback rockfish	Total PCB aroclors	74.7	68	81.3	5.3
12	Dalco Passage/Poverty Bay	35743	BNSPNT	47122D4A5	Quillback rockfish	Total PCBs congeners	3.5	2.6	4.3	5.3

¹ Site Numbers correspond with Figure 1.

* Puget Sound Ambient Monitoring Program

** Contaminant concentrations were pooled in the report (West, et. al., 2001)

Bolded values exceed NTR Human Health criteria

Lower Budd Inlet

The 303(d) listed grid in lower Budd Inlet that will be evaluated in this study is shown in Figure 2. The listings came from a 1985 investigation by Ecology of the intertidal area surrounding the Cascade Pole Company wood treatment facility (Norton, 1986), where high concentrations of PAHs (polynuclear aromatic hydrocarbons) were found in soft shell clam (*Mya arenaria*) tissue.

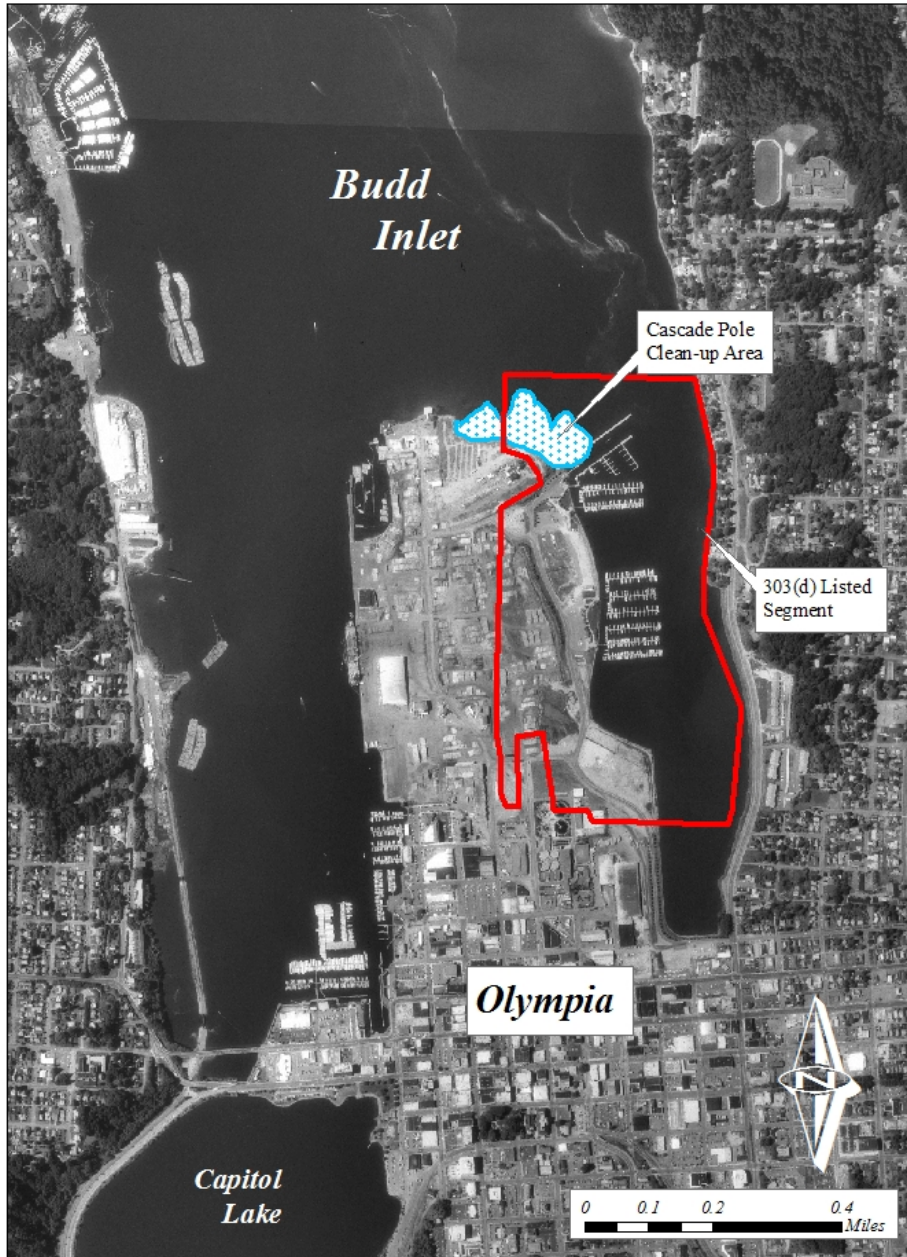


Figure 2. Budd Inlet Showing the Cascade Pole Sampling Area

Table 2 compares the PAH levels that were found during the investigation to the NTR human health criteria. Concentrations of chrysene, benzo(a)anthracene, benzo(b)fluoranthene, and benzo(k)fluoranthene were found to be two-to-three orders of magnitude higher than the NTR human health criteria.

Table 2. 303(d) listed PAHs in Soft Shell Clam Tissue from lower Budd Inlet near Cascade Pole in 1985.

303(d) Listed Parameter	Concentration (ug/Kg ww)	NTR Human Health Criteria (ug/Kg ww)
Chrysene	110	0.93
Benzo(a)anthracene	77	0.93
Benzo(b)fluoranthene & Benzo(k)fluoranthene	91	0.93

From 1957 until 1986, the Cascade Pole Company operated a wood-treating facility on property leased from the Port of Olympia. Other wood-treating businesses also operated at the site prior to 1957. During numerous investigations of the site, many toxic chemicals related to wood preserving substances such as creosote were found at elevated concentrations in soils, groundwater, surface water, intertidal sediments, and marine organisms adjacent to the site. Toxic chemicals included PAHs, pentachlorophenol (PCP), volatile hydrocarbons, and dioxins. Many of these chemicals are known human carcinogens (Duerr, 2004).

During 2001 and 2002, after years of much public debate, court settlements, and other clean-up actions at the site, 42,000 cubic yards of contaminated intertidal sediment were removed from Budd Inlet (Figure 2) and stored in an on-site upland containment area (Mohsen Kourehdar, Ecology, personal communication). Clean sediment was then brought in to replace the removed contaminated sediment in the intertidal area.

The Port of Olympia, in accordance with Ecology's Toxics Cleanup Program (TCP), has agreed to conduct ongoing monitoring of site. Monitoring includes groundwater monitoring every six months, eventual construction of a new groundwater treatment system, and sediment sampling every five years. There are no plans within the ongoing monitoring agreement to address the 303(d) listings for clam tissue at the Cascade Pole site.

Project Description

South Puget Sound

Two composite samples (5 fish per composite) each of edible muscle tissue from English sole will be collected from the eight 303(d) listed grids in South Puget Sound. Tissue will be analyzed for 303(d) contaminants: PCBs and BEHP. Both PCB aroclors and a subset of samples for PCB congeners will be analyzed. Four grids listed for rockfish will not be sampled due to conservation concerns, as previously described.

The Washington State Department of Fish and Wildlife has already collected English sole from one site (Pickering Passage) as part of an abundance and distribution survey of groundfishes in Puget Sound conducted in May 2005. Ecology will also be able to utilize archive English sole tissue from a 2005 PSAMP monitoring site (Nisqually) leaving only six sites for Ecology to trawl sample.

Lower Budd Inlet

Four composite samples of blue mussels (*Mytilus trossulus*) will be sampled from the Cascade Pole intertidal clean-up/excavation site and analyzed for 303(d) listed contaminants: benzo(a)anthracene, chrysene, benzo(b)fluoranthene, and benzo(k) fluoranthene. At the request of Ecology's Toxics Cleanup Program (TCP), additional PAHs, pentachlorophenol (PCP), and dioxin/furans will also be analyzed.

The original 303(d) listings from the Cascade Pole site were based on soft shell clam tissue. A recent reconnaissance visit to the site revealed that soft shell clams and other organisms are just starting to recolonize the site after the 2001-2002 excavation and addition of new intertidal sediments. There is currently not enough clam tissue biomass at the site for analysis. Blue mussels, which are abundant at the site, will be used in place of soft shell clams.

During the clean-up and excavation of the Cascade Pole intertidal area, different sections of sediment were removed at different depths depending on contamination levels. Depths of sediment removal included one, two, three, and five feet. Depending on fall tides, every attempt will be made to collect mussels from three sections representing the different depths of sediment removal and clean-up. This sampling design will ensure that the entire clean-up site is represented.

Decision Criteria

In order to make recommendations on whether waterbodies should be removed or retained on the 303(d) list, data must meet the listing criteria of Ecology's Water Quality 303(d) Listing Policy (Ecology, 2002). Listing recommendations for this study will be based on the following:

A segment will be placed on the 303(d) list due to toxic pollutants in fin fish muscle or whole shellfish when either the average of three single-fish samples with the highest concentration of a given chemical or one composite sample made up of at least five fish exceeds the criteria for human health impacts based on EPA's bio-concentration factors and water column criteria established under the National Toxics Rule. A segment will be placed in the Waters of Concern Category (Category 2) when any one tissue sample exceeds the criteria.

Organization and Schedule

Organization

Kim McKee (Ecology-WQP) – Client and staff contact for the Water Quality Program in the Southwest Regional Office. Responsible for reviewing the QA Project Plan and draft study report. Phone: 360.407.6407.

Mohsen Kourehdar (Ecology-TCP) – Site Manager for the Cascade Pole. Responsible for input regarding the Cascade Pole site mussel sampling portion of the project and review of the Quality Assurance Project Plan and draft study report. Phone: 360.407.6256.

Brandee Era-Miller (Ecology-EAP) – Toxics Studies Unit Project Manager. Responsible for study design and preparation of the QA Project Plan, oversight of field sampling, interpretation of results and authoring the final study report. Phone: 360.407.6771.

Dale Norton (Ecology-EAP) – Toxics Studies Unit Supervisor. Responsible for review of QA Project Plan and draft study report. He will also be the R.V. Skookum captain and main trawl operator. Phone 360.407.6765.

Field assistants from Ecology-EAP:

Art Johnson – Phone 360.407.6766.

Steve Golding – Phone 360.407.6701.

Kristin Kinney – Phone 360.407.7168.

Paul Anderson – Phone 360.407.7548.

Dave Serdar (also an Ecology certified boat master for the R.V. Skookum) – Phone 360.407.6772.

Will Kendra (Ecology) – Section Manager, Watershed Ecology Section. Responsible for review of QA Project Plan and draft study report. Phone: 360.407.6698.

Stewart Lombard (Ecology) – Quality Assurance Coordinator. Responsible for review of QA Project Plan and assistance on quality assurance issues during the implementation of the study. Phone: 360.895.6148

Stuart Magoon – Manchester Environmental Laboratory (MEL) – Responsible for review of the QA Project Plan pertaining to laboratory analysis and the analysis and reporting of project data to the project manager. Also responsible for setting up contract work for the dioxin/furan and PCB congeners analyses. Phone: 360.871.8800

Schedule

Task	Date
Finalization of Quality Assurance Project Plan	October 2005
Collect fish and mussel samples	October – Nov. 2005
Process samples	October – Nov. 2005
Samples submitted to Manchester Laboratory	November 2005
Laboratory data completed	January 2006
Final Report	
Report Author Lead	Brandee Era-Miller
Schedule	
Report Supervisor Draft Due	February 2006
Report Client/Peer Draft Due	March 2006
Report Final Due (original)	May 2006
Environmental Information System (EIM) Data Set	
EIM Data Engineer	Brandee Era-Miller
EIM User Study ID	BERA0003
EIM Study Name	South Puget Sound Fish and Shellfish Tissue Verification of 303(d) Listings
EIM Completion Due	May 2006

Quality Objectives

In order to limit potential sources of bias prior to laboratory analysis, tissue processing will follow EPA guidance (PSEP, 1996; EPA, 2000). These protocols are explained in further detail in the *Sampling Procedures*, *Measurement Procedures*, and *Quality Control* sections of this QA Project Plan.

Manchester Environmental Laboratory and the laboratories conducting contract analysis are expected to meet all the quality control (QC) requirements of the analytical methods being used for this project. The analytical Measurement Quality Objectives (MQOs) that will be used are shown in Table 3.

Table 3. Analytical Measurement Quality Objectives.¹

Parameter	Laboratory Control Samples	Duplicate Samples	Matrix Spikes	Matrix Spike Duplicates	Surrogate Standards
	% recovery limits	RPD	% recovery limits	RPD	% recovery limits
Percent lipids	n/a	≤ 20	n/a	n/a	n/a
PCB aroclors	50-150	≤ 50	50-150	≤ 50	10-140
BEHP	50-150	≤ 50	50-150	≤ 40	50-150
PCB congeners	30-150	≤ 50	50-150	≤ 50	25-150
PAHs	50-150	≤ 50	50-150	≤ 40	50-150
PCP	50-150	≤ 50	50-150	≤ 40	50-150
Dioxin/Furans	15-190	≤ 50	50-150	≤ 50	20-180

RPD = Relative Percent Difference.

¹Quality Control (QC) limits from EPA methods and personal communication with Manchester Laboratory.

The percent recoveries of the laboratory control samples (LCS), matrix spikes, and surrogate standards provide an indication of bias in the analytical system due to calibration or matrix effects. Surrogate standards are added to every sample prior to extraction, while matrix spikes are added to only one sample within a sample batch. The relative percent differences (RPD) of laboratory duplicates and matrix spike duplicates are a measure of analytical precision.

Sampling Procedures

English sole will be collected by trawling from Ecology's 26' research vessel "Skookum." Ten individuals of the target species at each site will be collected. The total number of English sole collected for the entire study will be between 60 to 90 individuals. Trawling will employ an Otter trawl (4-seam semi-balloon, 16' head rope, 19' footrope with loop style chain, $\frac{3}{4}$ " square measure net mesh with codend mesh of $\frac{5}{8}$ "). The trawl will be towed along the bottom for approximately 15 minutes before retrieval. Up to a maximum of five tows will be used at each site to capture the desired number of specimens. Trawling will stop when 10 individuals of acceptable weight are obtained. Individual fish need to be at least 100 grams to be able to obtain enough muscle tissue for analysis.

Selected fish will be humanely killed, weighed and measured, rinsed with site water, individually wrapped in aluminum foil, placed in waterproof plastic bags, and stored on ice in coolers for transport to Ecology Headquarters, where samples will be frozen pending preparation of tissue samples.

Blue mussels will be taken from the Cascade Pole excavation/clean-up site. They will be collected by hand off the beach at low tide. Approximately 50 – 75 individual mussels will be collected from each of four areas at the site. Mussels between 35 – 70 mm in length will be targeted. Mussels will be placed in laboratory cleaned one-gallon glass jars after collection and placed on ice in coolers for transport to Ecology Headquarters, where samples will be frozen pending preparation of tissue samples.

Field data including specimen lengths and weights, latitude and longitude for the start and end of each tow and collection site, date and time, and other pertinent information will be recorded in a field notebook.

All field personnel will wear non-talc nitrile gloves while handling fish and mussels in the field.

Measurement Procedures

Preparation of Tissue Samples

Preparation of tissue samples will follow EPA (2000) guidance and will take place at Ecology's Headquarters in Lacey, Washington. Precautions will be taken to minimize contamination during sample processing. Persons preparing samples will wear non-talc nitrile gloves and aprons. Work surfaces will be covered with heavy grade aluminum foil. Gloves, aluminum foil, and dissection tools will be changed between composite samples.

English Sole

Samples for analysis will be prepared by partially thawing the English sole to remove the foil wrapper and rinsing in deionized water to remove adhering debris. The scales will be removed and the entire skin-on muscle fillet from one or both sides of each fish will be taken with stainless steel knives and homogenized by several passes through a Kitchen-Aid food processor.

To avoid contamination with tissue samples for BEHP analysis, plastics will be avoided. For these samples, an all-metal, hand held-grinder will be used for homogenization.

Composite samples will consist of equal-weight aliquots from each of five fish. Samples will be homogenized to uniform color and consistency and placed in jars, specifically cleaned for low-level organics analyses, and sent to the laboratories. Excess samples will be archived in freezers in the chain-of-custody room at the Ecology Headquarters building.

The sex of each fish will be recorded during processing and aging structures (otoliths and scales) will be saved for age determination by the Washington State Department of Fish and Wildlife in Olympia, Washington.

Mussels

Mussels for analysis will be measured and lengths recorded prior to processing. Mussels will then be rinsed with tap water followed by deionized water to remove any adhering debris. The entire soft parts will then be removed and homogenized to uniform color and consistency with several passes through a Kitchen-Aid food processor. Shell fragments will not be included. Composites will include similar numbers and sizes of mussels. Excess sample will be archived in freezers in the chain-of-custody room at the Ecology Headquarters building.

Decontamination Procedures for Processing Tissues

All resecting instruments will be washed thoroughly with Liquinox detergent, followed by sequential rinses of hot tap water, de-ionized water, pesticide-grade acetone, and pesticide-grade hexane. This decontamination procedure will be repeated between each composite sample.

Containers and holding times for fish and mussel tissue samples are shown in Table 4.

Table 4. Containers and Holding Times for Tissue Samples.¹

Parameter	Container	Preservation	Holding Time*
Percent lipids	Taken from the other jars for analysis	Refrigerate, 4° C Freeze, -18° C	7 day extraction 14 day analysis
<i>English Sole Muscle Tissue</i>			
PCB aroclors	Certified 4-oz glass jar w/ Teflon lid liner	“	“
BEHP	Certified 4-oz glass jar w/ Teflon lid liner	“	“
PCB congeners	To be specified by contract laboratory	“	“
<i>Mussel Tissue</i>			
PAHs	Certified 4-oz glass jar w/ Teflon lid liner	“	“
PCP	Certified 4-oz glass jar w/ Teflon lid liner	“	“
Dioxin/Furans	To be specified by contract laboratory	“	“

* Frozen tissue samples can be held for up to 1 year.

¹ MEL, 2003 and PSEP, 1996.

Chemical Analysis

Parameters, anticipated reporting limits, and analytical methods for the study are shown in Table 5. The lowest concentrations of interest were included in the table to give a clear comparison to the anticipated reporting limits. These lowest concentrations of concern are the NTR human health criteria for contaminants in fish tissue. The laboratories must report down to these concentrations in order to meet the objectives of the study.

Table 5. Reporting Limits and Analytical Methods.¹

Parameter	Anticipated Reporting Limits (ug/Kg ww)	Lowest Conc. of Interest (ug/Kg ww)	Sample Preparation Method	Analytical Method	Lab
Percent lipids	0.1%	--	Extraction	EPA 608.5	MEL
<i>English Sole Muscle Tissue</i>					
PCB aroclors	5.0	5.3 ^a	EPA 3540/3620/3665	EPA 8082	MEL
BEHP	100	767	EPA 3540/3620	EPA 1625 & 8270	MEL
PCB congeners	0.1	5.3 ^a	Soxhlet extraction	EPA 1668a	Contract
<i>Mussel Tissue</i>					
PAHs	0.9 [†]	0.93 ^b	EPA 3640	EPA 8270	MEL
PCP	90	90.2	EPA 3540/3620	EPA 1625 & 8270	MEL
Dioxin/Furans	0.00001	0.00007 ^c	Soxhlet extraction	EPA 1613	Contract

¹ Information adapted from Manchester Environmental Laboratory - Lab User's Manual (MEL, 2005) and personal communication with the lab.

[†] Reporting limits based on a new PAH method currently being developed by Manchester Laboratory.

^a NTR criteria is for sum of individual PCBs.

^b NTR criteria is for individual PAHs: benzo(a)anthracene, chrysene, benzo(b)fluoranthene and benzo(k)fluoranthene.

^c NTR criteria is for dioxin (2,3,7,8-TCDD), but also refers to sum of dioxins and furans as toxic equivalents (TEQs).

The anticipated reporting limits for Manchester Laboratory are what the lab expects to achieve based on what they are currently reporting with the selected methods. Manchester's current method for PAHs, EPA 8270 – isotopic dilution, will not meet the lowest concentration of interest (0.93 ug/Kg) for the study. Manchester is, however, currently working on a new method for PAHs based on a newly purchased instrument. The instrument is an ion trap mass spectrometer. The new method for this instrument will still be based on EPA 8270. With this new analysis, Manchester should be able to report below 0.93 ug/Kg by November 2005, when the samples are expected to be analyzed (MEL, personal communication). In the event that Manchester will not be ready to analyze PAHs at lower reporting limits, the analysis will be contracted out to another laboratory which has the capability to achieve the desired detection limits.

Quality Control Procedures

Field

Field sampling procedures described in the *Sampling Procedures* and *Measurement Procedures* sections of this QA project plan will be carefully followed to avoid contamination of samples. A copy of the QA project plan will be taken into the field for reference.

Natural variability in contaminant concentrations between individual organisms will be assessed by analyzing English sole and mussel composite samples in replicate. Replicate sampling will include two separate composite samples from the same listed grid for the South Puget Sound English sole. One replicate will be analyzed from the Cascade Pole site. Both English sole and mussel samples will also have laboratory duplicates analyzed.

Laboratory

As part of their Standard Operating Procedures (SOPs), Manchester Laboratory routinely analyzes quality control samples for all analytical methods. These SOPs are described in Manchester’s Quality Assurance Manual (MEL, 2002). Quality control samples selected for this study are shown in Table 6.

A standard reference material (SRM) will be analyzed for determining accuracy of the PCB congeners and PAH analyses. The laboratories will analyze the National Institute of Standards & Technology (NIST) SRM 1974b – Organics in Mussel Tissue (*Mytilus edulis*). PCB congener and PAH concentrations in this SRM are similar to concentrations expected to be found in the samples for the current study.

Table 6. Laboratory Quality Control Samples.

Analysis	Method Blank	Lab Duplicate	Lab Control Sample	Surrogate Spikes	SRM	Matrix Spike	Matrix Spike Duplicate
Percent lipids	1	2	1	--	--	--	--
PCB aroclors	1	2	1	all samples	--	1	1
BEHP	1	1	1	all samples	--	1	1
PCB congeners	1	1	1	all samples	1	--	--
PAHs	1	1	1	all samples	1	1	1
PCP	1	1	1	all samples	--	1	1
Dioxin/Furans	1	1	1	all samples	--	--	--

Estimated costs of the laboratory analysis for the study are shown in Table 7.

Table 7. Estimated Laboratory Costs.

Analysis	No. of Samples	No. of QC Samples ¹	Total No. of samples	Cost per Analysis	Cost Subtotals
Percent lipids	20	2	22	31	\$ 682
PCB aroclors	16	4	20	150	\$ 3,000
BEHP	5	3	8	375	\$ 3,000
PCB congeners	4	2	6	800	\$ 4,800
PAHs	4	4	8	425	\$ 3,400
PCP	4	3	7	375	\$ 2,625
Dioxin/Furans	4	1	5	800	\$ 4,000
25% MEL surcharge for contract analysis					\$ 2,200
Fish Tissue Analysis Total					\$ 23,707*

¹ Includes laboratory duplicates, standard reference material, and matrix spikes.

* Costs include 50% discount for samples analyzed by MEL.

Data Management Procedures

Field data will be transferred to Excel templates for entry into Ecology's Environmental Information Management System (EIM). MEL will send their chemistry data in spreadsheets ready for EIM entry. Contract lab data will be transferred into Excel templates for EIM entry. All project data will be entered into EIM following data validation as described in the *Data Verification and Data Validation* section of this QA project plan. The formal EIM data entry process requires that an independent person review the data after it has been entered into EIM.

Project data will be downloaded from EIM and used for analysis to create data tables for the draft technical report.

Audits and Reports

Audits

MEL participates in performance and system audits of their routine procedures. Results of these audits are available upon request.

Reports

The project manager will provide a draft technical report of the study results to the client, internal Ecology reviewers, and other interested parties by March 2006. The final technical report will be completed and published by May 2006. The project manager (Brandee Era-Miller) will also enter the data into EIM prior to May 2006.

At a minimum, the final technical report will contain the following elements:

- Map of the study areas showing sampling sites.
- Coordinates and other location information for each sampling site.
- Descriptions of field and laboratory methods.
- Discussion of data quality and the significance of any problems encountered during sampling and analysis.
- Summary tables of biological and chemical data.
- Summary of significant findings.
- Comparison of new findings to historical data, NTR criteria, and other pertinent data.
- Recommendations for continued listing or de-listing on the 303(d) list and potential follow-up work.

Data Verification and Validation

MEL will verify laboratory results and prepare a data verification report, including case summaries of their data. MEL will also review and verify laboratory results and case narratives from the contract laboratories. Formal (third party) validation of the results will not be necessary for the scope of this project.

Data Quality (Usability) Assessment

Once the data have been reviewed and verified, the project manager will determine if the quality and quantity of the data are usable and whether the data can be used to make decisions for which the study was designed. The project manager will review laboratory data by determining if measurement quality objectives for the study were met.

References

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Appendices

A. 303(d) Listing Matrices

Water Quality Assessment for Washington

2002/2004 Candidate List

Water Body Name:	SQUAXIN, PEALE, AND PICKERING PASSAGES	Listing ID #:	35941
Parameter:	Total PCBs	Township:	
Medium:	Tissue	Range:	
Category:	5	Section:	
Listed 98?:	N	Latitude:	47.155
Listed 96?:	N	Longitude:	122.905

Basis

Washington Department of Fish and Wildlife PSAMP database show the National Toxic Rule Criterion was exceeded in a composite of more than 5 muscle tissue tissue tissue tissue samples collected in 1992-1993 from English sole (*Pleuronectes vetulus*) samples from station BDDINLET.

Remarks

Water Quality Assessment for Washington

2002/2004 Candidate List

Water Body Name:	SQUAXIN, PEALE, AND PICKERING PASSAGES	Listing ID #:	35987
Parameter:	Bis(2-ethylhexyl)phthalate	Township:	
Medium:	Tissue	Range:	
Category:	5	Section:	
Listed 98?:	N	Latitude:	47.295
Listed96?:	N	Longitude:	122.875

Basis

Washington Department of Fish and Wildlife PSAMP database show the National Toxic Rule Criterion was exceeded in a composite of more than 5 muscle tissue tissue tissue tissue samples collected in 1993 from English sole (*Pleuronectes vetulus*) samples from station PICKERNG.

Remarks

Water Quality Assessment for Washington

2002/2004 Candidate List

Water Body Name: SQUAXIN, PEALE, AND PICKERING
PASSAGES

Listing ID #: 36025

Parameter: Total PCBs

Township:

Medium: Tissue

Range:

Category: 5

Section:

Listed 98?: N

Latitude: 47 295

Listed96?: N

Longitude: 122 875

Basis

Washington Department of Fish and Wildlife PSAMP database show the National Toxic Rule Criterion was exceeded in a composite of more than 5 muscle tissue tissue tissue tissue samples collected in 1993 and 1996 from English sole (Pleuronectes vetulus) samples from station PICKERING.

Remarks

Water Quality Assessment for Washington

2002/2004 Candidate List

Water Body Name: CASE INLET AND DANA PASSAGE

Listing ID #: 35988

Parameter: Bis(2-ethylhexyl)phthalate

Township:

Medium: Tissue

Range:

Category: 5

Section:

Listed 98?: N

Latitude: 47.335

Listed96?: N

Longitude: 122.805

Basis

Washington Department of Fish and Wildlife PSAMP database show the National Toxic Rule Criterion was exceeded in a composite of more than 5 muscle tissue tissue tissue tissue samples collected in 1993 from English sole (*Pleuronectes vetulus*) samples from station CASEIN3.

Remarks

Water Quality Assessment for Washington

2002/2004 Candidate List

Water Body Name: CASE INLET AND DANA PASSAGE

Parameter: Total PCBs

Medium: Tissue

Category: 5

Listed 98?: N

Listed96?: N

Listing ID #: 36342

Township:

Range:

Section:

Latitude: 47.195

Longitude: 122.795

Basis

Washington Department of Fish and Wildlife PSAMP database show the National Toxic Rule Criterion was exceeded in a composite of more than 5 muscle tissue samples collected in 1993 and 1996 from English sole (*Pleuronectes vetulus*) samples from station CASEIN1.

Remarks

Water Quality Assessment for Washington

2002/2004 Candidate List

Water Body Name: CASE INLET AND DANA PASSAGE

Parameter: Bis(2-ethylhexyl)phthalate

Medium: Tissue

Category: 5

Listed 98?: N

Listed96?: N

Listing ID #: 36237

Township:

Range:

Section:

Latitude: 47.195

Longitude: 122.795

Basis

Washington Department of Fish and Wildlife PSAMP database show the National Toxic Rule Criterion was exceeded in a composite of more than 5 muscle tissue samples collected in 1993 from English sole (*Pleuronectes vetulus*) samples from station CASEIN1.

Remarks

Water Quality Assessment for Washington

2002/2004 Candidate List

Water Body Name: PUGET SOUND (SOUTH)

Parameter: Total PCBs

Medium: Tissue

Category: 5

Listed 98?: N

Listed96?: N

Listing ID #: 36340

Township:

Range:

Section:

Latitude: 47.165

Longitude: 122.665

Basis

Washington Department of Fish and Wildlife PSAMP database show the National Toxic Rule Criterion was exceeded in a composite of more than 5 muscle tissue tissue tissue tissue tissue samples collected in 1993-1997 from English sole (*Pleuronectes vetulus*) samples from station NISQUALY. Washington Department of Fish and Wildlife PSAMP database show the National Toxic Rule Criterion was exceeded in a composite of more than 5 muscle tissue tissue tissue tissue tissue samples collected in 1997-1999 from English sole (*Pleuronectes vetulus*) samples from station NISQUALY.

Remarks

Water Quality Assessment for Washington

2002/2004 Candidate List

Water Body Name: PUGET SOUND (SOUTH)

Parameter: Bis(2-ethylhexyl)phthalate

Medium: Tissue

Category: 5

Listed 98?: N

Listed96?: N

Listing ID #: 36235

Township:

Range:

Section:

Latitude: 47.165

Longitude: 122.665

Basis

Washington Department of Fish and Wildlife PSAMP database show the National Toxic Rule Criterion was exceeded in a composite of more than 5 muscle tissue tissue tissue tissue samples collected in 1993 from English sole (Pleuronectes vetulus) samples from station NISQUALY.

Remarks

Water Quality Assessment for Washington

2002/2004 Candidate List

Water Body Name: CARR INLET

Parameter: Total PCBs

Medium: Tissue

Category: 5

Listed 98?: N

Listed96?: N

Listing ID #: 36343

Township:

Range:

Section:

Latitude: 47.215

Longitude: 122.625

Basis

Washington Department of Fish and Wildlife PSAMP database show the National Toxic Rule Criterion was exceeded in a composite of more than 5 muscle tissue tissue tissue tissue samples collected in 1993 and 1996 from English sole (Pleuronectes vetulus) samples from station CARINLT1.

Remarks

Water Quality Assessment for Washington

2002/2004 Candidate List

Water Body Name: HALE PASSAGE (SOUTH)

Parameter: Total PCBs

Medium: Tissue

Category: 5

Listed 98?: N

Listed96?: N

Listing ID #: 36344

Township:

Range:

Section:

Latitude: 47.265

Longitude: 122.605

Basis

Washington Department of Fish and Wildlife PSAMP database show the National Toxic Rule Criterion was exceeded in a composite of more than 5 muscle tissue tissue tissue tissue samples collected in 1993 and 1996 from English sole (Pleuronectes vetulus) samples from station WOLLCHET.

Remarks

Water Quality Assessment for Washington

2002/2004 Candidate List

Water Body Name: COMMENCEMENT BAY (OUTER)

Listing ID #: 35739

Parameter: Total PCBs

Township:

Medium: Tissue

Range:

Category: 5

Section:

Listed 98?: N

Latitude: 47.285

Listed96?: N

Longitude: 122.425

Basis

Washington Department of Fish and Wildlife PSAMP database show the National Toxic Rule Criterion was exceeded in a composite of more than 5 muscle tissue tissue tissue tissue samples collected in 1993 and 1995 from English sole (Pleuronectes vetulus) samples from station OUTRCOMM.

Remarks

Water Quality Assessment for Washington

2002/2004 Candidate List

Water Body Name: COMMENCEMENT BAY (OUTER)

Parameter: Bis(2-ethylhexyl)phthalate

Medium: Tissue

Category: 5

Listed 98?: N

Listed96?: N

Listing ID #: 35655

Township:

Range:

Section:

Latitude: 47.285

Longitude: 122.425

Basis

Washington Department of Fish and Wildlife PSAMP database show the National Toxic Rule Criterion was exceeded in a composite of more than 5 muscle tissue tissue tissue tissue tissue samples collected in 1993 from English sole (*Pleuronectes vetulus*) samples from station OUTRCOMM.

Remarks

Water Quality Assessment for Washington

2002/2004 Candidate List

Water Body Name: PUGET SOUND (SOUTH)

Parameter: Total PCBs

Medium: Tissue

Category: 5

Listed 98?: N

Listed96?: N

Listing ID #: 35829

Township:

Range:

Section:

Latitude: 47.245

Longitude: 122.565

Basis

Washington Department of Fish and Wildlife PSAMP database show the National Toxic Rule Criterion was exceeded in a composite of more than 5 muscle tissue tissue tissue tissue samples collected in 1992-1993 from copper rockfish (Sebastes caurinus) samples from station DAYISLND.

Remarks

Water Quality Assessment for Washington

2002/2004 Candidate List

Water Body Name: IACOMA NARROWS

Parameter: Total PCBs

Medium: Tissue

Category: 5

Listed 98?: N

Listed96?: Y

Listing ID #: 36346

Township:

Range:

Section:

Latitude: 47.325

Longitude: 122.565

Basis

Washington Department of Fish and Wildlife PSAMP database show the National Toxic Rule Criterion was exceeded in a composite of more than 5 muscle tissue tissue tissue tissue samples collected in 1996 from quillback rockfish (Sebastes maliger) samples from station GIGHARBR.

Remarks

Water Quality Assessment for Washington

2002/2004 Candidate List

Water Body Name: DALCO PASSAGE/POVERTY BAY

Parameter: Total PCBs

Medium: Tissue

Category: 5

Listed 98?: N

Listed96?: N

Listing ID #: 36345

Township:

Range:

Section:

Latitude: 47.325

Longitude: 122.475

Basis

Washington Department of Fish and Wildlife PSAMP database show the National Toxic Rule Criterion was exceeded in a composite of more than 5 muscle tissue tissue tissue tissue samples collected in 1996 from quillback rockfish (Sebastes maliger) samples from station DALCOPAS..

Remarks

Water Quality Assessment for Washington

2002/2004 Candidate List

Water Body Name: DALCO PASSAGE/POVERTY BAY

Listing ID #: 35743

Parameter: Total PCBs

Township:

Medium: Tissue

Range:

Category: 5

Section:

Listed 98?: N

Latitude: 47.305

Listed96?: N

Longitude: 122.455

Basis

Washington Department of Fish and Wildlife PSAMP database show the National Toxic Rule Criterion was exceeded in a composite of more than 5 muscle tissue tissue tissue tissue samples collected in 1992-1995 from quillback rockfish (*Sebastes maliger*) samples from station BNSPNT.

Remarks

Water Quality Assessment for Washington

2002/2004 Candidate List

Water Body Name: BUDD INLET (INNER)

Parameter: Benzo(b)fluorene

Medium: Tissue

Category: 5

Listed 98?: Y

Listed96?: Y

Listing ID #: 8685

Township:

Range:

Section:

Latitude: 47.055

Longitude: 122.895

Basis

Norton, 1986. , excursions beyond the criterion in edible shellfish tissue.

Remarks

Water Quality Assessment for Washington

2002/2004 Candidate List

Water Body Name: BUDD INLET (INNER)

Parameter: Benzo(k)fluorene

Medium: Tissue

Category: 5

Listed 98?: Y

Listed96?: Y

Listing ID #: 8686

Township:

Range:

Section:

Latitude: 47.055

Longitude: 122.895

Basis

Norton, 1986. , excursions beyond the criterion in edible shellfish tissue.

Remarks

Water Quality Assessment for Washington

2002/2004 Candidate List

Water Body Name: BUDD INLET (INNER)
Parameter: BENZO(A)ANTHRACENE
Medium: Tissue
Category: 5
Listed 98?: Y
Listed96?: Y

Listing ID #: 8688
Township:
Range:
Section:
Latitude: 47.055
Longitude: 122.895

Basis

Norton, 1986. , excursions beyond the criterion in edible shellfish tissue.

Remarks

Water Quality Assessment for Washington

2002/2004 Candidate List

Water Body Name: BUDD INLET (INNER)

Parameter: Chrysene

Medium: Tissue

Category: 5

Listed 98?: Y

Listed96?: Y

Listing ID #: 8689

Township:

Range:

Section:

Latitude: 47.055

Longitude: 122.895

Basis

Norton, 1986. , excursions beyond the criterion in edible shellfish tissue.

Remarks