PIER 53–55 SEDIMENT CAP AND ENHANCED NATURAL RECOVERY AREA REMEDIATION PROJECT 1996 DATA

ELLIOTT BAY/DUWAMISH RESTORATION PROGRAM

Prepared for the
Elliott Bay/Duwamish Restoration Program Panel
by
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Panel Publication 17

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The Panel of Managers holds regularly scheduled meetings that are open to the public. Technical Working Group and committee meetings are scheduled on an as-needed basis, and are also open to the public. Meetings are generally held at the National Oceanic and Atmospheric Administration, Northwest Fisheries Science Center auditorium, 2725 Montlake Boulevard East, Seattle. The Panel recommends that you contact Robert C Clark, Jr., Administrative Director, at (206) 526-4338 to confirm meeting schedules and locations. The Panel also holds periodic special evening and weekend public information meetings and workshops.

Panel and Committee Meeting Dates

Panel: Quarterly, first Thursday of the month, beginning January 1998, 9:30 a.m. to 12:30 p.m.

Sediment Remediation Technical Working Group: Scheduled as needed.

Public Participation Committee: Scheduled as needed.

Budget Committee: Scheduled as needed.

Environmental Review of Specific Projects

Formal hearings and comment periods on appropriate environmental documents for proposed sediment remediation and habitat development projects will be observed. Please contact the Administrative Director for more information.

This information is available on request in accessible formats for persons with disabilities by calling (206) 526-4338 (voice) or 1-800-833-6388 (TTY/TDD)

PREFACE

This report was prepared by the King County Water and Land Resources Division (KCWLRD). It documents the results of the 1996 environmental monitoring of the Pier 53-55 Sediment Cap and Enhanced Natural Recovery Area Remediation Project. Monitoring in 1996 was part of monitoring in a scheduled 10-year program that began in 1992. Project construction information, project background, and 1992 monitoring results appear in the report, *Pier 53-55 Sediment Cap and Enhanced Natural Recovery Area Remediation Project* (EB/DRP, 1993), and 1993 monitoring results appear in the report *Pier 53-55 Sediment Cap and Enhanced Natural Recovery Area Remediation Project 1993 Data* (EB/DRP, 1995).

This project is conducted under the administration of the Elliott Bay/Duwamish Restoration Program Panel. The Panel is composed of representatives from the National Oceanic and Atmospheric Administration, the U.S. Fish and Wildlife Service, the Muckleshoot Indian Tribe, the Suquamish Tribe, the Washington State Department of Ecology, the City of Seattle, and KCWLRD. The Panel's goals are to identify, prioritize, and implement sediment remediation and habitat development projects, along with associated source control measures, and real estate acquisition for habitat purposes in Elliott Bay and the Duwamish River.

ACKNOWLEDGMENTS

Many individuals at several different agencies were part of the Pier 53-55 Sediment Cap and Enhanced Natural Recovery Area remediation project. We wish to acknowledge the contributions of the following individuals to the project and the production of this document.

Sample Collection

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Trace Organics Laboratory–Dana Walker, Dave Fada, Jim Endres, Rex Robinson, Susan Dino, Glen Lagrou, Diane McElhany, Galina Mikhlin, Jim Fiscus, Mike Doubrava, Ann Bryant, Mike Henry

Trace Metals Laboratory–Cheryl Kamera, John Rowan, Philip Almonte, Debra Osada, Scott Carpenter, Sean McRae, Brian Mazikowski, Lisa Wanttaja

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Contractors

Benthic taxonomy screening	Fukuyama Hironaka Taxonomic and Environmental Services, Inc.
Benthic taxonomy identification	Marine Taxonomic Services
Core samples	Global Diving
Particle size distribution analysis	AMTest

Elliott Bay Duwamish Restoration Panel Members

The Elliott Bay/Duwamish Restoration Panel approved funding for the Pier 53-55 project. The voting members were as follows:

Robert C. Clark Jr.	National Oceanic and Atmospheric Administration
Alisa Ralph	U.S. Fish and Wildlife Service
Dan Cargill	Washington State Department of Ecology
Glen St. Amant	Muckleshoot Indian Tribe
Georgia George	Suquamish Tribe
Kevin Clark	City of Seattle
Bob Swartz	King County Water and Land Resources (Formerly Metro)

Sediment Remediation Technical Working Group

The Sediment Remediation Technical Working Group reviewed and recommended that the Panel fund the Pier 53-55 project. The group members were as follows:

Pat Romberg, chair, Bob Matsuda	King County Water and Land Resources (formerly Metro)
Pat Cagney	U.S. Army Corps of Engineers
Randy Carman, Rick Vining	Washington Department of Fisheries
Bob Chandler, Virginia Hassinger	City of Seattle
Robert C. Clark Jr., Gail Siani	National Oceanic and Atmospheric Administration
Doug Hotchkiss	Port of Seattle
David Jamison, Joan McGilton	Washington State Dept. of Natural Resources
Paul Johansen	The Boeing Company
Dan Cargill, Joanne Polayes-Wien	Washington State Department of Ecology
Glen St. Amant	Muckleshoot Indian Tribe
Margaret Duncan	Suquamish Tribe
Justine Barton	U.S. Environmental Protection Agency

EXECUTIVE SUMMARY

In 1996, monitoring activities were conducted at the Pier 53-55 remediation area as part of a 10-year monitoring program. The area comprises 4.5 acres of contaminated bottom sediment in Seattle's Elliott Bay that were capped with clean sand in March 1992. The capped sediments are located offshore of Piers 53, 54, and 55 in downtown Seattle (Figure 1). The cap is designed to be 3 feet thick over the 2.9 acres farthest offshore and 1 foot thick over 1.6 acres nearshore. The thinner part of the cap is known as the enhanced natural recovery area (ENR).

The purpose of the monitoring program is to determine how stable the cap is, how well it is functioning to isolate the contaminated sediments, whether the cleanup continues to meet state sediment standards, and how the cap is biologically repopulated. It is also a means to evaluate the rate of possible recontamination. Bottom stakes were installed to measure cap thickness and stability, and sampling stations were established to monitor both chemistry and taxonomy (Figure 2).

METHODS AND RESULTS

Cap Thickness and Settlement

Cap thickness and settlement were measured directly using 13 measuring stakes and settling plate assemblies that were installed in the target capping area before the cap was placed (not shown on Figure 2). Divers measured both cap thickness and settlement at each of the 13 stakes soon after capping in 1992, a year later in 1993, and again in 1996 to determine whether the cap is eroding and the amount the seafloor is settling.

Cap thickness and settlement measurements taken in 1996 showed that the cap and ENR are stable and not eroding or sinking into the native bottom mud. Most of the changes in cap thickness that occurred between 1993 and 1996 were in the range of a few hundredths of a foot (Table 2-1). Four measured changes were equal to or slightly greater than 0.1 of a foot (3 cm). Cap thickness measurements were not available on the 3-foot cap at Stakes 5 and 8 and on the ENR at Stake 13 because the stakes were missing or broken.

The overlying burden of 22,000 cubic yards (16,700 m^3) of sand caused some seafloor settlement as anticipated. In the 3-foot cap area, settlement ranged from 0.17 foot (5.2 cm) to 0.35 foot (10.7 cm). Settlement in the ENR ranged from 0.26 foot (7.9 cm) to 0.03 foot (0.9 cm). The ENR settled less than the 3-foot cap probably because of the smaller amount of overburden. The minimal amount of settlement shows that the cap is stable and not sinking into the native bottom muds.

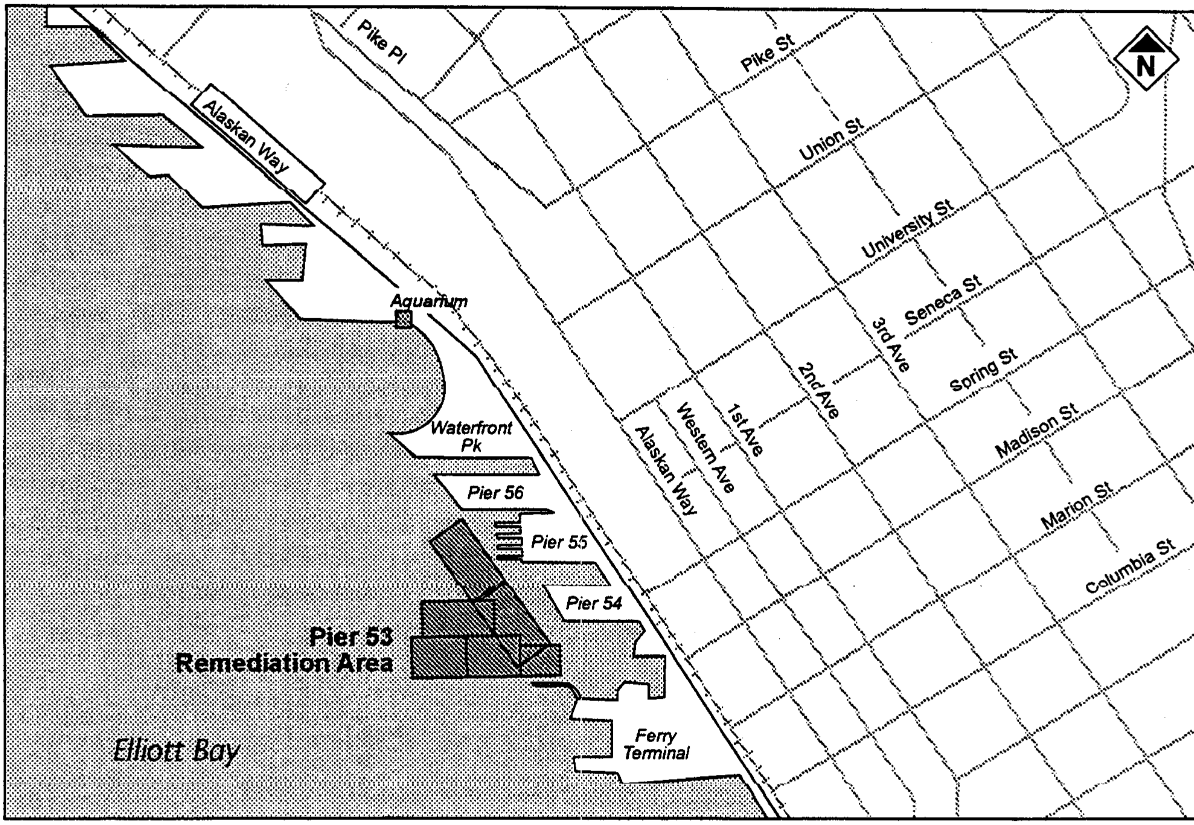

Figure 1. Location of Remediation Area

Core Chemistry

Cores were taken at three stations on the 3-foot cap and ENR (C1, C4, and C5). Each core extended completely through the cap and into the underlying contaminated sediments by at least 1 foot. The cores were divided into 6-inch-long sections. For each core, one section from within the cap just above the cap/under-cap interface were analyzed for organic, metal, and conventional parameters.

Analysis of the 1996 core samples showed that no chemicals have migrated up into the cap from the underlying contaminated sediments. Only one organic compound was detected at one station (C1). Most metals found in the cap were in concentrations near detection limits.

Surface Sediment Chemistry

Seven surface sampling stations were monitored on the 3-foot cap and ENR (VG1 through VG7). The top 2 cm of sediment from three grab samples were

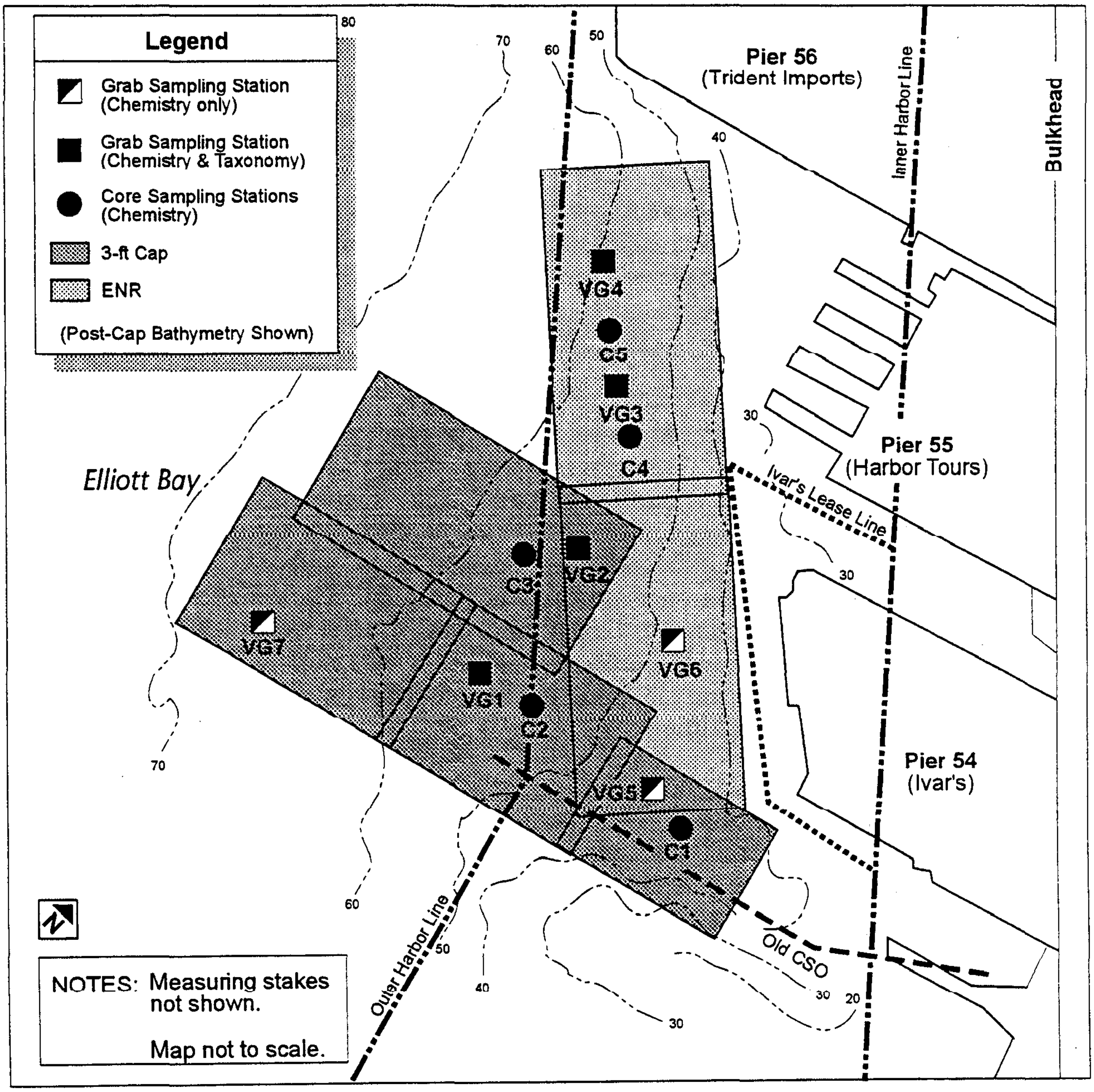

Figure 2. Sampling Stations

composited from each sampling station. The composite samples were analyzed for organic, metal, and conventional parameters. Additionally, samples representing the 0 to 10 cm depth were collected and analyzed.

Several new contaminants appeared on the Pier 53-55 remediation area for the first time in 1996. These contaminants included PCBs, pesticides, a chlorinated benzene, phthalates, and phenols. 4-Methylphenol was detected at every station in the Pier 53-55 remediation area and it exceeded the CSL at VG5 in the 2-cm-deep primary and replicate samples. It also exceeded the CSL in the 10-cm-deep sample at VG5. Phenol was detected at every station. It exceeded the CSL at VG5 in the 2-cm sample and exceeded the SQS at VG3, VG6, and the 2-cm replicate at VG5. Phenol also exceeded the SQS in the 10-cm sample at VG5.

A likely source of both phenols was not found during this study. Further study and an investigation of phenol and possibly phthalate sources along the waterfront are needed to understand the new contamination detected on the Pier 53-55 remediation area.

Benthic Recolonization

Benthic taxonomy samples were taken at four surface sampling stations across the remediation area. Two stations were in the ENR (VG3 and VG4), and two stations were in the 3-foot cap (VG1 and VG2). Five replicate samples were taken from each station. The samples were analyzed for the number of individual organisms, for the number of species, and for biomass (weight). Additionally in 1996, a benthic taxonomic reference station was sampled. The reference station was located just offshore of Richmond Beach and the results were compared to the taxonomic results from the Pier 53-55 remediation area. Reference stations are used to represent background or undisturbed conditions for comparison to the stations in the areas being studied.

The 1996 data showed that the number of polychaete individuals were lower while the numbers of mollusks and crustaceans were higher than in 1993. Polychaetes decreased at all stations, ranging from 47 to 86 percent. Mollusks increased at all stations, ranging from 82 to 224 percent and crustaceans increased at all stations, ranging from 26 to 200 percent.

The increase in the numbers of mollusks and crustaceans show that the recolonization process of the cap is continuing and that the benthic community is changing over time. The changes in the benthic community appear to be linked to a change toward a finer grain-size on the surface of the remediation area. This particle-size shift was expected because the sand cap was placed on top of the native, mostly fine-grain muds. Eventually the sedimentation process present along the Seattle waterfront will completely cover the cap with fine-grain muds.

Another factor in the change in community structure was the increase in chemical contamination. Chemical results in 1993 showed that the cap had been re-contaminated with high levels of PAHs and mercury from construction activities at the nearby ferry terminal. At that time, however, the benthic community did not appear to show any adverse affects. It is possible that sampling was conducted too soon after the recontamination occurred in 1993 for the benthic community to show chronic effects. During the time between 1993 and 1996, the high PAH concentrations have declined significantly but new contamination is now present. The source of this new contamination is not yet known. In 1993 the Ampharetid *Asabellides lineata* was dominant in the benthic community and in 1996 it was completely absent. Ampharetids have been used as an indicator species that are "sensitive or intolerant to toxic stress" (Metro 1987). Also, the Infaunal Trophic Index identifies Ampharetids as species that are common in control regions (Thom et al. 1979). Between the grain-size shift and continued recontamination of the remediation area, Ampharetids have decreased from 1,314 total individuals in 1993 to 57 in 1996.

A comparison of samples taken in 1996 to samples taken in March 1992 before the remediation area was capped showed that the post-cap benthic community is becoming more like the pre-cap community. The results showed that *Axinopsida serricata* was the top most dominant species at all pre-cap stations and was the top most dominant species at three of the four stations in 1996. Other infauna that were dominant in both studies include *E carcharodonta*, *Prionospio jubata* (formerly *P. steenstrupi*), Lumbrineridae, *Macoma*, and *Parvilucina tenuisculpta*. *A. serricata*, *P. jubata* and *E. carcharodonta* have been dominant in all post-cap samples except the baseline samples, which were taken only a few months after capping.

CONCLUSIONS

Conclusions from the 1996 monitoring of the Pier 53-55 remediation area are as follows:

- The 3-foot cap and ENR are stable. They are not eroding or sinking into the native bottom muds.
- Contaminants are not migrating from the underlying sediments up into the 3-foot cap or ENR. Results show few chemicals were detected from within the 3-foot cap and ENR. When chemicals were detected, the concentrations were near the detection limits.
- High levels of PAHs found in 1993 have decreased. However, the surface of the 3-foot cap and ENR have been recontaminated by 4-methylphenol and phenol, as indicated by chemical analyses of 2-cm-deep and 10-cm-deep surface samples. These samples showed that the southeast corner of the remediation area exceeded state sediment standards. The source of the new contamination was not readily apparent and further study will be needed.
- The 1996 benthic taxonomy data indicated that the number of polychaete individuals was lower while the numbers of mollusks and crustaceans were higher than in 1993. This shift in species dominance shows that the recolonization process of the cap is

continuing and that the benthic community is changing over time. These changes in the benthic community appear to be linked to a greater percentage of fine-grain sediments in the remediation area. This particle-size shift was expected because the sand cap was placed on top of the native, mostly fine-grain muds. Another possible factor in the change in community structure has been the increase in chemical contamination. In 1993, the ampharetid *Asabellides lineata* was dominant in the benthic community, however, in 1996 it was completely absent. Ampharetids have been used as an indicator species that are "sensitive or intolerant to toxic stress" (Metro 1987). Additionally, a comparison of samples taken in 1996 to samples taken in March 1992 before the remediation area was capped showed that the post-cap benthic community is becoming more like the pre-cap community.

The next monitoring of the Pier 53-55 remediation area is scheduled for August 2002.

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SECTION 1
INTRODUCTION

In March 1992, contractors for the U.S. Army Corps of Engineers placed 22,000 cubic yards of clean sand offshore of Piers 53, 54, and 55 in Elliott Bay on Seattle's downtown waterfront, capping 4.5 acres of chemically contaminated bottom sediments. This action, known as the Pier 53 project, was the culmination of over 4 years of study and planning by many agencies, including the City of Seattle Department of Engineering, the King County Water and Land Resources Division (KCWLRD) (formerly the Municipality of Metropolitan Seattle or Metro), the U.S. Army Corps of Engineers (the Corps), the Washington State Department of Ecology (Ecology), the Washington State Department of Natural Resources (DNR), the Washington State Department of Fisheries, and the U.S. Environmental Protection Agency (EPA).

The purpose of this report is to document the methods, results, and conclusions of monitoring conducted on the Pier 53 project site in 1996 as part of the monitoring program established for the project. For further background information, see *Pier 53-55 Sediment Cap and Enhanced Natural Recovery Area Remediation Project* (EB/DRP, 1993a) and *Pier 53-55 Sediment Cap and Enhanced Natural Recovery Area Remediation Project 1993 data* (EB/DRP 1995a).

PROJECT SITE

The project site is an east-west-trending rectangular and trapezoidal area located offshore of Piers 53, 54, and 55 (Figure 1-1). The site is west and slightly north of the intersection of Madison Street and Alaskan Way in downtown Seattle. The project consists of a 3-foot-thick sediment cap covering the 2.9 acres farthest offshore and an experimental 1-foot-thick enhanced natural recovery area (ENR) covering the 1.6 acres nearshore.

PROJECT BACKGROUND

Planning for a remediation project along the Seattle waterfront began as part of Metro's Toxic Sediment Remediation Program, which was formed to coordinate and plan multi-agency efforts to clean up contaminated sediment in Elliott Bay and the lower Duwamish Estuary. An interagency committee was formed to provide guidance for this program. The Denny Way sediment cap—located north of Seattle's downtown waterfront—sponsored by Metro, and constructed in 1990, was the first project completed under the Toxic Sediment Remediation Program.

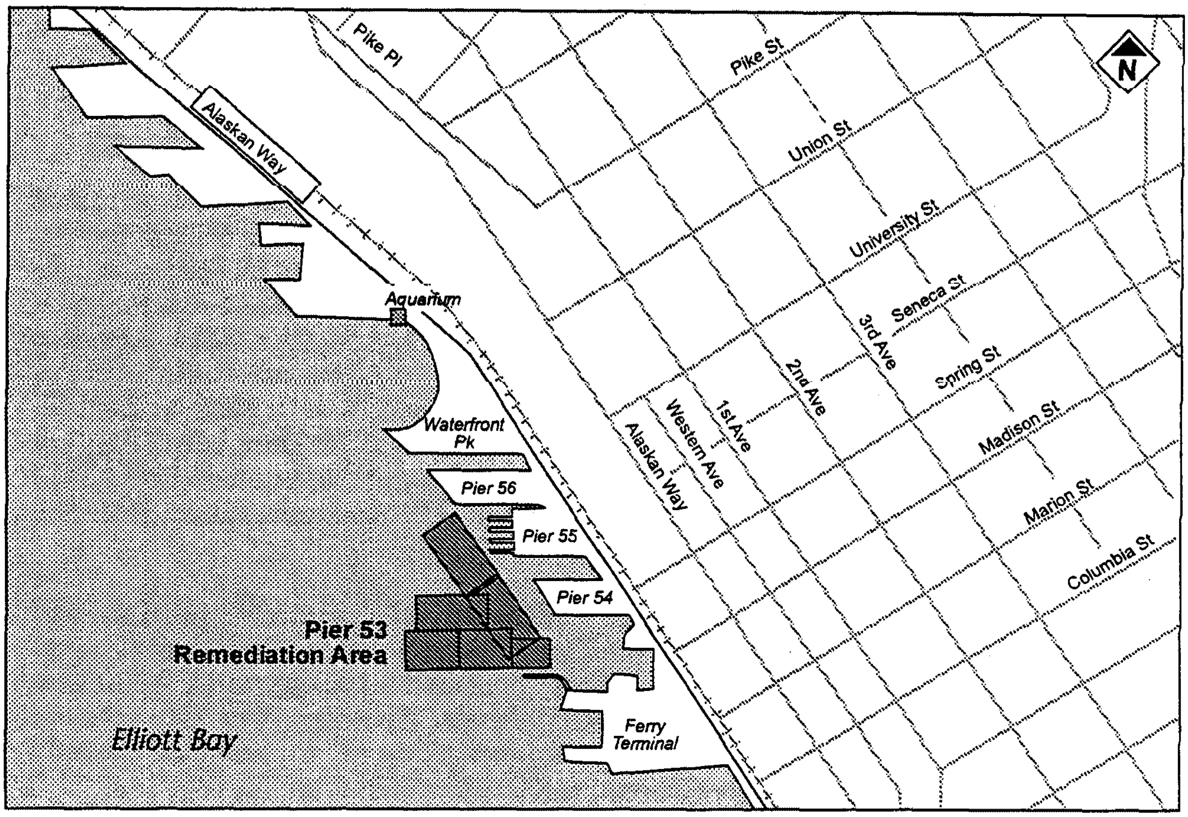


Figure 1-1. Location of the Pier 53 Remediation Area

The first major step in planning a new sediment remediation project along the Seattle waterfront was to contract Parametrix, Inc., to develop a risk assessment of potential remediation sites and to prioritize a list of 49 potential sites. The list was later expanded to include sites in the Duwamish River for a total of 68 sites. The sites were ranked on the basis of the number and types of chemicals present and the maximum concentration of these chemicals. Of the initial 49 sites, the two highest ranked sites were Seacrest Park, located south of the Seacrest Marina on the West Seattle side of Elliott Bay, and the Pier 53 site. A preliminary remediation plan was developed for these two sites as part of the Parametrix report (Parametrix, 1992).

Planning for remediation was suspended when the National Oceanic and Atmospheric Administration (NOAA) filed a lawsuit against the City of Seattle and Metro in 1990. The lawsuit alleged damages to natural resources resulting from hazardous substances released in and around Elliott Bay and the Duwamish River from combined sewer overflows (CSOs) and storm drains. It was settled out of court in 1991. The negotiated settlement among NOAA, the U.S. Fish and Wildlife Service, the Muckleshoot Indian Tribe, the Suquamish Tribe, Ecology, the City of

Seattle, and Metro created a fund designated for sediment cleanup and habitat restoration in Elliott Bay and the lower Duwamish River. It also created a panel, the Elliott Bay/Duwamish Restoration Program Panel (the Panel), to administer the fund. The settlement stipulated that money for the fund would come from the City of Seattle and Metro.

After the lawsuit was settled, planning for a remediation project in Elliott Bay was revived. The Pier 53 site was chosen when the City of Seattle expressed a willingness to take the lead in implementing a capping project at the site and the Corps was willing to provide capping sand from routine maintenance dredging in the Duwamish River.

No effort was made to reassemble the initial interagency committee. Instead, the City of Seattle and Metro decided to develop plans and coordinate agencies during the permit process. The Corps was committed to complete dredging in the Duwamish River by the end of March 1992 and would dispose of the sand at the open water disposal site in Elliott Bay if no beneficial capping project was possible. Because of this dredging schedule, the time frame for acquiring the necessary permits and the review period for the permitting agencies were very short. All permitting agencies were cooperative, and all permits were obtained.

After the Pier 53 sediment cap was installed, the project was presented to the Panel. The Panel reviewed the project and, after deciding it met certain criteria, declared that the project was eligible for reimbursement from the restoration fund. The management of the Pier 53 project then proceeded under the direction of the restoration panel with the City of Seattle as project sponsor. Metro and now KCWLRD agreed to conduct the monitoring program, which was established during the permitting process.

MONITORING PROGRAM

It was determined that environmental monitoring for the Pier 53 project should consist of short-term activities needed to place the cap and long-term activities needed to document the effectiveness of the cap. The long-term activities would include intensive sampling and observation during the first 2 years after capping, followed by less frequent monitoring thereafter. A 10-year monitoring plan was adopted and is currently under way (City of Seattle and Metro, 1992). The next and final Pier 53 monitoring study will be conducted in August 2002 (Appendix A).

Monitoring Plan

The monitoring plan (Appendix A) lists seven objectives and provides an outline for the periodic monitoring report. The objectives are as follows:

- Provide pre-cap taxonomic data.

- Guide and document the cap placement and thickness.
- Document how well the 3-foot cap and ENR function to isolate contaminated sediments from migrating upward into the cap.
- Determine whether offsite chemicals migrate and accumulate on the surface of the 3-foot cap and ENR.
- Determine the amount and type of benthic recolonization that occurs in the remediation area and whether benthic recolonization differs between the 3-foot cap and ENR.
- Review and evaluate the monitoring data to determine whether the cap is functioning as expected and whether further actions are warranted in the capped area.
- Provide data that may inform and assist the Panel and other agency teams in developing future cleanup plans for Elliott Bay.

To meet these objectives, the monitoring plan required the establishment of bottom stakes for measuring cap thickness, surface sediment stations for taking samples for chemical and taxonomical analysis, and core sediment stations for taking samples for chemical analysis (Figure 1-2). Sediment chemistry data collected during monitoring were to be normalized for total organic carbon and compared to the state Sediment Management Standards (SMS) (Ecology, 1991) to determine whether the site continues to meet the state cleanup criteria. The SMS include the Cleanup Screening Levels (CSL) and the more conservative Sediment Quality Standards (SQS).

Status Report on the Monitoring Program

Monitoring activities have been conducted in 1992, 1993, and 1996 at the Pier 53 site, both before and after the cap was placed.

The first monitoring activities took place in 1992 with the collection of pre-cap benthic taxonomy and sediment chemistry samples. Monitoring was conducted again in 1992 soon after capping to establish baseline conditions, in 1993 (1 year after capping), and in 1996 (4 years after capping). Monitoring data included cap placement, thickness, and settlement; benthic taxonomy; surface sediment chemistry; and core chemistry. A video camera survey of the cap was conducted in 1992 and 1993 and a sediment-profile camera survey was conducted in 1992. The report containing 1992 data results and discussions was issued as a draft and as a preliminary review draft to the Panel and to other regulatory agencies before being finalized in 1993 (EB/DRP, 1993a). The report containing 1993 data was issued as a draft and finalized in 1995 (EB/DRP, 1995a).

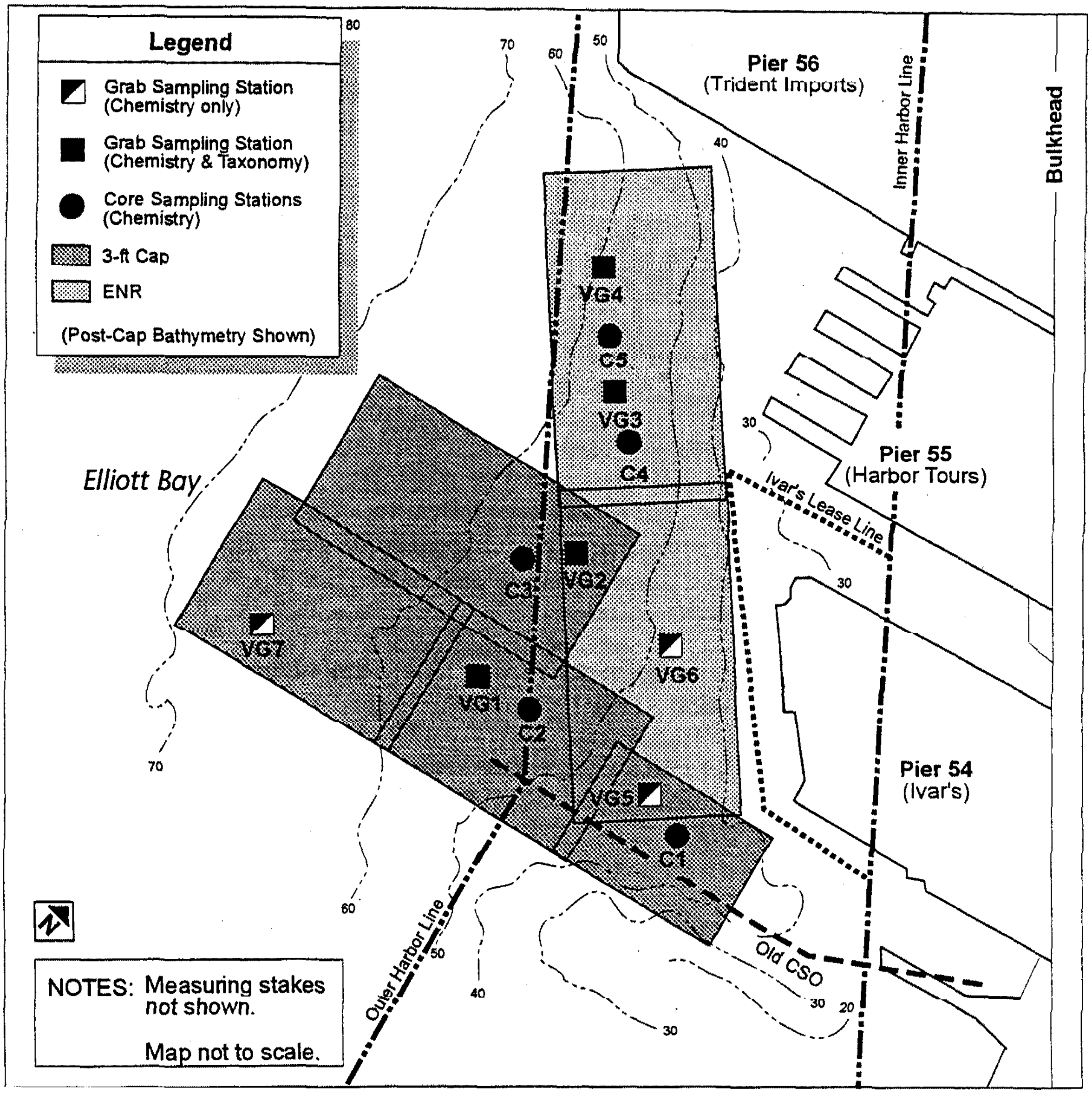


Figure 1-2. Sampling Stations

The pre-cap chemical analysis showed the expected high concentrations of organic and metallic contaminants at the Pier 53 site. Pre-cap sediment samples exceeded the CSL for mercury, cadmium, and silver. Pre-cap bioassays showed that the sediments were toxic. The pre-cap benthic taxonomy showed that the benthic community was composed of species most likely to inhabit a disturbed environment, however, it was not clear if this was related to the contamination present at the site.

Baseline cap thickness measurements and a sediment-profile camera survey taken after cap placement in 1992 showed that the cap placement proceeded as planned except for a small amount of sand that drifted offsite. The amount of sand used in the 3-foot cap and ENR was similar to the amount projected except for the area farthest offshore and in deeper water, which required more sand. The method of applying the capping sand directly and slowly from the barge worked well, and, by using available equipment, the project costs were kept to a minimum. All maps of the Pier 53 project that appear in this report include rectangles that represent the barge tracks—the areas where individual barge loads were deposited.

Post-cap baseline core samples taken in 1992 showed the expected high chemical concentrations in the under-cap samples and either undetected or low concentrations in the within-cap samples. The cap surface samples showed the cap to be clean and that the chemical concentrations were similar over the entire cap. As expected, the within-cap core and cap-surface chemistry levels were well below the state sediment standards. The post-cap baseline benthic taxonomy survey taken in 1992 showed that recolonization was beginning but that numbers and biomass were low. The video camera survey showed that benthic recolonization was beginning at the edges of the cap.

Scheduled monitoring continued in 1993. Thickness measurements showed that the cap remained stable and was not eroding. However, thickness measurements showed an additional 0.5 foot (15 cm) of sediment had accumulated on the southeast corner of the cap. The extra sediment was probably deposited during construction activities at the adjacent downtown ferry terminal. Settlement measurements showed that the seafloor under the cap remained stable and the cap was not sinking into the native bottom mud.

Core samples taken in 1993 showed that the cap continued to isolate the underlying contaminated sediments. Samples showed a dramatic contrast between the high concentrations in the underlying sediments and the low or undetected concentrations in the cap and ENR. Chemical results from the under-cap samples showed wide variability.

Surface samples taken in 1993 showed that the cap had become recontaminated. Chemical analyses of 2-cm deep surface samples showed that the southeast corner of the remediation area exceeded state sediment standards. Chemical concentrations and visual observations showed a strong correlation between the recontamination and construction activities at the adjacent downtown ferry terminal.

Despite the recontamination, benthic taxonomy samples indicated that the number of individuals, the number of species, and biomass were greater in 1993 than in the 1992 baseline study. The number of species and individuals was also higher in 1993 than before the cap was placed, although biomass was lower. These increases show that improved sediment quality has had a positive effect on the benthic community. However, the benthic sampling stations were not located near the areas of highest recontamination, and, consequently, biological effects of the contamination could not be determined.

Modifications to the Monitoring Plan

Experience gained from monitoring at the Pier 53 project and at the Denny Way sediment cap has shown that not all of the scheduled activities listed in the monitoring plan for the Pier 53 project (Appendix A) were necessary to meet the objectives outlined in the plan. Difficulties with certain sampling methods and the usefulness of the collected data made it necessary to continually re-evaluate the effectiveness and costs of the original monitoring plan. The following is a discussion of modifications to the plan.

Core samples

Baseline monitoring and monitoring in 1993 at Pier 53 showed very low or undetected results for all chemicals that were analyzed for within the cap. Based on this, only the first 6-inch sections above the cap/under-cap interface in each core sample were analyzed in 1996 for organics, metals, and conventional parameters. The second 6-inch section taken from the ENR and the second, third, and fourth 6-inch sections taken from the 3-foot cap all were archived.

Chemical results from the under-cap samples in past years at Pier 53 (1992, 1993) and at the Denny Way cap (1990, 1991, 1992) have been widely variable. Coring through the cap sand and into the underlying mud has apparently resulted in inconsistent sample capture from the underlying mud. Because of this, the under-cap samples have been archived.

Because previous core samples showed no migration of contamination from the underlying sediments up into the cap, the decision was made to reduce the number of core stations sampled from five to three. The three cores stations that were sampled were C1, C4, and C5. C1 was sampled because it was located in the area of the greatest pre-cap contamination. C4 and C5 were sampled because they were located in the thinner ENR. Cores were planned on the 3-foot cap at C2 and C3 but would have been sampled only if there were substantial erosion in those areas. Stake measurements during monitoring showed that there was no erosion and therefore, C2 and C3 were not sampled.

Surface samples

In 1996, samples were collected at all seven on-cap surface stations from the 0- to 2-cm depth as in all previous years. The 0- to 2-cm samples are taken to characterize the most recent contamination. Previous studies at the Pier 53-55 cap

(Hart Crowser, 1994 and EB/DRP 1995a) have shown significant differences between the results of samples taken from the 0- to 2-cm depth and the 0- to 10-cm depth, however. The different results were possibly caused by cleaner cap sand in the deeper 10-cm sample diluting higher concentration of recently deposited contaminants in the top 2 cm.

To document the differences between the different sample depths and because the standard sampling depth for comparisons with the SMS is 10 cm, 2- to 10-cm-deep samples were also collected at stations VG3, VG4, and VG5. During data interpretation, the results of these samples were proportionally combined with the results from the top 2 cm at these stations to reflect the chemical concentrations in the top 10-cm biologically active zone.

Benthic taxonomy

Two years of benthic taxonomy samples have been collected from the cap. The results of these samples have shown that the benthic community has recolonized the cap and has increased since the 1992 baseline study. For 1996, the decision was made to collect a benthic taxonomy reference sample to enable comparisons of the cap to a reference community that represents normal and stable conditions. This comparison would help determine how long it takes for a stable benthic community to re-establish itself after capping.

REMOTS sediment-profile survey

After capping, the REMOTS sediment-profile survey was used to determine how far capping sand drifted offsite during construction. The REMOTS study was also used for an initial assessment of the benthic community during the first stages of recolonization. Further information is not needed on capping sand location, however, and benthic recolonization is being evaluated using benthic taxonomy studies. Therefore, no further REMOTS surveys will be conducted during this monitoring program.

Video camera survey

Video camera surveys were not required by the monitoring plan but were determined to provide useful information about the cap. Two years of video camera surveys have been conducted on the cap. The video surveys were able to show the actual surface of the cap. Video surveys have also shown a surface organic layer that increased since capping, marine plants and organisms, and a buildup of litter and other debris. The information is not easily quantifiable, however, and other methods of determining the organic content of the sediments and of evaluating the benthic community are being used. Therefore, no further video camera surveys will be conducted.

SECTION 2
CAP THICKNESS AND SETTLEMENT

Once the Pier 53 cap was installed, the monitoring plan required periodic measurement of cap thickness and seafloor settlement. These measurements document changes that could compromise the integrity of the cap and its ability to isolate contaminated sediments. This section describes the cap measuring stakes and settling plate assemblies, documents cap thickness and settlement in 1996, and compares these results to the 1992 baseline and 1993 measurements.

METHODS

Before the cap was placed in 1992, Metro directed contract divers to install 13 bottom stakes and settling plate assemblies in the capping target area (Figure 2-1). The stakes and assemblies measure cap thickness and seafloor settlement after cap placement. The stakes were 13- to 18-foot long (3.9 to 5.4 m), 1-inch-diameter (2.5 cm) steel pipes, pounded 8 to 13 feet (2.4 to 3.9 m) into the bottom, with 4.81 to 4.9 feet (1.46 to 1.48 m) left exposed. Settling plate assemblies were then fitted over each steel stake.

Settling plate assemblies were made of a 16-inch-diameter (40 cm) plate sitting horizontally on the pre-cap seafloor, attached to a vertical 4-inch-diameter (10 cm) PVC cylinder long enough to remain exposed after the cap was placed (Figure 2-2). The settling plate assembly was designed to slide down the stake as the contaminated sediments were compressed under the weight of the overlying cap. A metal clamp fastened to the steel stake marked the position of the PVC cylinder before capping. The distance between the bottom edge of the metal clamp and the top of the PVC cylinder was a direct measurement of seafloor settlement after capping.

Cap thickness was determined by measuring the length of PVC cylinder exposed above the cap surface, and then subtracting the total length of the cylinder measured before capping. (The net change in water depth can be obtained by subtracting the settlement from the cap thickness.)

Using a surveyor's rod, divers measured both cap thickness and seafloor settlement at each of the 13 stakes soon after capping in 1992, in 1993, and in 1996.

RESULTS

Cap thickness and settlement measurements taken in 1996 showed that the cap and ENR are stable and not eroding or sinking into the native bottom mud.

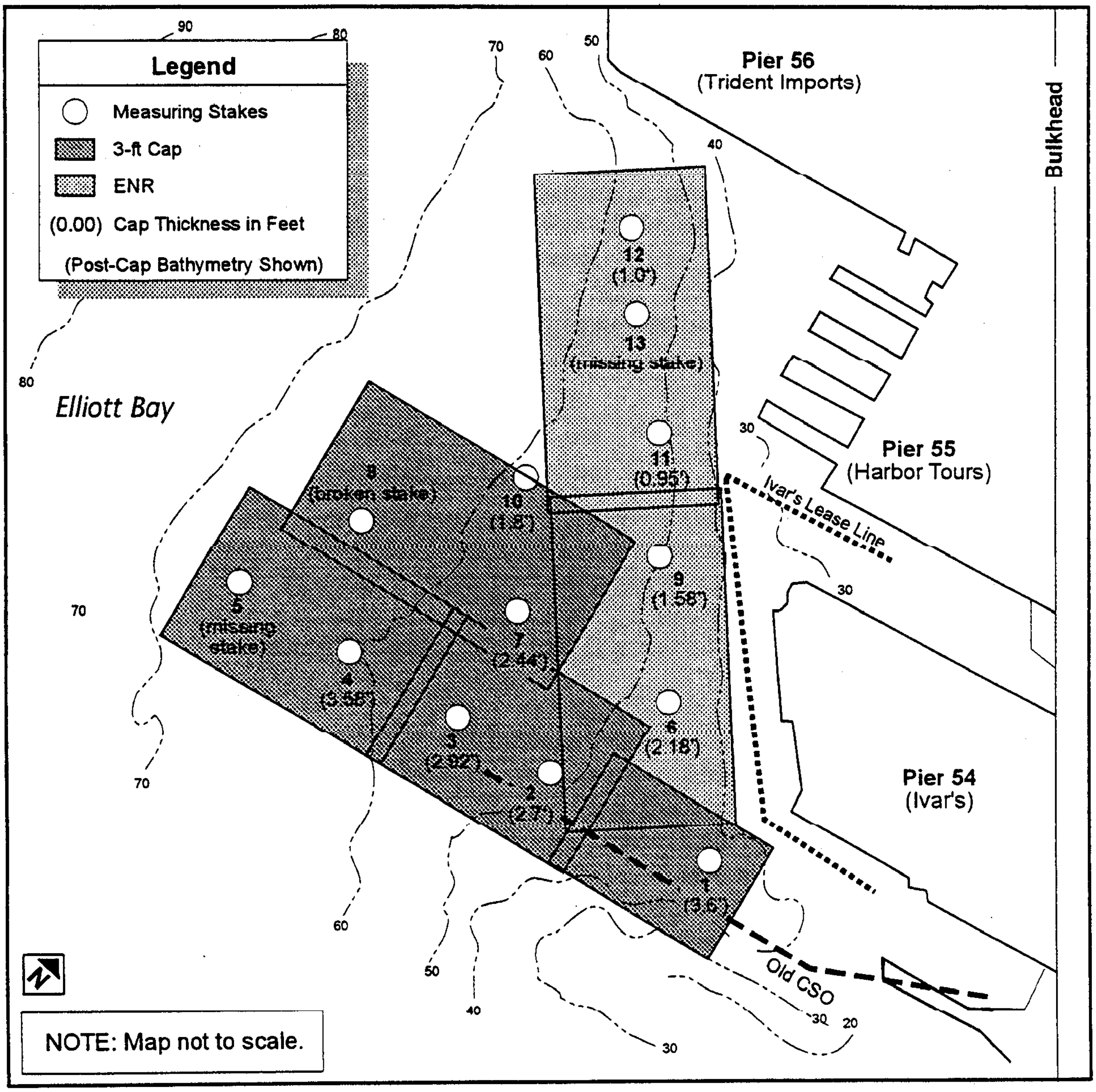


Figure 2-1. Barge Tracks and Measuring Stakes Locations

Cap Thickness

Most of the changes in cap thickness that occurred between 1993 and 1996 were in the range of a few hundredths of a foot (Table 2-1). Four measured changes were equal to or slightly greater than 0.1 foot (3 cm). Cap thickness measurements were not available on the 3-foot cap at Stakes 5 and 8 and on the ENR at Stake 13 because the stakes were missing or broken.

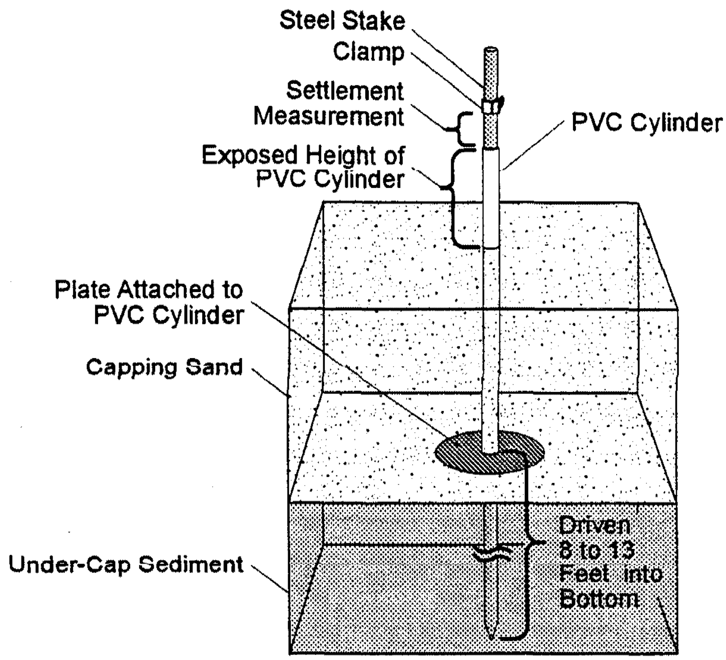


Figure 2-2. Measuring Stake Assembly

Comparing 1996 measurements to 1992 baseline measurements showed only three stakes with measured changes equal to or greater than 0.1 of a foot. All three of these stakes were located on the southern portion of the cap and all accumulated sediment, ranging from 0.7 foot (21 cm at Stake 1) to 0.1 foot (at Stake 2).

In the ENR (Stakes 6, 9, 11, and 12), three stakes showed that the cap was thicker compared to 1993, ranging from 0.06 foot (1.8 cm) to 0.17 foot (5.2 cm) and one stake showed that the cap was thinner by 0.06 foot (1.8 cm). Comparing the 1996 measurements to the 1992 baseline measurements showed that all changes on the ENR were less than 0.1 foot ranging from 0.08 foot (2.4 cm) increase at Stakes 6 and 9 to no change at Stake 12.

Seafloor Settlement

The overlying burden of 22,000 cubic yards (16,700 m^3) of sand caused some seafloor settlement as anticipated. In the 3-foot cap area, settlement ranged from 0.17 foot (5.2 cm) at Stake 7 to 0.35 foot (10.7 cm) at Stake 1 (Table 2-2). Settlement in the ENR ranged from 0.26 foot (7.9 cm) at Stake 9 to 0.03 foot (0.9 cm) at Stake 12. The ENR settled less than the 3-foot cap probably because of the smaller amount of overburden. The minimal amount of settlement shows that the cap is stable and not sinking into the native bottom muds.

TABLE 2-1. Cap Thicknesses at Measuring Stakes (in Feet)					
Stake	1992 Cap Thickness	1993 Cap Thickness	1996 Cap Thickness	Change From 1993	Change From 1992
1	2.9	3.44	3.6	+ 0.16	+ 0.7
2	2.6	2.72	2.7	- 0.02	+ 0.1
3	2.8	2.82	2.92	+ 0.10	+ 0.12
4	3.5	3.56	3.58	+ 0.02	+ 0.08
5	3	Missing Stake and Assembly	Missing Stake and Assembly	Missing Stake and Assembly	Missing Stake and Assembly
6	2.1	2.2	2.18	- 0.02	+ 0.08
7	2.5	2.5	2.44	- 0.06	- 0.06
8	2.5	2.54	Broken Stake and Assembly	Broken Stake and Assembly	Broken Stake and Assembly
9	1.5	1.52	1.58	+ 0.06	+ 0.08
10*	1.9	1.86	1.8	- 0.06	- 0.1
11	0.9	0.78	0.95	+ 0.17	+ 0.05
12	1	0.88	1	+ 0.12	0
13	0.8	0.83	Missing Stake and Assembly	Missing Stake and Assembly	Missing Stake and Assembly

* Stake 10 is located on the edge of the cap.

Settlement measurements were not available at four sites along the southern and western boundaries of the 3-foot cap and one site on the ENR because the measuring stakes were damaged or missing (Table 2-2).

DISCUSSION

With the exception of Stake 1, all of the changes in cap thickness were less than a few tenths of a foot and most were approximately a few hundredths of a foot. All stakes in the ENR showed very little, if any, change. All changes were minor and show that the 3-foot cap and ENR are stable and isolating the underlying sediments.

All of the stakes along the southern boundary of the cap showed at least minor increases in cap thickness. The substantial increase at Stake 1 since capping was likely caused by construction activities at the ferry terminal between 1992 baseline monitoring and monitoring in 1993. Increases in cap thickness since 1993 are likely from sediment that is stirred up by prop-wash from large car-ferries and then settles on to the cap. During docking of the ferries, a reverse propeller thrust is used to brake the momentum of the ferry prior to contacting the dock. This reverse thrust is directed onshore into a shallow nearshore area. A similar thrust is also used during ferry departure. It is possible that these onshore thrusts suspend bottom sediment that travels a short distance and then re-settles on the bottom. The southwest corner of the cap is in an area where some of the suspended sediment would likely settle.

TABLE 2-2. Seafloor Settlement

Stake	1992 Settlement	1993 Settlement	1996 Settlement
1	No Settlement	0.3	0.35
2	No Settlement	Missing Steel Tube	Missing Steel Stake
3	No Settlement	Missing Clamp	Missing Clamp
4	No Settlement	0.3	0.28
5	No Settlement	Missing Stake and Assembly	Missing Stake and Assembly
6	0.12	0.2	0.23
7	No Settlement	0.16	0.17
8	0.12	Broken Stake and Assembly	Broken Stake and Assembly
9	No Settlement	0.2	0.26
10	0.18	0.04	0.25
11	0.2	0.04	0.05
12	0.15	0.04	0.03
13	0.1	0.02	Missing Stake and Assembly

During 1996 monitoring, divers reported that Stake 8 had been broken off at the cap surface. Also, divers were unable to find Stake 13 despite a lengthy attempt and excellent visibility. The divers reported that a significant amount of large wood debris covered the bottom in the area of Stake 13, however, leaving the possibility that either the stake was destroyed or that the diver could not locate it among the debris.

These two stakes are in addition to three stakes that were partially damaged or completely missing during monitoring in 1993. Two of these stakes, however, were only partially damaged and were still accurate for cap thickness measurements but did not allow for cap settlement measurements.

The Stake damage possibly reflects construction and commercial activities in the Pier 53-55 area. At the Denny Way cap, one of the six measuring stakes was bent during capping but no other damage has occurred in the 6 years since capping (Metro 1994, Wilson and Romberg 1996). The Denny Way cap is located just offshore of Myrtle Edwards park where almost no commercial activity occurs, although public boaters anchor on the cap during several public events per year.

SECTION 3
CORE CHEMISTRY

In August 1996, the monitoring team collected core samples from the 3-foot cap and ENR. The samples were collected and analyzed to determine whether contaminants are migrating from under-cap sediments upward into the cap. Core samples were analyzed for trace metal, organic, and conventional parameters. This section describes the core sampling methods and compares the results of the chemical analysis to the SMS and to the 1992 baseline and 1993 results.

METHODS

The monitoring plan defined five core sampling stations (C1 through C5), as shown in Figure 3-1. Two stations are in the ENR (C4 and C5), and three stations are in the 3-foot cap (C1, C2, and C3) to allow comparisons between the two areas. The stations are located in water depths of 55 to 60 feet (16.6 to 18 m) and in areas where the bottom slope is less steep than farther inshore. C1 is located in the southeast corner of the site where some of the highest chemical levels were previously observed and where sampling is more likely to detect the possible upward migration of contaminants into the cap. All five stations are situated at least 30 feet (9 m) away from the surface sampling stations so that any potential release of contaminated sediment from core sampling activities would not affect surface samples.

Because core samples taken during 1992 baseline and 1993 monitoring at Pier 53 showed no migration of contamination from the underlying sediments up into the cap, the decision was made to reduce the number of core stations sampled from five to three. The three cores stations that were sampled were C1, C4, and C5. C1 was sampled because it was located in the area of the greatest pre-cap contamination. C4 and C5 were sampled because they were located in the thinner ENR area. Cores were planned on the 3-foot cap at C2 and C3 but would have been sampled only if there were substantial erosion in those areas. Stake measurements during monitoring showed that there was no erosion and so C2 and C3 were not sampled.

Sample Collection

During 1996 monitoring, two cores were collected from each of the three stations that were sampled. The longest core was analyzed first, while the second served as a backup in case there was a problem with the first core.

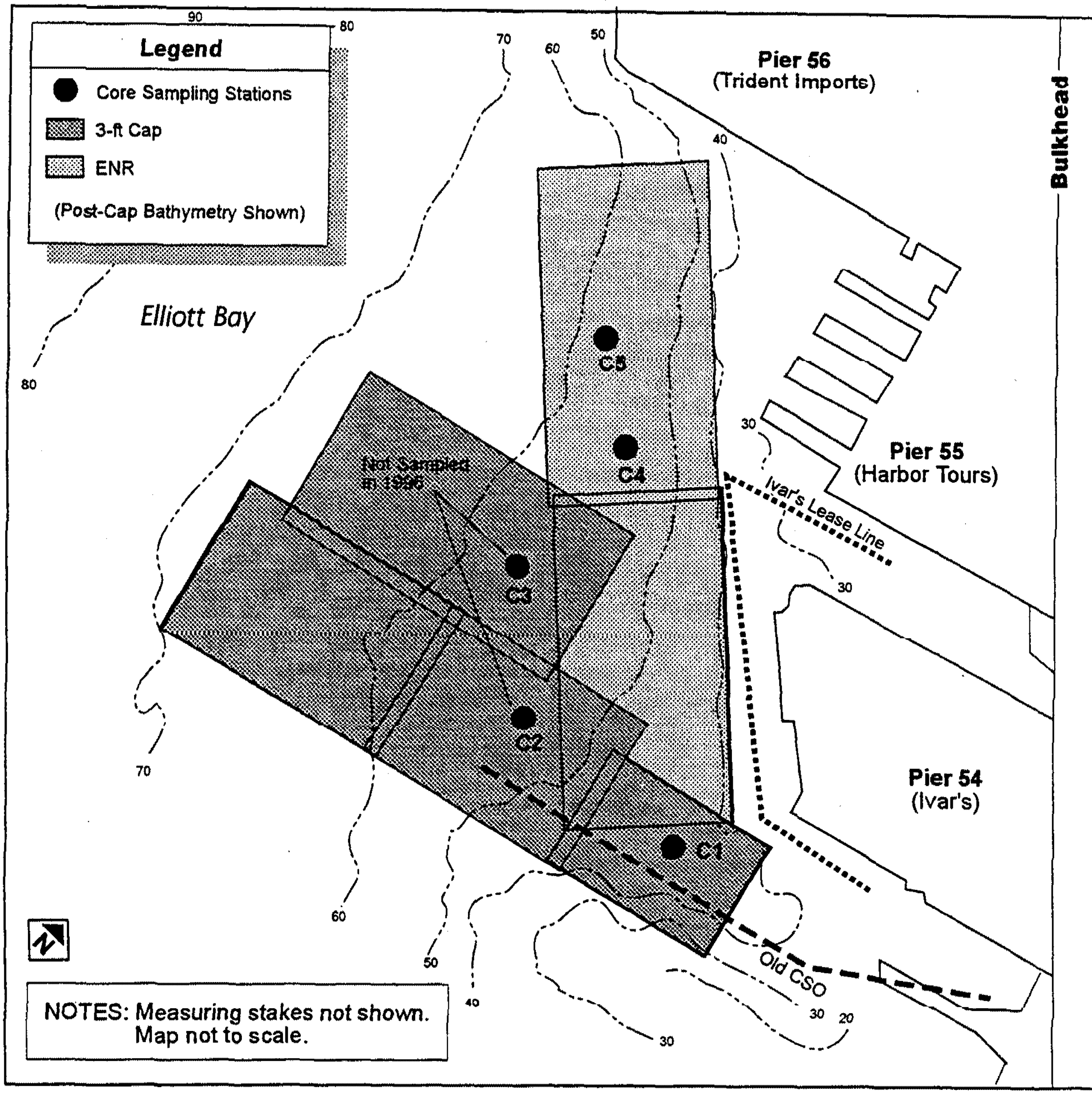


Figure 3-1. Core Sampling Stations

The monitoring team consisted of a diver, a diving support crew and boat, and King County's *RV Liberty* and crew. Station location was determined using a differential global positioning system (DGPS) onboard the *RV Liberty*. In addition, a shore-based surveyor ensured consistency between previously surveyed station locations, which used a range azimuth laser positioning system, and DGPS positions. The *RV Liberty* crew began by setting marker buoys at each coring station. After the buoys were set, the *RV Liberty* crew anchored at a coring station and tied the diver support boat alongside. The diver carried a 6-foot-long (1.8 m), 4-

inch-diameter (10 cm), thin-walled aluminum coring tube down to the core station and inserted it into the bottom, keeping it vertical. While in the water, the diver was in constant contact with the support boat via closed-circuit radio. A 0.5-inch (1.25 cm) nylon rope was attached from a boat winch to the coring tube for later retrieval of the core. The crew, using another winch, lowered a pneumatic jackhammer to the diver. The diver then jackhammered the core tube through the cap and into the sediments below. The diver required about 10 minutes to drive the core tube 5 feet (1.5 m) into the bottom, leaving about 1 foot (30 cm) of the core tube above the bottom. Each core extended completely through the cap and into the underlying contaminated sediments by at least 1 foot. Once the core tube was deep enough, the diver removed the jackhammer and inserted a rubber screw plug into the top of the tube. The winch operator, using the nylon rope attached to the coring tube, slowly pulled the core out of the bottom sediments. Once the core was free of the bottom, the diver inserted a second rubber screw plug into the bottom of the tube to completely encapsulate the sample.

The core samples were then brought onboard where the top plug was removed, excess water was siphoned off, and the length of the core was measured. Each core tube was labeled with a permanent marker to show station number and the length of the core sample. The cores were transported to King County's laboratory and stored in a walk-in freezer.

Sample Analysis

Shortly before the cores were processed, they were removed from the freezer and thawed. When the cores were thawed, the aluminum tubes were cut down the sides lengthwise. Half of the tube was removed and the other half was left to hold the core.

The cores were then divided into 6-inch-long (15 cm) sections for analysis, as shown in Figure 3-2. In the cores taken from the 3-foot cap area, one 6-inch section was taken below the interface of the cap with the contaminated sediment and four 6-inch sections were taken from above the interface (within the cap). In cores taken from the ENR area, one 6-inch section was taken from below the interface and two 6-inch sections were taken from within the cap. Before the sections were cut, a 1-inch-thick (2.5 cm) band of cap sediment above the interface was discarded to remove any contaminated sediment that may have been mixed into the cap during placement. The outsides of the 6-inch sections were scraped away, and the interior of the core was scooped out and placed into a stainless steel bowl. The material in each bowl was stirred before a sample was taken for analysis.

Analyses of the core sections in 1992 and 1993 showed no migration or mixing of contaminants into the cap. Concentrations in the 6-inch section below the cap/under-cap interface differed greatly between years and were possibly a sampling

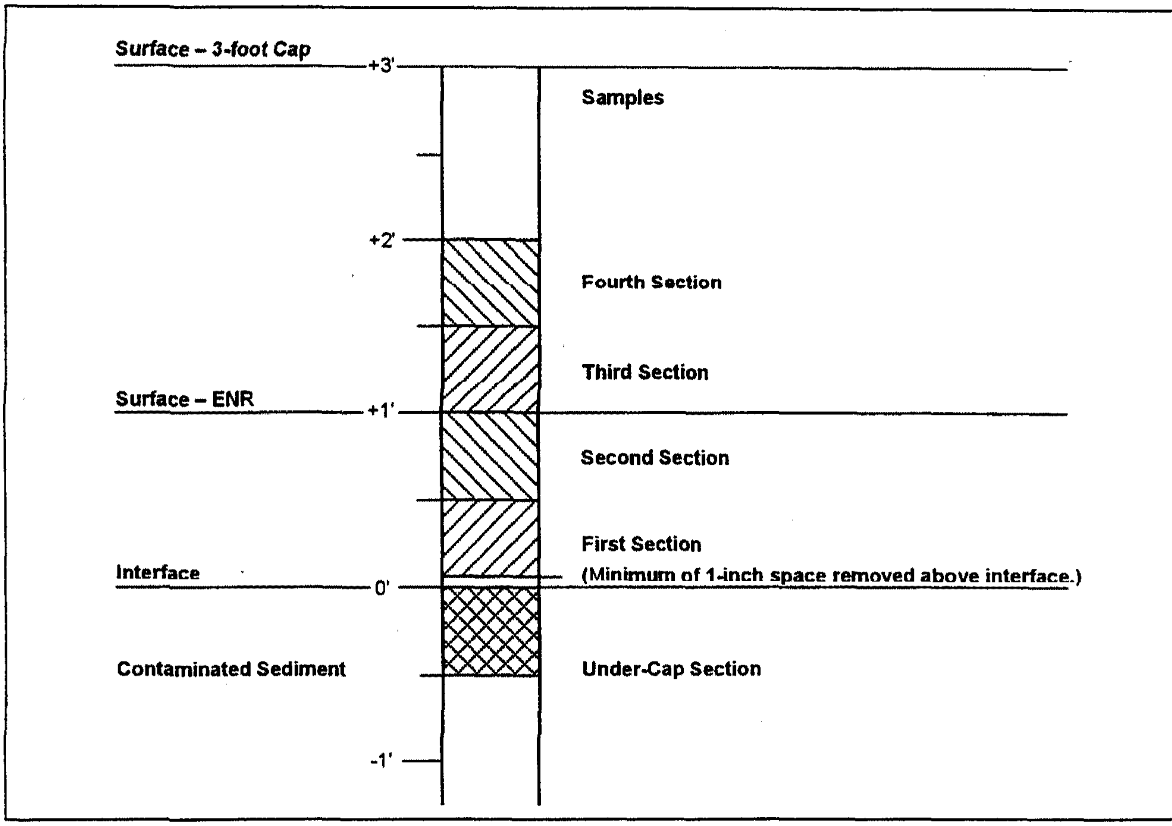


Figure 3-2. Cross Section of Core Sample

artifact. Therefore, in 1996 only the first 6-inch section of each core directly above the cap/under-cap interface ("first 6-inch section") was analyzed. If migration were to occur, the chemicals would be found in this section first. Samples from the under-cap and other within-cap sections were collected but were archived.

King County's Environmental Laboratory analyzed the samples for trace metals, base neutral acid extractable (BNA) organics, pesticides, polychlorinated biphenyls (PCBs), total organic carbon (TOC), and total solids. BNAs include low and high molecular weight polycyclic aromatic hydrocarbons (LPAHs and HPAHs). The lab used the EPA and Puget Sound Environmental Program approved procedures for sediment analysis. (Quality assurance procedures are discussed in Appendix B.) AmTest, Inc., analyzed the samples for particle size distribution. Certain BNA organics and PCBs were normalized with respect to total organic carbon for comparison to the SQS and CSL. These values were reported as milligrams per kilogram (mg/kg) organic carbon.

RESULTS

Data tables and figures appear at the end of this section. Data tables show detected chemicals on a dry-weight basis (Table 3-1), comparisons to the SMS (Table 3-2), and particle size distribution (Table 3-3). A complete list and explanation of qualifiers also appears in Appendix B.

Analysis of the three 1996 core samples indicated that chemicals from the underlying sediments have not migrated up into the 3-foot cap or ENR. The samples showed a stark contrast between the chemical concentrations of the surface sediments and low or undetectable concentrations within the cap. Of the 98 organic compounds analyzed for, only bis(2-ethylhexyl)phthalate was detected at one station. All other organic chemicals were undetected. For metals, mercury, cadmium, and silver were undetected. Lead and arsenic were detected slightly above detection limits.

Particle size distribution data showed that the sediment within the cap remained mostly sand (Table 3-3). Samples ranged from 92.6 to 96.9 percent sands and gravels. These data further support the chemical results that show little or no mixing of the clean capping sand with the under-cap sediments is occurring.

Comparing 1996 results to results from the first 6-inch sections taken from cores during the 1992 basecline study showed some similarities and in some cases the 1996 data showed lower results. In the first 6-inch section at C1, 9 organic chemicals were detected at or near the detection limit in the 1992 baseline study. At C1 in 1996, one organic chemical was detected. At C5, no organic chemicals were detected in either the 1992 baseline or the 1996 studies. At C4, no organic chemicals were detected in 1996, however, several were detected at elevated levels in the 1992 baseline study. These chemicals found in 1992 were attributed to clay lumps from the Duwamish river that were dredged along with the capping sands (EB/DRP 1993a).

TABLE 3-1. Core Stations: Detected Chemicals

Station Locator	P53C1		P53C4		P53C5	
Date Sampled	Aug 14, 96		Aug 14, 96		Aug 15, 96	
Sample Number	L9316-1		L9316-2		L9316-3	
% Solids	77.7		93.7		80.5	
% TOC dry	0.353		0.16		0.297	
BNA Organics (µg/kg dry weight)	Qual	Value	Qual	Value	Qual	Value
LPAHs						
Naphthalene	<MDL,G	55	<MDL,G	46	<MDL,G	53
Acenaphthene	<MDL	14	<MDL	12	<MDL,G	14
Acenaphthylene	<MDL	21	<MDL	17	<MDL,G	20
Anthracene	<MDL,G	21	<MDL,G	17	<MDL,G	20
Fluorene	<MDL,G	21	<MDL,G	17	<MDL,G	20
Phenanthrene	<MDL,G	21	<MDL,G	17	<MDL,G	20
2-Methylnaphthalene	<MDL	55	<MDL	46	<MDL,G	53
Total LPAHs		208		172		200
HPAHs						
Fluoranthene	<RDL,G	22	<MDL,G	17	<MDL,G	20
Pyrene	<RDL,G	31	<MDL,G	17	<MDL,G	20
Benzo(a)anthracene	<MDL,G	21	<MDL,G	17	<MDL,G	20
Chrysene	<MDL	21	<MDL	17	<MDL,G	20
Benzo(b)fluoranthene	<MDL	55	<MDL	46	<MDL,G	53
Benzo(k)fluoranthene	<MDL,G	55	<MDL,G	46	<MDL,G	53
Benzo(a)pyrene	<MDL,G	35	<MDL,G	29	<MDL,G	34
Indeno(1,2,3-Cd)Pyrene	<MDL,G	35	<MDL,G	29	<MDL,G	34
Dibenzo(a,h)anthracene	<MDL	55	<MDL	46	<MDL,G	53
Benzo(g,h,i)perylene	<MDL,G	35	<MDL,G	29	<MDL,G	34
Total HPAHs		365		293		341
Other BNA						
1,4-Dichlorobenzene	<MDL,G	0.89	<MDL,G	0.74	<MDL,G	0.86
Di-N-Octyl Phthalate	<MDL	21	<MDL	17	<MDL,G	20
Benzyl Butyl Phthalate	<MDL	21	<MDL	17	<MDL,G	20
Bis(2-Ethylhexyl)Phthalate		35.1	<MDL	17	<MDL,G	20
Dibenzofuran	<MDL	35	<MDL	29	<MDL,G	34
4-Methylphenol	<MDL	35	<MDL	29	<MDL,G	34
Phenol	<MDL	140	<MDL	120	<MDL,G	140
Benzoic Acid	<MDL	140	<MDL	120	<MDL,G	140
Carbazole	<MDL	35	<MDL	29	<MDL,G	34
Coprostanol	<MDL,E	140	<MDL,E	206	MDL,G,E	140
Pesticides and PCBs (µg/kg dry weight)						
4,4'-DDD	<MDL	1.7	<MDL	1.4	<MDL	1.6
Endosulfan I	<MDL	1.7	<MDL	1.4	<MDL	1.6
Aroclor 1254	<MDL	17	<MDL	14	<MDL	16
Aroclor 1260	<MDL	17	<MDL	14	<MDL	16
Total PCBs	<MDL	17	<MDL	14	<MDL	16
Metals (mg/kg dry weight)						
Mercury	<MDL	0.024	<MDL	0.02	<MDL	0.025
Aluminum	L	10800	L	9380	L	9020
Arsenic	<RDL	3.3	<RDL	2.9	<RDL	5.5
Beryllium	<RDL	0.24	<RDL	0.22	<RDL	0.22
Cadmium	<MDL	0.19	<MDL	0.16	<MDL	0.19
Chromium		11.9		11.8		12.9
Copper		11.5		10.6		10.5
Iron		17400		16500		18000
Lead	<RDL	4.6	<RDL	4.4	<RDL	4.3
Magnesium		3800		3700		3900
Nickel		12		11.6		11.2
Silver	<MDL	0.27	<MDL	0.21	<MDL	0.25
Zinc		45.2		47.4		45.5

<MDL - Undetected at the method detection limit
<RDL - Detected below reporting detection limits
B - Blank contamination
E - Estimate
G - Low standard reference material recovery
L - High standard reference material recovery

For further information on data qualifiers see Appendix B.

TABLE 4-2. Comparison to Sediment Standards

Station Locator	P53C1		P53C4		P53C5		Sediment Management Standards	
Date Sampled	Aug 14, 96		Aug 14, 96		Aug 15, 96			
Sample Number	L9316-1		L9316-2		L9316-3			
% Solids	77.7		93.7		80.5			
T.O.C. dry in %	0.353		0.16		0.297			
Organics	Qual	Value	Qual	Value	Qual	Value	SQS	CSL
LPAHs (mg/kg TOC)								
Naphthalene	<MDL,G	7.31	<MDL,G	2.09	<MDL,G	5.38	99	170
Anthracene	<MDL,G	2.79	<MDL,G	0.77	<MDL,G	2.03	220	1200
Acenaphthene	<MDL	1.86	<MDL	0.55	<MDL,G	1.42	16	57
Phenanthrene	<MDL,G	2.79	<MDL,G	0.77	<MDL,G	2.03	100	480
Fluorene	<MDL,G	2.79	<MDL,G	0.77	<MDL,G	2.03	23	79
Acenaphthylene	<MDL	2.79	<MDL	0.77	<MDL,G	2.03	66	66
2-Methylnaphthalene	<MDL	7.31	<MDL	2.09	<MDL,G	5.38	38	64
Total LPAHs		27.7		7.82		20.3	370	780
HPAHs (mg/kg TOC)								
Fluoranthene	<RDL,G	2.93	<MDL,G	0.77	<MDL,G	2.03	160	1200
Pyrene	<RDL,G	4.12	<MDL,G	0.77	<MDL,G	2.03	1000	1400
Benzo(a)anthracene	<MDL,G	2.79	<MDL,G	0.77	<MDL,G	2.03	110	270
Chrysene	<MDL	2.79	<MDL	0.77	<MDL,G	2.03	110	460
Total benzo fluoranthenes	<MDL,G	7.31	<MDL,G	2.09	<MDL,G	5.38	230	450
Benzo(a)pyrene	<MDL,G	4.65	<MDL,G	1.32	<MDL,G	3.45	99	210
Indeno(1,2,3-Cd)Pyrene	<MDL,G	4.65	<MDL,G	1.32	<MDL,G	3.45	34	88
Dibenzo(a,h)anthracene	<MDL	7.31	<MDL	2.09	<MDL,G	5.38	12	33
Benzo(g,h,i)perylene	<MDL,G	4.65	<MDL,G	1.32	<MDL,G	3.45	31	78
Total HPAHs		41.2		11.2		29.2	960	5300
Other (mg/kg TOC)								
1,2,4-Trichlorobenzene	<MDL,G	0.12	<MDL,G	0.03	<MDL,G	0.09	0.81	1.8
1,2-Dichlorobenzene	<MDL,G	0.12	<MDL,G	0.03	<MDL,G	0.09	2.3	2.3
1,4-Dichlorobenzene	<MDL,G	0.12	<MDL,G	0.03	<MDL,G	0.09	3.1	9
Hexachlorobenzene	<MDL,G	0.12	<MDL,G	0.03	<MDL,G	0.09	0.38	2.3
Diethyl Phthalate	<MDL	4.65	<MDL	1.32	<MDL,G	3.45	61	110
Dimethyl Phthalate	<MDL	1.86	<MDL	0.55	<MDL,G	1.42	53	53
Di-N-Butyl Phthalate	<MDL	4.65	<MDL	1.32	<MDL,G	3.45	220	1700
Benzyl Butyl Phthalate	<MDL	2.79	<MDL	0.77	<MDL,G	2.03	4.9	64
Bis(2-Ethylhexyl)Phthalate		4.67	<MDL	0.77	<MDL,G	2.03	47	78
Di-N-Octyl Phthalate	<MDL	2.79	<MDL	0.77	<MDL,G	2.03	58	4500
Dibenzofuran	<MDL	4.65	<MDL	1.32	<MDL,G	3.45	15	58
Hexachlorobutadiene	* <MDL,G	4.65	<MDL,G	1.32	<MDL,G	3.45	3.9	6.2
N-Nitrosodiphenylamine	<MDL	4.65	<MDL	1.32	<MDL,G	3.45	11	11
Total PCBs	<MDL	2.26	<MDL	0.64	<MDL	1.62	12	65
Other (µg/kg dry weight)								
Phenol	<MDL	140	<MDL	120	<MDL,G	140	420	1200
2-Methylphenol	<MDL	35	<MDL	29	<MDL,G	34	63	63
4-Methylphenol	<MDL	35	<MDL	29	<MDL,G	34	670	670
2,4-Dimethylphenol	* * <MDL	35	<MDL	29	* * <MDL,G	34	29	29
Pentachlorophenol	<MDL,G	35	<MDL,G	29	<MDL,G	34	360	690
Benzyl Alcohol	<MDL	35	<MDL	29	<MDL,G	34	57	73
Benzoic Acid	<MDL	140	<MDL	120	<MDL,G	140	650	650
Metals (mg/kg dry weight)								
Mercury	<MDL	0.02	<MDL	0.02	<MDL	0.03	0.41	0.59
Arsenic	<RDL	3.3	<RDL	2.9	<RDL	5.5	57	93
Cadmium	<MDL	0.19	<MDL	0.16	<MDL	0.19	5.1	6.7
Chromium		11.9		11.8		12.9	260	270
Copper		11.5		10.6		10.5	390	390
Lead	<RDL	4.6	<RDL	4.4	<RDL	4.3	450	530
Silver	<MDL	0.27	<MDL	0.21	<MDL	0.25	6.1	6.1
Zinc		45.2		47.4		45.5	410	960

* - Exceeds SQS
** - Exceeds CSL

<RDL - Detected below quantification limits
<MDL - Undetected at the method detection limit

Note: For further information on data qualifiers see QA Report in Appendix B

TABLE 3-3. Core Stations: Particle Size Distribution

Station Locator	P53C1		P53C4		P53C5	
Date Sampled	Aug 14, 96		Aug 14, 96		Aug 15, 96	
Sample Number	L9316-1		L9316-2		L9316-3	
% Solids	77.7		93.7		80.5	
Phi Size (%)	Qual	Value	Qual	Value	Qual	Value
Sands and Gravels						
p-2.00(less than) *		0.4		0.4		1.1
p-2.00 *		0.1		0.1		0.1
p-1.00 *		0.6		1.3		1.1
p+0.00 *		3.3		5.2		5.5
p+1.00 *		35		36.8		38
p+2.00 *		46.5		48.3		46.6
p+3.00 *		5.9		4.5		3.5
p+4.00 *		0.8		0.3		0.4
Total % Sands and Gravels		92.6		96.9		96.3
Silts and Clays						
p+5.00 *		1.8		0.3	<MDL	0.1
p+6.00 *	<MDL	0.1	<MDL	0.1	<MDL	0.1
p+7.00 *		1.4		0.3	<MDL	0.1
p+8.00 *		2.1		2		0.5
p+9.00 *		0.7		0.3		0.1
p+10.0 *		0.3	<MDL	0.1	<MDL	0.1
p+10.0(more than) *		1.1	<MDL	0.1		3.1
Total % Silts and Clays		7.5		3.2		4.1

<RDL - Detected below quantification limits
* indicates wet weight used for this parameter
For further information on data qualifiers see Appendix B.

<MDL - Undetected at the method detection limit
E - Estimate based on high relative percent difference in duplicate, high relative standard deviation in triplicate, or high or low surrogate recoveries

SECTION 4
SURFACE SEDIMENT CHEMISTRY

In August 1996, the monitoring team collected surface sediment samples from the 3-foot cap and the ENR. The samples were analyzed for trace metal, organic, and conventional parameters. This section describes the surface sampling methods, reports the results of the surface sample analysis, and compares the results to the state sediment standards.

METHODS

Within the remediation area, the monitoring plan defines seven surface sampling stations (VG1 through VG7). These stations provide spatial coverage across the cap and ENR (Figure 4-1). VG3, VG4, and VG6 were placed along the centerline of the long axis of the rectangular-shaped ENR. VG5 was placed in the southeast corner of the remediation area on the shallower inshore end of the 3-foot cap. VG1, VG2, and VG7 provide sampling coverage of the 3-foot cap in deeper water.

Sediment chemistry samples were also collected from the seven stations in the remediation area during 1992 baseline and 1993 monitoring.

Sample Collection

In 1996, samples were collected at all on-cap surface stations from the 0- to 2-cm depth as in all previous years of study. A replicate sample was taken at VG5. Also, samples were collected at certain stations to characterize the top 10 cm of sediment. This is because previous studies at the Pier 53-55 cap (Hart Crowser, 1994 and EB/DRP 1995a) have shown significant differences between the results of samples taken from the 0- to 2-cm depth and the 0- to 10-cm depth. The different results were likely caused by cleaner cap sand in the deeper 10-cm sample diluting higher concentration of recently deposited contaminants in the top 2 cm.

To document the differences between the sample depths, 2- to 10-cm deep samples were collected at stations VG3, VG4, and VG5. During data interpretation, the results of these samples were proportionally combined with the results from the top 2 cm at these stations to reflect the chemical concentrations in the top 10-cm biologically-active zone.

Subtidal samples were collected with a 0.1-m^2 van Veen grab sampler operated from King County's *R V Liberty*. Three individual grab samples were taken at each station. A stainless steel "cookie cutter" sampler and stainless steel

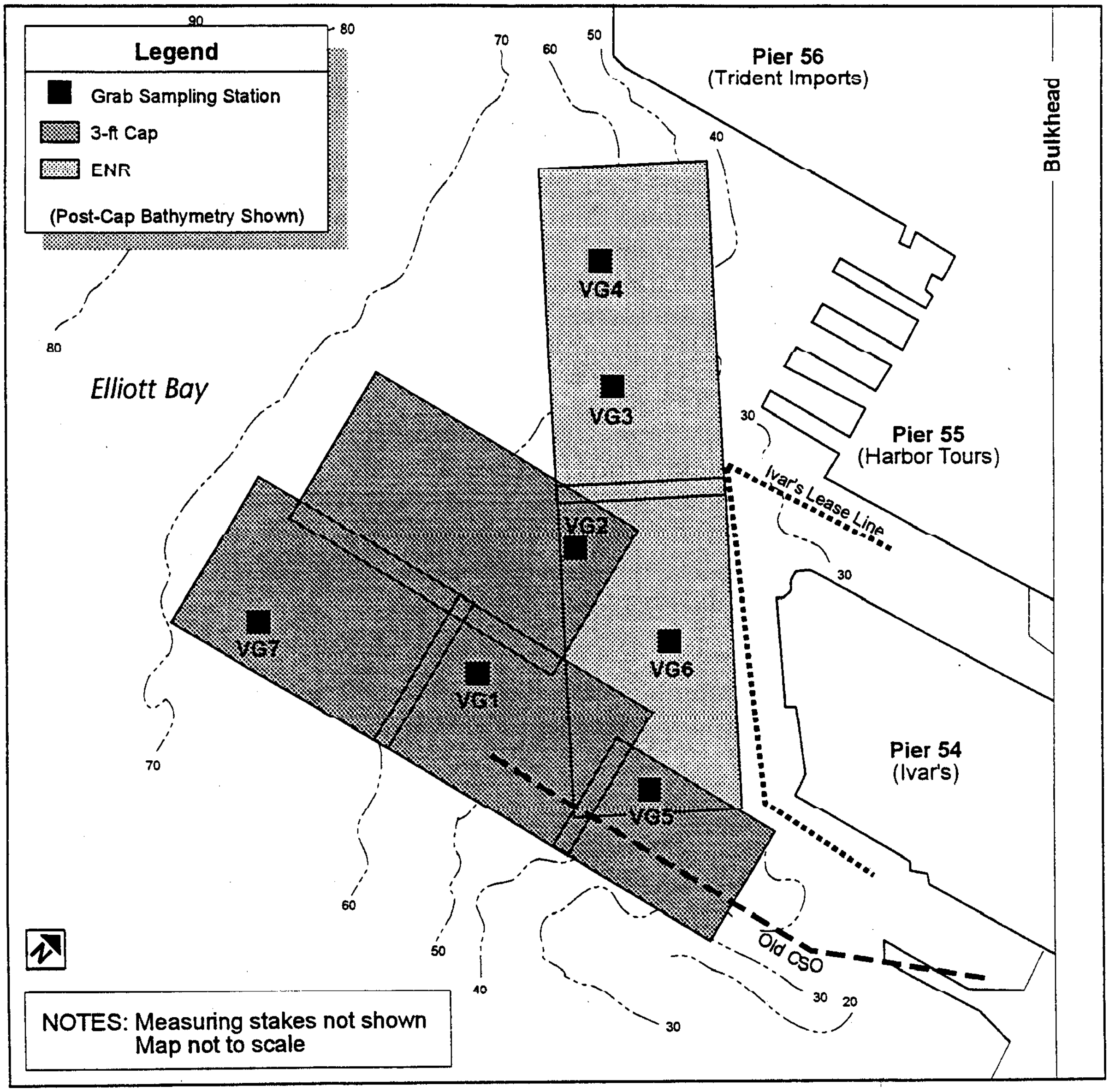


Figure 4-1. Surface Sampling Stations

spatula were used to remove a 2-cm-deep subsample from the top of each grab sample. The three subsamples were composited in a stainless-steel bowl. After the 2 cm subsample had been removed from the grab sample, an additional subsample representing the 2- to 10-cm depth at the above mentioned stations were removed using a stainless steel spoon. The 2- to 10-cm subsamples were composited in separate stainless-steel bowls.

The van Veen grab sampler was rinsed between each deployment and was decontaminated before use at the next sampling station. To decontaminate the sampler it was scrubbed with a brush and a phosphate-free detergent/water solution followed by several rinses on board the vessel. Dedicated stainless steel bowls, spoons, cookie cutters, and spatulas were used for each sample station. All stainless steel equipment was cleaned prior to sampling using a phosphate-free detergent/water solution followed by several rinses with deionized water and a final rinse with acetone. The equipment was wrapped in aluminum foil for storage prior to use.

Sample Analysis

The King County Environmental Laboratory analyzed the samples for trace metals, BNAs, pesticides, PCBs, volatile compounds, total solids, and TOC. AmTest, Inc., analyzed the samples for particle size distribution. For complete results see Appendix C; for QA procedures see Appendix B.

RESULTS

Chemical Analysis

In all, 32 organic compounds were detected on the sediment cap and ENR. As in 1993, the highest number of compounds and the highest concentrations were found at VG5 in the southwest corner of the remediation area. Moving alongshore to the north and offshore to the west, the number of compounds detected and their concentrations consistently decreased with distance from VG5. The lowest number of detected compounds and the lowest concentrations were found at the station farthest offshore (VG7); the second lowest number of compounds and concentrations were found at the station farthest north (VG4) (Figures 4-2 through 4-5).

Chemical concentrations from the 3-foot cap and ENR exceeded the SQS eight times and the CSL three times. All three CSL exceedances occurred at VG5 where phenol and 4-methylphenol exceeded the CSL in the primary sample and 4-methylphenol exceeded the CSL in the replicate sample (Tables 4-1 and 4-2).

Both 2-cm-deep samples and 10-cm-deep samples were collected from stations VG3, VG4, and VG5 and their results were compared. Six parameters were chosen for the comparison: total LPAHs, total HPAHs, mercury, BEHP, 4-methylphenol, and phenol.

At VG3 and VG4 most parameter concentrations were approximately 50 percent lower in the 10-cm sample than in the 2-cm sample. The six parameters at VG3 averaged 44 percent lower in the 10-cm sample and at VG4 the parameters averaged 58 percent lower in the 10-cm sample.

The differences were smaller between the 2- and 10-cm samples at VG5 in both the primary and replicate samples. In the primary sample, all six parameters were lower in the 10-cm sample by an average of 30 percent. In the replicate sample, most parameters were higher in the 10-cm sample. However, all six parameters in both the 2-cm and 10-cm samples were within 20 percent of each other.

Lower concentrations were expected in the 10-cm samples because clean cap sand would be incorporated into the deeper sample. At VG5, the differences may have been less because this area has received more new sediment than at other stations. Measuring stakes showed that between 1992 and 1993 over 0.5 foot (15.5 cm) of new sediment accumulated in the area around VG5 and that another 0.2 foot (6.5 cm) accumulated between 1993 and 1996. All of the 2-cm and 10-cm samples at VG5 were composed of this newly deposited sediment, which may explain the homogeneity of the 2-cm and 10-cm samples.

Conventionals Analysis

Grain size analysis showed a shift in particle size on the 3-foot cap and ENR between 1993 to 1996. In 1996, most stations showed a higher percentage of fines ranging from 13.8 to 41.9 percent fines compared to a range of 8.4 to 18.9 percent fines found in 1993.

This overall increase in fines on the cap was expected because the cap is mostly in a depositional area where fine particles are able to settle out. Eventually sedimentation will make the surface of the cap more like the fine-grain native bottom muds.

VG7 is the only station that decreased in the percentage of fines. Results showed that fines decreased from 9.1 percent in 1993 to 6.1 percent in 1996. VG7 is in the south western corner of the cap adjacent to the ferry terminal, which suggests that the grain size makeup of this station is being affected by ferry traffic. In particular, ferries sitting at idle in the terminal berths probably cause this area to be scoured regularly. However, measuring stakes in this area do not show that the cap is eroding. Currents generated by the ferries in this area are probably just enough to keep fine-grain particles from settling.

In the southeast corner of the remediation area, VG5 showed the highest percentage of fines with 41.9 percent. VG5 is apparently located where fine material stirred up by ferry traffic settles. This area is far enough away from ferry turbulence that could wash away the fine sediment layer. Bottom contours also show that VG5 is at the end of an elongated valley-like depression. This would cause suspended sediments in the ferry dock area to funnel down toward VG5. A measuring stake in this area showed an increase in cap thickness each time the stakes were measured since capping. Additionally, observations during monitoring revealed a layer of fine-grain mud a few-inches thick on top of the capping sand during sampling at VG5. It is likely that this area of the 3-foot cap will continually receive more sediment than any other in the remediation area.

DISCUSSION

In general, chemical levels were lower in 1996 than the extremely high levels of the contaminants found on the Pier 53 remediation area in 1993. The contaminants found in high concentrations in 1993 included LPAHs, HPAHs, and mercury. However, several new contaminants appeared on the Pier 53 remediation area for the first time in 1996. These contaminants included PCBs, pesticides, a chlorinated benzene, phthalates, and phenols.

Concentrations of PAHs and mercury decreased in 1996 from 1993. All stations showed a dramatic decrease in total LPAH concentrations and all but two stations decreased in total HPAH concentrations. In 1993, total LPAHs and several individual LPAHs, total HPAHs and several individual HPAHs, and mercury all exceeded the CSL at VG5. In addition, several individual LPAHs and HPAHs exceeded the SQS. In 1996, chrysene was the only PAH parameter to exceed the SQS at VG5, and mercury only exceeded the SQS. At VG1, VG2, and VG6 total LPAHs decreased by several times. Total HPAHs decreased by over three times at VG5 and they decreased by half at VG2 and VG6. Mercury decreased by a third at VG5.

The cause of the decreases are unclear but the possibilities include sedimentation, mixing, and/or dispersion that would reduce concentrations. Approximately 3 inches of new sediment was deposited in the VG5 area. Even if this new sediment was moderately contaminated, the extremely high concentrations that were seen in 1993 would have been reduced by dilution. Also, because the concentrations were quite high compared to the surrounding areas, it is possible that the high concentrations would disperse to reach an equilibrium with the surrounding areas. Another possibility is that benthic invertebrates living beneath the surface of the cap brought clean capping sand to the surface. This process, known as bioturbation, can also dilute chemical concentrations. In addition, PAHs can biodegrade, however, they do so slowly and it is not likely that biodegradation contributed greatly to the reduction in PAH level. Mercury also decreased and because mercury is not biodegradable it is unlikely that biodegradation played a large role in the apparent decrease in concentrations. While PAHs persist in a marine environment, they can be redistributed or diluted by many mechanisms in a dynamic marine environment.

PCBs, Pesticides, Chlorinated Benzenes, and Phthalates

In 1996, PCBs were found on the remediation area for the first time but the levels were quite low. At the four stations where PCBs were found, the concentrations were near the detection limits and well below the SQS. Because PCBs were not detected in the remediation area prior to 1996 future trends of PCBs should continue to be monitored.

In 1996, 1,4 dichlorobenzene was found in the 2-cm primary sample at VG5 just above the detection limit. This chemical is well below the SQS and is not a chemical of concern in this study. In 1996 the KC Environmental Laboratory analyzed BNA extracts by selected ion monitoring to attain lower detection limits for all chlorinated benzenes. It is possible that 1,4 dichlorobenzene was detected in 1996 because of the lower detection limits achieved by selected ion monitoring.

Pesticides were found on the remediation area for the first time in 1996. Endosulfan and 4,4 DDD—a DDT derivative—were found at levels near the detection limits at a few stations and at slightly higher levels (12 to 6 µg/kg dry weight) at VG5 and VG6. State sediment standards do not exist for pesticides.

Three phthalates were found on the remediation area for the first time in 1996. Di-n-octyl phthalate was found in concentrations near the detection limit and was therefore not a concern during this study. Benzyl butyl phthalate was also found in concentrations near the detection limit, but still exceeded the SQS at one station. Bis(2-ethylhexyl)phthalate (BEHP) appeared on the remediation area in concentrations several times higher than the detection limits at most stations. BEHP also exceeded the SQS at VG4.

Recently BEHP has become a concern along the Seattle waterfront (Wilson and Romberg 1996, EB/DRP unpublished data 1996). In 1996, in addition to the Pier 53 sampling, sediment samples were taken along the waterfront in the area between the ferry terminal and the aquarium (see Figure 1-1 in Section 1) as part of the Seattle Waterfront Cleanup Study (EB/DRP unpublished data 1996). This study is being sponsored by the Panel and managed by the City of Seattle. Samples were collected just inshore of the Pier 53 remediation area in shallower water. These samples showed high concentrations of BEHP. In most cases the levels were many times higher than on the Pier 53 remediation area. This suggests that redistribution of contaminants from inshore may have caused the sudden appearance of BEHP on the remediation area. Cores from the Waterfront Cleanup Study showed high levels of BEHP in the 0- to 2-foot sections but none in the deeper sections, suggesting that the contamination is of a recent origin.

Phenols

4-Methylphenol and phenol were detected on the remediation area for the first time in 1996 and were found at every station. 4-Methylphenol exceeded the CSL at VG5 in the 2-cm-deep-primary and replicate samples and in the 10-cm-deep sample. Phenol exceeded the CSL at VG5 in the 2-cm sample. It exceeded the SQS at VG3, VG6, the 2-cm replicate at VG5, and the 10-cm sample at VG5.

In 1993, 4-methylphenol and phenol were not detected in the Pier 53 remediation area or to the south of the remediation area. Chemists in the KC environmental organics lab reviewed the quality assurance procedures of both the 1993 and 1996 Pier 53 analyses and confirmed that both data sets passed QA1 review. In 1993, four out of eleven of the surface samples were diluted by a factor of ten. It is common practice that when, as in the case of these four samples, the sediment matrix includes high concentrations of oil or tar, the sample is diluted by a factor specified by the chemist (e.g. two or ten). The chemists reviewed the possibility that this process could have diluted out 4-methylphenol and phenol concentrations to below detection limits. It was thought that while this may have been possible for these four samples, other samples were diluted only by a factor of two and some weren't diluted at all and yet 4-methylphenol and phenol were never detected in any sample. Because neither chemical was detected in any of the 1993 samples, dilution that would cause matrix interference and mask the presence of these phenols was ruled out as a possibility. Detection limits were similar for both data sets and extractions met QA criteria. Another possibility to explain the differences between the 1993 and 1996 samples was that 4-methylphenol and phenol contamination were introduced into the 1996 samples after sampling had taken place. However, samples from the Denny Way sediment cap were run at the same time and no phenols were detected in the Denny Way analyses. As a result of this follow-up review, the chemists concluded that in 1993 4-methylphenol and phenol were not environmental contaminants at the Pier 53 remediation area but were present in 1996.

Three other data sets were evaluated to provide more information about the appearance of 4-methylphenol and phenol. Samples were taken under Piers 54 and 55 in 1992 as part of the investigation of baseline environmental conditions that existed just after placing the Pier 53 cap (EB/DRP 1993a). Analysis of these samples did not detect either 4-methylphenol or phenol. Additionally, no other phenols or phthalates were detected at that time.

In July 1994, samples were collected on the Pier 53 cap as part of a Washington State Department of Transportation (WSDOT) investigation of contamination at the north end of the downtown Seattle ferry terminal and the recontamination of the Pier 53 remediation area (Appendix D). The recontamination of the remediation area in 1993 appeared to be caused by construction activities at the ferry terminal. The samples were collected by Hart-Crowser, Inc. and sample splits were analyzed at the King County Environmental Laboratory. Samples taken on the cap at VG1, VG3, VG5, and VG6 had no detectable levels of 4-methylphenol and phenol. These data from 1994 confirm the results of the 1993 sampling and suggest further recontamination of the remediation area has taken place since July 1994.

Between October 1993 and October 1994 The Elliott Bay Waterfront Recontamination Study (EB/DRP 1995b) was conducted along the central Seattle waterfront. As part of the study, sediment traps were deployed for the year of study in the Pier 53-55 area. The sampling year was divided into four quarters for reporting purposes. The first quarter was from October to December 1993, the second quarter was from January to April 1994, the third quarter was from May to July 1994, and the fourth quarter was from August to October 1994. Of the six sediment trap stations that were located in the Pier 53-55 area, four of them showed exceedances of the CSL for 4-methylphenol in the fourth quarter from August to October 1994. At these four stations in the other three quarters, 4-methylphenol was only detected twice at levels near the detection limit. At the remaining two station, one exceeded the CSL for 4-methylphenol in the first quarter (October to December 1993) and the other station exceeded the CSL for 4-methylphenol in the third quarter (May to July 1994). Phenol was also detected in the sediment traps but not as often as 4-methylphenol, although it did exceed the CSL in a few instances during the study. The waterfront recontamination study reported that a possible reason for the variability in the sediment trap samples was seasonal fluctuations of boat and ferry traffic along the waterfront that would stir up existing contamination which would then be captured in the sediment traps. But because previous studies failed to show 4-methylphenol contamination, these results could be showing a new contamination source along the waterfront.

Sediment samples collected as part of the waterfront cleanup study in the summer of 1996, mentioned above, showed high concentrations of 4-methylphenol under the piers inshore of the Pier 53 remediation area. However, 4-methylphenol was undetected in the slips between the piers. This could possibly indicate that propeller wash from boating activities washed the chemical contamination from the boat slips to underneath the piers where it then settled. An analysis of particle size for the waterfront cleanup study samples does not support this scenario, however. Fine material was randomly distributed under the piers as well as in the slips. This suggests that the slips were not necessarily erosional and under the piers were not necessarily depositional. Because 4-methylphenol concentrations did not correlate to grain size it is not likely that propeller wash scoured away the 4-methylphenol concentrations in the slips and deposit them under the piers.

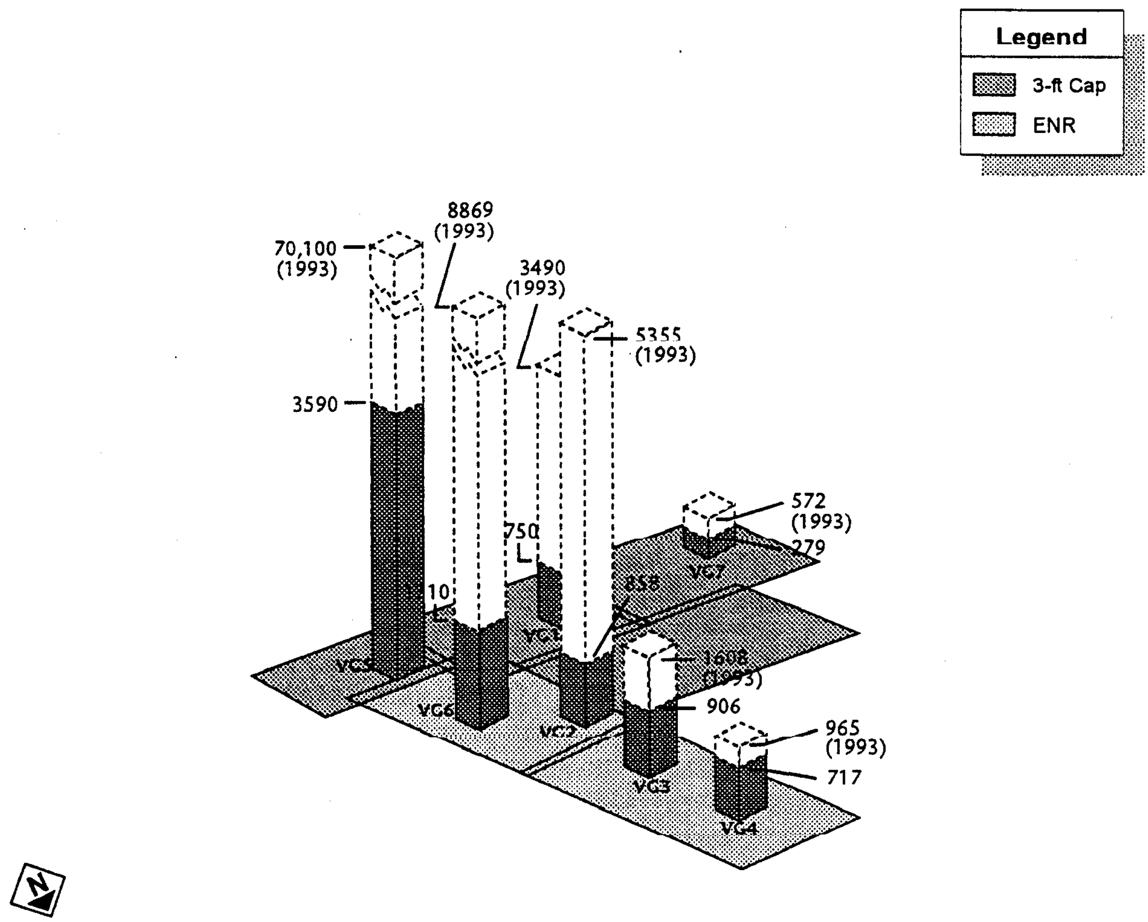
In addition to the seasonal trends of 4-methylphenol in the waterfront recontamination study, the waterfront cleanup study showed strong seasonal variations in 4-methylphenol concentrations. Because of logistical difficulties and other considerations, approximately half of the waterfront cleanup samples analyzed for chemistry were collected in July and half were collected in September 1996. All of the samples collected in July showed that neither 4-methylphenol nor phenol were detected, while all of the samples collected in September showed moderate to high levels of both phenols. Coincidentally, samples collected from within the slips were collected in July and samples collected from under the piers were collected in September. This suggests the following: the phenols are not likely existing contamination being redistributed; phenols detected along the waterfront are short-lived in the environment; a source of phenols is ongoing and possibly seasonal; and once the source is found and controlled, the environmental chemical concentrations should quickly return to pre-contamination conditions.

Studies of the degradation rates of phenols suggest that they degrade rapidly (days) but may persist in anaerobic sediment conditions. Total degradation of 4-methylphenol in a freshwater lake was shown to occur in only 6 days. The half-life of 4-methylphenol in marine waters was shown to be less than 4 days. In a study of anaerobic lake sediment, degradation did not begin during the 29 weeks of the study (Howard 1991).

Studies also found that 4-methylphenol does not adsorb to soil/sediment. One study modeled adsorption and found that less than 1% would be sorbed to sediments (Howard 1991). This lack of adsorption to sediment may explain why no correlation exists between particle size and 4-methylphenol along the waterfront. The study also found a correlation between higher adsorption rates and lower total organic carbon. An analysis of the total organic carbon in the waterfront cleanup study samples, however, showed no correlation between organic carbon and concentrations of 4-methylphenol.

Howard (1991) also mentioned that the highest levels and the most frequent detections of 4-methylphenol were in the effluent discharges from the timber products industry. It is possible that the 4-methylphenol is associated with wood products that have been cast off from the piers throughout Seattle's history, from wood that drifts to and accumulates along the waterfront, or from wood or wood products used in the construction and repair of the piers along the waterfront. Samples taken at VG5, VG6, and VG1 contained small wood chips and wood debris. These stations showed some of the highest levels of 4-methylphenol in the Pier 53 study.

Unfortunately during the waterfront cleanup study, no single station or group of stations were sampled both in July and September 1996 to confirm that phenols first appeared in the sediment at this time and that they degrade quickly along the waterfront or that a seasonal source of phenols is the culprit. Sampling variability and sediment transport along the waterfront remain possible reasons for the resulting pattern of the detection of phenols during the waterfront cleanup study. Further study and an investigation of phenol and possibly phthalate sources along the waterfront are needed to understand the new contamination detected on the Pier 53 remediation area.



NOTE: Unit of measure is µg/kg dry weight.

Figure 4-2. Spatial Concentrations of Total LPAHs

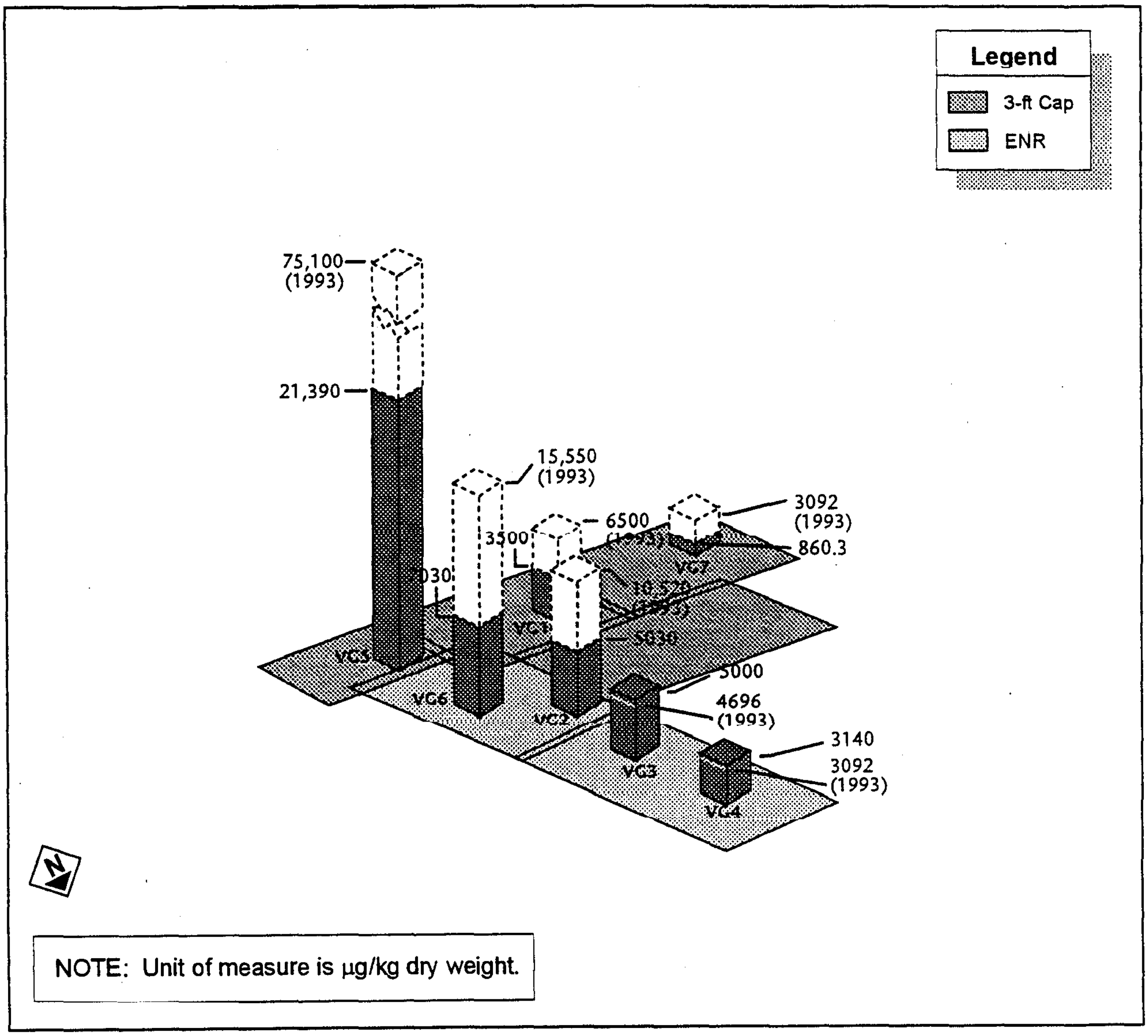


Figure 4-3. Spatial Concentrations of Total HPAHs

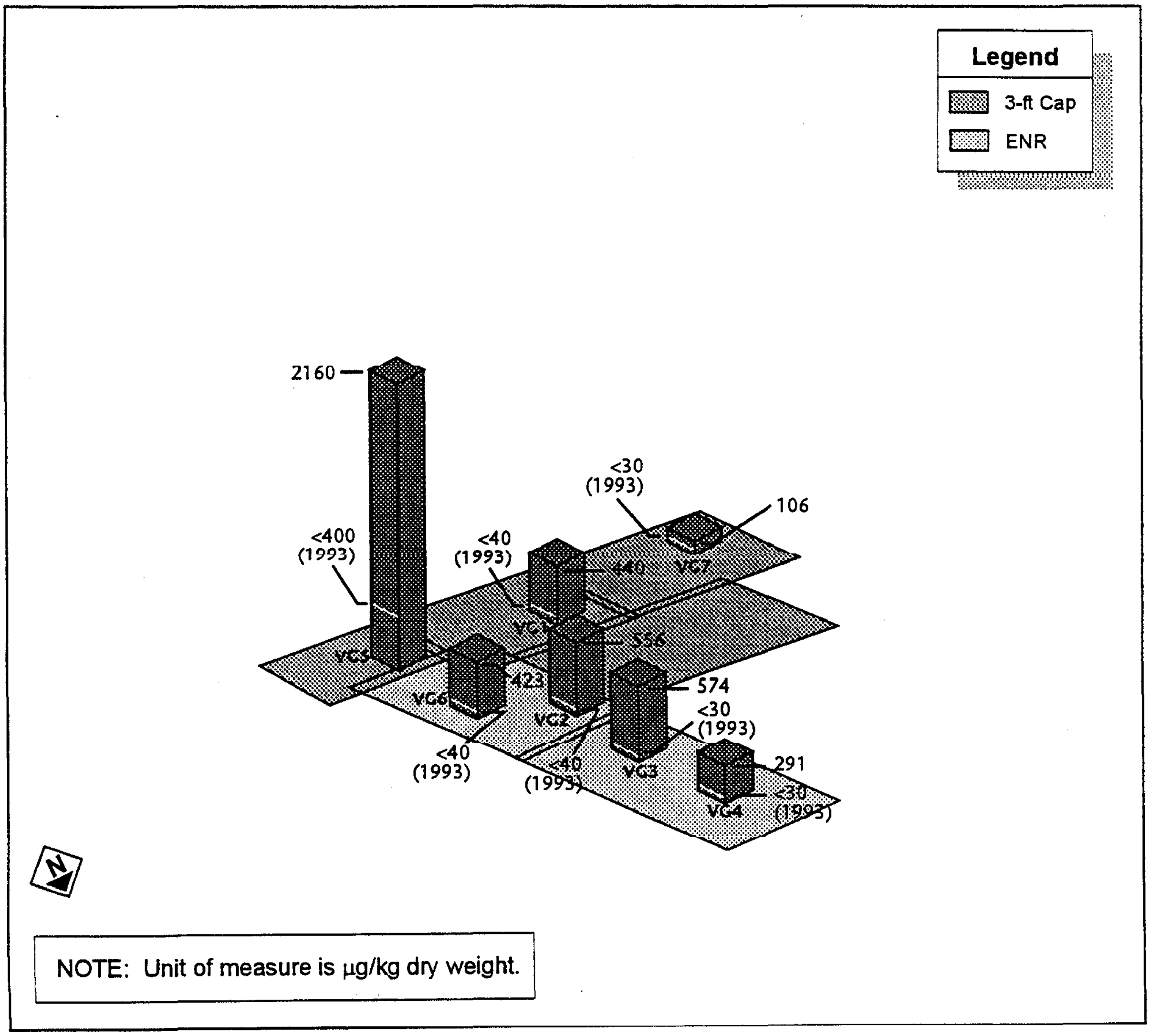
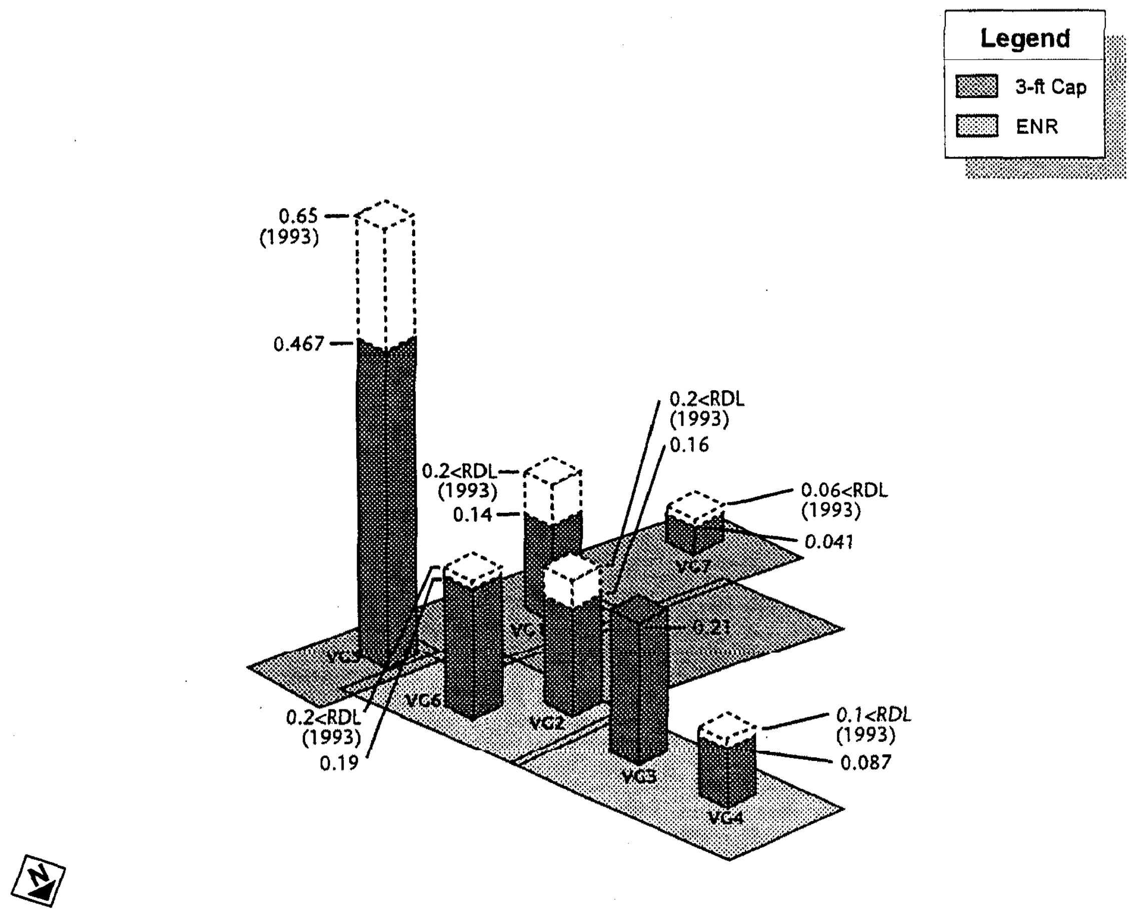


Figure 4-4. Spatial Concentrations of 4-Methylphenol



NOTE: Unit of measure is µg/kg dry weight.

Figure 4-5. Spatial Concentrations of Mercury

TABLE 4-1. Surface Stations: Detected Chemicals

Station Locator	P53VG1		P53VG2		P53VG3		P53VG4	
Date Sampled	Aug 12, 96		Aug 12, 96		Aug 12, 96		Aug 12, 96	
Sample Number	L9209-1		L9209-2		L9209-3		L9209-4	
% Solids	65.7		60.4		58.4		72.4	
% TOC dry	0.752		2.2		0.985		0.775	
BNA Organics (µg/kg dry weight)	Qual	Value	Qual	Value	Qual	Value	Qual	Value
LPAHs								
Naphthalene	<MDL,G	65	<MDL,G	71	<MDL,G	74	<MDL,G	59
Acenaphthene		37.3		36.8		41.6		34.5
Acenaphthylene	<MDL	24	<RDL	28	<MDL	27	<MDL	22
Anthracene	G	163	G	224	G	247	G	209
Fluorene	G	63.6	G	68.5	G	67	G	66.7
Phenanthrene	G	332	G	359	G	375	G	267
2-Methylnaphthalene	<MDL,G	65	<MDL,G	71	<MDL,G	74	<MDL,G	59
Total LPAHs		749.9		858.3		905.6		717.2
HPAHs								
Fluoranthene	G	559	G	632	G	616	G	446
Pyrene	G	553	G	642	G	726	G	442
Benzo(a)anthracene	G	346	G	510	G	481	G	309
Chrysene		522		863		801		490
Benzo(b)fluoranthene		473		853		800		508
Benzo(k)fluoranthene	G	221	G	306	G	329	G	195
Benzo(a)pyrene	G	370	G	594	G	587	G	359
Indeno(1,2,3-Cd)Pyrene	G	199	G	285	G	296	G	171
Dibenzo(a,h)anthracene	<MDL	65	<RDL	79	<RDL	77	<MDL	59
Benzo(g,h,i)perylene	G	196	G	263	G	289	G	159
Total HPAHs		3504		5027		5002		3138
Other BNA								
1,4-Dichlorobenzene	<MDL,G	1.1	<MDL,G	1.1	<MDL,G	1.2	<MDL,G	0.95
Di-N-Octyl Phthalate	<MDL	24	<MDL	26	<MDL	27	<MDL	22
Benzyl Butyl Phthalate		41.4	<RDL	35	<RDL	41	<RDL	26
Bis(2-Ethylhexyl)Phthalate		143		263		289		372
Dibenzofuran	<MDL	41	<MDL	45	<MDL	46	<MDL	37
4-Methylphenol	G	440	G	556	G	574	G	291
Phenol	G	306	G	402	G	481	G	405
Benzoic Acid	<MDL,L	170	<MDL,L	180	<MDL,L	190	<MDL,L	150
Carbazole	<MDL	41	<RDL	51	<RDL	57	<RDL	57
Coprostanol		400		384	<RDL	190	<MDL	150
Pesticides and PCBs (µg/kg dry weight)								
4,4'-DDD	<MDL	2	<MDL	2.2	<MDL	2.2	<MDL	1.8
Endosulfan I	<MDL	2	<RDL	3.8	<RDL	4.3	<MDL	1.8
Aroclor 1254	<MDL	20	<MDL	22	<MDL	22	<MDL	18
Aroclor 1260	<MDL	20	<RDL	36	<RDL	26	<MDL	18
Total PCBs	<MDL	20	<RDL	36	<RDL	26	<MDL	18
Volatiles (µg/kg dry weight)								
Acetone	<RDL,B	72	B,H	99.7	B,H	98.5	<RDL,B,H	69
Metals (mg/kg dry weight)								
Mercury	<RDL	0.14	<RDL	0.16	<RDL	0.21	<RDL	0.087
Aluminum	L	13400	L	15100	L	16100	L	12600
Arsenic	<RDL	5.8	<RDL	7.6	<RDL	5.5	<RDL	5.5
Beryllium	<RDL	0.18	<RDL	0.22	<RDL	0.21	<RDL	0.15
Cadmium	<MDL	0.23	<RDL	0.33	<MDL	0.26	<MDL	0.21
Chromium		17.8		21.2		22.3		17.7
Copper		24.7		33.4		36.3		24.9
Iron	G	21600	G	23700	G	23600	G	22100
Lead		17.4		24.3		26.4		16
Magnesium		5510		5810		6180		4930
Nickel		17.2		17.1		18.5		15.5
Silver	<MDL	0.3	<MDL	0.33	<MDL	0.34	<MDL	0.28
Zinc		63.9		73.3		78.4		63.8

<MDL - Undetected at the method detection limit
<RDL - Detected below reporting detection limits
B - Blank contamination
E - Estimate
G - Low standard reference material recovery
L - High standard reference material recovery
For further information on data qualifiers see Appendix B.

TABLE 4-1. Surface Stations: Detected Chemicals (continued)

Station Locator	P53VG5		P53VG5 (Rep)		P53VG6		P53VG7	
Date Sampled	Aug 12, 96		Aug 12, 96		Aug 12, 96		Aug 12, 96	
Sample Number	L9209-5		L9209-11		L9209-6		L9209-7	
% Solids	52.7		61.7		57.2		75.4	
% TOC dry	2.6		1.38		2.69		0.463	
BNA Organics (µg/kg dry weight)	Qual	Value	Qual	Value	Qual	Value	Qual	Value
LPAHs								
Naphthalene	G	393	G	214	<MDL,G	75	<MDL,G	57
Acenaphthene		273		134		60	<MDL	15
Acenaphthylene		111		61.4	<RDL	35	<MDL	21
Anthracene	G	930	G	525	G	351	<RDL,G	24
Fluorene	G	385	G	193	G	113	<MDL,G	21
Phenanthrene	G	1390	G	715	G	605	G	84.5
2-Methylnaphthalene	<RDL,G	110	<MDL,G	70	<MDL,G	75	<MDL,G	57
Total LPAHs		3592		1912		1314		279.5
HPAHs								
Fluoranthene	G	2790	G	1750	G	965	G	153
Pyrene	G	4420	G	2790	G	1070	G	139
Benzo(a)anthracene	G	2200	G	1160	G	741	G	73.3
Chrysene		3230		1520		1100		122
Benzo(b)fluoranthene		3430		1730		1120		110
Benzo(k)fluoranthene	G	1220	G	718	G	484	<MDL,G	57
Benzo(a)pyrene	G	2350	G	1220	G	767	<RDL,G	69
Indeno(1,2,3-Cd)Pyrene	G	829	G	452	G	360	<RDL,G	44
Dibenzo(a,h)anthracene		230	<RDL	120	<RDL	100	<MDL	57
Benzo(g,h,i)perylene	G	691	G	303	G	323	<RDL,G	36
Total HPAHs		21390		11763		7030		860.3
Other BNA								
1,4-Dichlorobenzene	G	6.68	<MDL,G	1.1	<MDL,G	1.2	<MDL,G	0.92
Di-N-Octyl Phthalate	<RDL	32	<MDL	26	<MDL	28	<MDL	21
Benzyl Butyl Phthalate	<RDL	38	<MDL	26		51.7	<RDL	25
Bis(2-Ethylhexyl)Phthalate		349		259		281		56.9
Dibenzofuran		262		129	<RDL	54	<MDL	36
4-Methylphenol	G	2160	G	985	G	423	G	106
Phenol	G	1630	G	692	G	453	<RDL,G	160
Benzoic Acid	<RDL,L	270	<MDL,L	180	<MDL,L	190	<MDL,L	150
Carbazole		207		125	<RDL	89	<MDL	36
Coprostanol		822		517	<RDL	190	<MDL	150
Pesticides and PCBs (µg/kg dry weight)								
4,4'-DDD	<MDL	2.5		4.72	<MDL	2.3	<MDL	1.7
Endosulfan I		12		7.07		5.94	<MDL	1.7
Aroclor 1254		71.9	<RDL	36	<MDL	23	<MDL	17
Aroclor 1260		79.5	<RDL	36	<RDL	35	<MDL	17
Total PCBs		79.5	<RDL	36	<RDL	35	<MDL	17
Volatiles (µg/kg dry weight)								
Acetone	B,H	168	B,H	119	B,H	118	<RDL,B,H	46
Metals (mg/kg dry weight)								
Mercury		0.467	<RDL	0.28	<RDL	0.19	<RDL	0.041
Aluminum	L	15600	L	14200	L	14800	L	9430
Arsenic	<RDL	12	<RDL	11	<RDL	8.9	<RDL	5.3
Beryllium	<RDL	0.23	<RDL	0.23	<RDL	0.21	<RDL	0.13
Cadmium	<RDL	0.59	<RDL	0.44	<RDL	0.28	<MDL	0.2
Chromium		30		22.9		21.3		11.8
Copper		62.8		45.7		40.7		15.8
Iron	G	26400	G	25000	G	24300	G	21200
Lead		98.9		45.5		30.9	<RDL	8.9
Magnesium		6600		5980		5930		4070
Nickel		25		20.4		17.2		12.8
Silver	<RDL	1.2	<RDL	0.57	<MDL	0.33	<MDL	0.27
Zinc		119		94.7		78.3		49.3

<MDL - Undetected at the method detection limit
<RDL - Detected below reporting detection limits
B - Blank contamination
E - Estimate
G - Low standard reference material recovery
L - High standard reference material recovery
For further information on data qualifiers see Appendix B.

TABLE 4-1. Surface Stations: Detected Chemicals (continued)

Station Locator	VG3 10cm		VG4 10cm		VG5 10cm		VG5 (Rep) 10cm	
Date Sampled	Aug 12, 96		Aug 12, 96		Aug 12, 96		Aug 12, 96	
% Solids	69.1		75.2		59.4		61.2	
% TOC dry	0.466		0.366		2.56		2.32	
BNA Organics (µg/kg dry weight)	**Qual**	**Value**	**Qual**	**Value**	**Qual**	**Value**	**Qual**	**Value**
LPAHs								
Naphthalene	<MDL,G	63	<MDL,G	57	G	279	G	243
Acenaphthene		20.3		18.1		182		154
Acenaphthylene	<MDL	23	<MDL	21		73.6		63.7
Anthracene	G	108	G	85.2	G	636	G	555
Fluorene	G	31	G	30.1	G	244	G	206
Phenanthrene	G	183	G	135	G	909	G	774
2-Methylnaphthalene	<MDL,G	63	<MDL,G	57	<RDL,G	78	<MDL,G	70
Total LPAHs		491		404		2400		2070
HPAHs								
Fluoranthene	G	315	G	239	G	1960	G	1750
Pyrene	G	356	G	232	G	4050	G	3730
Benzo(a)anthracene	G	243	G	172	G	1500	G	1290
Chrysene		394		273		2170		1830
Benzo(b)fluoranthene		393		274		2370		2030
Benzo(k)fluoranthene	G	167	G	119	G	1030	G	933
Benzo(a)pyrene	G	285	G	201	G	1700	G	1480
Indeno(1,2,3-Cd)Pyrene	G	149	G	102	G	600	G	525
Dibenzo(a,h)anthracene	<RDL	63		57.4		166		144
Benzo(g,h,i)perylene	G	131	G	97.3	G	413	G	336
Total HPAHs		2500		1770		16000		14000
Other BNA								
1,4-Dichlorobenzene	<MDL,G	1	<MDL,G	0.92	G	2.22	<MDL,G	1.1
Di-N-Octyl Phthalate	<MDL	23	<MDL	21	<RDL	27	<MDL	26
Benzyl Butyl Phthalate	<MDL	26	<RDL	22	<RDL	28	<MDL	26
Bis(2-Ethylhexyl)Phthalate		133		133		324		306
Dibenzofuran	<MDL	40	<MDL	36		166		139
4-Methylphenol	G	484		132	G	1250	G	1010
Phenol	G	277		193	G	838	G	650
Benzoic Acid	<MDL,L	160	<MDL	140	<RDL,L	200	<MDL,L	180
Carbazole	<RDL	42	<RDL	40		137		121
Coprostanol	<RDL	170	<RDL	140		532		471
Pesticides and PCBs (µg/kg dry weight)								
4,4'-DDD	<MDL	1.9	<MDL	1.7		4.84		5.29
Endosulfan I	<RDL	2.3	<MDL	1.7		7.83		6.85
Aroclor 1254	<MDL	19	<MDL	17		53.7		46.5
Aroclor 1260	<RDL	20	<MDL	17		65.7		57
Total PCBs	<RDL	20	<MDL	17		65.7		104
Volatiles (µg/kg dry weight)								
Acetone	B,H	73.3	<RDL,B,H	63	B	88.8	B	79
Metals (mg/kg dry weight)								
Mercury	<RDL	0.092	<RDL	0.057		0.361		0.323
Aluminum	L	12600	L	10700	L	14100	L	13800
Arsenic	<RDL	4.3	<RDL	4.3	<RDL	8.3	<RDL	8.1
Beryllium	<RDL	0.16	<RDL	0.16	<RDL	0.21	<RDL	0.21
Cadmium	<MDL	0.22	<MDL	0.21	<RDL	0.51	<RDL	0.48
Chromium		20		15.1		24.6		23.1
Copper		21.4		16.9		49		45.5
Iron	G	20600	G	19300	G	23400	G	23200
Lead		21.9		10.9		62.1		51.4
Magnesium		4840		4430		5700		5580
Nickel		14.3		13.7		21.1		20.2
Silver	<MDL	0.29	<MDL	0.28	<RDL	0.8	<RDL	0.67
Zinc		60.2		51.7		97.2		92.3

<MDL - Undetected at the method detection limit
<RDL - Detected below reporting detection limits
B - Blank contamination
E - Estimate
G - Low standard reference material recovery
L - High standard reference material recovery

Note: 0 to 2 and 2 to 10cm results were proportionally combined to give10cm results. For further information on data qualifiers see Appendix B.

TABLE 4-2. Comparison to Sediment Standards

Station Locator	P53VC1		P53VC2		P53VC3		P53VC4		Sediment Management Standards	
Date Sampled	Aug 12, 96		Aug 12, 96		Aug 12, 96		Aug 12, 96			
Sample Number	L9209-1		L9209-2		L9209-3		L9209-4			
% Solids	65.7		60.4		58.4		72.4			
T.O.C. dry in %	0.752		2.2		0.985		0.775			
Organics	Qual	Value	Qual	Value	Qual	Value	Qual	Value	SQS	CSL
LPAHs (mg/kg TOC)										
Naphthalene	<MDL,G	8.64	<MDL,G	3.2	<MDL,G	7.5	<MDL,G	7.61	99	170
Anthracene	G	21.7	G	10	G	25	G	27	220	1200
Acenaphthene		4.96		1.7		4.2		4.45	16	57
Phenanthrene	G	44.1	G	16	G	38	G	34.5	100	480
Fluorene	G	8.46	G	3.1	G	6.8	G	8.61	23	79
Acenaphthylene	<MDL	3.19	<RDL	1.3	<MDL	2.7	<MDL	2.84	66	66
2-Methylnaphthalene	<MDL,G	8.64	<MDL,G	3.2	<MDL,G	7.5	<MDL,G	7.61	38	64
Total LPAHs		99.7		39		92		92.5	370	780
HPAHs (mg/kg TOC)										
Fluoranthene	G	74.3	G	29	G	63	G	57.5	160	1200
Pyrene	G	73.5	G	29	G	74	G	57	1000	1400
Benzo(a)anthracene	G	46	G	23	G	49	G	39.9	110	270
Chrysene		69.4		39		81		63.2	110	460
Total benzo fluoranthenes	G	92.3	G	53	G	115	G	90.7	230	450
Benzo(a)pyrene	G	49.2	G	27	G	60	G	46.3	99	210
Indeno(1,2,3-Cd)Pyrene	G	26.5	G	13	G	30	G	22.1	34	88
Dibenzo(a,h)anthracene	<MDL	8.64	<RDL	3.6	<RDL	7.8	<MDL	7.61	12	33
Benzo(g,h,i)perylene	G	26.1	G	12	G	29	G	20.5	31	78
Total HPAHs		466		229		508		405	960	5300
Other (mg/kg TOC)										
1,2,4-Trichlorobenzene	<MDL,G	0.15	<MDL,G	0.1	<MDL,G	0.1	<MDL,G	0.12	0.81	1.8
1,2-Dichlorobenzene	<MDL,G	0.15	<MDL,G	0.1	<MDL,G	0.1	<MDL,G	0.12	2.3	2.3
1,4-Dichlorobenzene	<MDL,G	0.15	<MDL,G	0.1	<MDL,G	0.1	<MDL,G	0.12	3.1	9
Hexachlorobenzene	<MDL,G	0.15	<MDL,G	0.1	<MDL,G	0.1	<MDL,G	0.12	0.38	2.3
Diethyl Phthalate	<MDL	5.45	<MDL	2	<MDL	4.7	<MDL	4.77	61	110
Dimethyl Phthalate	<MDL	2.26	<MDL	0.8	<MDL	1.9	<MDL	1.94	53	53
Di-N-Butyl Phthalate	<MDL	5.45	<MDL	2	<MDL	4.7	<MDL	4.77	220	1700
Benzyl Butyl Phthalate	*	5.51	<RDL	1.6	<RDL	4.2	<RDL	3.35	4.9	64
Bis(2-Ethylhexyl)Phthalate		19		12		29	*	48	47	78
Di-N-Octyl Phthalate	<MDL	3.19	<MDL	1.2	<MDL	2.7	<MDL	2.84	58	4500
Dibenzofuran	<MDL	5.45	<MDL	2	<MDL	4.7	<MDL	4.77	15	58
Hexachlorobutadiene	* <MDL,G	5.45	<MDL,G	2	* <MDL,G	4.7	* <MDL,G	4.77	3.9	6.2
N-Nitrosodiphenylamine	<MDL	5.45	<MDL	2	<MDL	4.7	<MDL	4.77	11	11
Total PCBs	<MDL	2.66	<RDL	1.6	<RDL	2.6	<MDL	2.32	12	65
Other (µg/kg dry weight)										
Phenol	G	306	G	402	* G	481	G	405	420	1200
2-Methylphenol	<MDL,G	41	<MDL,G	45	<MDL,G	46	<MDL,G	37	63	63
4-Methylphenol	G	440	G	556	G	574	G	291	670	670
2,4-Dimethylphenol	** <MDL,G	41	** <MDL,G	45	** <MDL,G	46	** <MDL,G	37	29	29
Pentachlorophenol	<MDL,E,G	41	<MDL,E,G	45	<MDL,E,G	46	<MDL,E,G	37	360	690
Benzyl Alcohol	<MDL,G	41	<MDL,G	45	<MDL,G	46	<MDL,G	37	57	73
Benzoic Acid	<MDL,L	170	<MDL,L	180	<MDL,L	190	<MDL,L	150	650	650
Metals (mg/kg dry weight)										
Mercury	<RDL	0.14	<RDL	0.2	<RDL	0.2	<RDL	0.09	0.41	0.59
Arsenic	<RDL	5.8	<RDL	7.6	<RDL	5.5	<RDL	5.5	57	93
Cadmium	<MDL	0.23	<RDL	0.3	<MDL	0.3	<MDL	0.21	5.1	6.7
Chromium		17.8		21		22		17.7	260	270
Copper		24.7		33		36		24.9	390	390
Lead		17.4		24		26		16	450	530
Silver	<MDL	0.3	<MDL	0.3	<MDL	0.3	<MDL	0.28	6.1	6.1
Zinc		63.9		73		78		63.8	410	960

* - Exceeds SQS
** - Exceeds CSL
<RDL - Detected below quantification limits
<MDL - Undetected at the method detection limit
Note: For further information on data qualifiers see QA Report in Appendix B

TABLE 4-2. Comparison to Sediment Standards (continued)

Station Locator	P53VG5		P53VG5 (Rep)		P53VG6		P53VG7		Sediment Management Standards	
Date Sampled	Aug 12, 96		Aug 12, 96		Aug 12, 96		Aug 12, 96			
Sample Number	L9209-5		L9209-11		L9209-6		L9209-7			
% Solids	52.7		61.7		57.2		75.4			
T.O.C. dry in %	2.6		1.38		2.69		0.463			
Organics	Qual	Value	Qual	Value	Qual	Value	Qual	Value	SQS	CSL
LPAHs (mg/kg TOC)										
Naphthalene	G	15.1	G	16	<MDL,G	2.8	<MDL,G	12.3	99	170
Anthracene	G	35.8	G	38	G	13	<RDL,G	5.18	220	1200
Acenaphthene		10.5		9.7		2.2	<MDL	3.24	16	57
Phenanthrene	G	53.5	G	52	G	22	G	18.3	100	480
Fluorene	G	14.8	G	14	G	4.2	<MDL,G	4.54	23	79
Acenaphthylene		4.27		4.4	<RDL	1.3	<MDL	4.54	66	66
2-Methylnaphthalene	<RDL,G	4.23	<MDL,G	5.1	<MDL,G	2.8	<MDL,G	12.3	38	64
Total LPAHs		138		139		49		60.4	370	780
HPAHs (mg/kg TOC)										
Fluoranthene	G	107	G	127	G	36	G	33	160	1200
Pyrene	G	170	G	202	G	40	G	30	1000	1400
Benzo(a)anthracene	G	84.6	G	84	G	28	G	15.8	110	270
Chrysene	*	124	*	110		41		26.3	110	460
Total benzo fluoranthenes	G	179	G	177	G	60	G	36.1	230	450
Benzo(a)pyrene	G	90.4	G	88	G	29	<RDL,G	14.9	99	210
Indeno(1,2,3-Cd)Pyrene	G	31.9	G	33	G	13	<RDL,G	9.5	34	88
Dibenzo(a,h)anthracene		8.85	<RDL	8.7	<RDL	3.7	* <MDL	12.3	12	33
Benzo(g,h,i)perylene	G	26.6	G	22	G	12	<RDL,G	7.78	31	78
Total HPAHs		823		852		261		186	960	5300
Other (mg/kg TOC)										
1,2,4-Trichlorobenzene	<MDL,G	0.05	<MDL,G	0.1	<MDL,G	0	<MDL,G	0.2	0.81	1.8
1,2-Dichlorobenzene	<MDL,G	0.05	<MDL,G	0.1	<MDL,G	0	<MDL,G	0.2	2.3	2.3
1,4-Dichlorobenzene	G	0.26	<MDL,G	0.1	<MDL,G	0	<MDL,G	0.2	3.1	9
Hexachlorobenzene	<MDL,G	0.05	<MDL,G	0.1	<MDL,G	0	<MDL,G	0.2	0.38	2.3
Diethyl Phthalate	<MDL	1.96	<MDL	3.2	<MDL	1.7	<MDL	7.78	61	110
Dimethyl Phthalate	<MDL	0.81	<MDL	1.3	<MDL	0.7	<MDL	3.24	53	53
Di-N-Butyl Phthalate	<MDL	1.96	<MDL	3.2	<MDL	1.7	<MDL	7.78	220	1700
Benzyl Butyl Phthalate	<RDL	1.46	<MDL	1.9		1.9	* <RDL	5.4	4.9	64
Bis(2-Ethylhexyl)Phthalate		13.4		19		10		12.3	47	78
Di-N-Octyl Phthalate	<RDL	1.23	<MDL	1.9	<MDL	1	<MDL	4.54	58	4500
Dibenzofuran		10.1		9.3	<RDL	2	<MDL	7.78	15	58
Hexachlorobutadiene	<MDL,G	1.96	<MDL,G	3.2	<MDL,G	1.7	** <MDL,G	7.78	3.9	6.2
N-Nitrosodiphenylamine	<MDL	1.96	<MDL	3.2	<MDL	1.7	<MDL	7.78	11	11
Total PCBs		5.82	<RDL	3.3	<RDL	1.3	<MDL	3.67	12	65
Other (µg/kg dry weight)										
Phenol	** G	1630	* G	692	* G	453	<RDL,G	160	420	1200
2-Methylphenol	<MDL,G	51	<MDL,G	44	<MDL,G	47	<MDL,G	36	63	63
4-Methylphenol	** G	2160	** G	985	G	423	G	106	670	670
2,4-Dimethylphenol	** <MDL,G	51	** <MDL,G	44	** <MDL,G	47	** <MDL,G	36	29	29
Pentachlorophenol	<MDL,E,G	51	<MDL,E,G	44	<MDL,E,G	47	<MDL,E,G	36	360	690
Benzyl Alcohol	<MDL,G	51	<MDL,G	44	<MDL,G	47	<MDL,G	36	57	73
Benzoic Acid	<RDL,L	270	<MDL,L	180	<MDL,L	190	<MDL,L	150	650	650
Metals (mg/kg dry weight)										
Mercury	*	0.47	<RDL	0.3	<RDL	0.2	<RDL	0.04	0.41	0.59
Arsenic	<RDL	12	<RDL	11	<RDL	8.9	<RDL	5.3	57	93
Cadmium	<RDL	0.59	<RDL	0.4	<RDL	0.3	<MDL	0.2	5.1	6.7
Chromium		30		23		21		11.8	260	270
Copper		62.8		46		41		15.8	390	390
Lead		98.9		46		31	<RDL	8.9	450	530
Silver	<RDL	1.2	<RDL	0.6	<MDL	0.3	<MDL	0.27	6.1	6.1
Zinc		119		95		78		49.3	410	960

* - Exceeds SQS
** - Exceeds CSL
<RDL - Detected below quantification limits
<MDL - Undetected at the method detection limit
Note: For further information on data qualifiers see QA Report in Appendix B

TABLE 4-2. Comparison to Sediment Standards (continued)

Station Locator	VG3 10cm		VG4 10cm		VG5 10cm		VG5 (Rep) 10cm		Management Standards	
Date Sampled	Aug 12, 96		Aug 12, 96		Aug 12, 96		Aug 12, 96			
% Solids	69.1		75.2		59.4		61.2			
T.O.C. dry in %	0.466		0.366		2.56		2.32			
Organics	Qual	Value	Qual	Value	Qual	Value	Qual	Value	SQS	CSL
LPAHs (mg/kg TOC)										
Naphthalene	<MDL,G	13.5	<MDL,G	16	G	11	G	10.5	99	170
Acenaphthene		4.36		4.9		7.1		6.64	220	1200
Acenaphthylene	<MDL	4.94	<MDL	5.7		2.9		2.75	16	57
Anthracene	G	23.2	G	23	G	25	G	23.9	100	480
Fluorene	G	6.65	G	8.2	G	9.5	G	8.88	23	79
Phenanthrene	G	39.3	G	37	G	36	G	33.4	66	66
2-Methylnaphthalene	<MDL,G	13.5	<MDL,G	16	<RDL,G	3	<MDL,G	3.02	38	64
Total LPAHs		105		110		94		89	370	780
HPAHs (mg/kg TOC)										
Fluoranthene	G	67.6	G	65	G	77	G	75.4	160	1200
Pyrene	G	76.4	G	63	G	158	G	161	1000	1400
Benzo(a)anthracene	G	52.1	G	47	G	59	G	55.6	110	270
Chrysene		84.5		75		85		78.9	110	460
Total benzo fluoranthenes	G	120	G	107	G	133	G	128	230	450
Benzo(a)pyrene	G	61.2	G	55	G	66	G	63.8	99	210
Indeno(1,2,3-Cd)Pyrene	G	32	G	28	G	23	G	22.6	34	88
Dibenzo(a,h)anthracene	* <RDL	13.5	*	16		6.5		6.21	12	33
Benzo(g,h,i)perylene	G	28.1	G	27	G	16	G	14.5	31	78
Total HPAHs		536		483		623		606	960	5300
Other (mg/kg TOC)										
1,2,4-Trichlorobenzene	<MDL,G	0.22	<MDL,G	0.3	<MDL,G	0	<MDL,G	0.05	0.81	1.8
1,2-Dichlorobenzene	<MDL,G	0.22	<MDL,G	0.3	<MDL,G	0	<MDL,G	0.05	2.3	2.3
1,4-Dichlorobenzene	<MDL,G	0.22	<MDL,G	0.3	G	0.1	<MDL,G	0.05	3.1	9
Hexachlorobenzene	<MDL,G	0.22	<MDL,G	0.3	<MDL,G	0	<MDL,G	0.05	0.38	2.3
Diethyl Phthalate	<MDL	8.5	<MDL	9.9	<MDL	1.8	<MDL	1.9	61	110
Dimethyl Phthalate	<MDL	3.39	<MDL	3.9	<MDL	0.7	<MDL	0.78	53	53
Di-N-Butyl Phthalate	<MDL	8.5	<MDL	9.9	<MDL	1.8	<MDL	1.9	220	1700
Benzyl Butyl Phthalate	* <RDL	5.54	* <RDL	6	<RDL	1.1	<MDL	1.12	4.9	64
Bis(2-Ethylhexyl)Phthalate		28.6		36		13		13.2	47	78
Di-N-Octyl Phthalate	<MDL	4.94	<MDL	5.8	<RDL	1.1	<MDL	1.12	58	4500
Dibenzofuran	<MDL	8.5	<MDL	9.9		6.5		6.01	15	58
Hexachlorobutadiene	** <MDL,G	8.5	** <MDL,G	9.9	<MDL,G	1.8	<MDL,G	1.9	3.9	6.2
N-Nitrosodiphenylamine	<MDL	8.5	<MDL	9.9	<MDL	1.8	<MDL	1.9	11	11
Total PCBs	<RDL	4.21	<MDL	4.7		4.7	<RDL	4.46	12	65
Other (µg/kg dry weight)										
Phenol	G	277	G	193	* G	838	* G	650	420	1200
2-Methylphenol	<MDL,G	39.6	<MDL,G	36	<MDL,G	45	<MDL,G	44	63	63
4-Methylphenol	G	484	G	132	** G	1248	** G	1013	670	670
2,4-Dimethylphenol	** <MDL,G	39.6	** <MDL,G	36	** <MDL,G	45	** <MDL,G	44	29	29
Pentachlorophenol	<MDL,E,G	39.6	<MDL,E,G	36	<MDL,E,G	45	<MDL,E,G	44	360	690
Benzyl Alcohol	<MDL,G	39.6	<MDL,G	36	<MDL,G	45	<MDL,G	44	57	73
Benzoic Acid	<MDL,L	158	<MDL,L	142	<RDL,L	198	<MDL,L	180	650	650
Metals (mg/kg dry weight)										
Mercury	<RDL	0.09	<RDL	0.1		0.4		0.32	0.41	0.59
Arsenic	<RDL	4.3	<RDL	4.3	<RDL	8.3	<RDL	8.1	57	93
Cadmium	<MDL	0.22	<MDL	0.2	<RDL	0.5	<RDL	0.48	5.1	6.7
Chromium		20		15		25		23.1	260	270
Copper		21.4		17		49		45.5	390	390
Lead		21.9		11		62		51.4	450	530
Silver	<MDL	0.29	<MDL	0.3	<RDL	0.8	<RDL	0.67	6.1	6.1
Zinc		60.2		52		97		92.3	410	960

* - Exceeds SQS
** - Exceeds CSL
<RDL - Detected below quantification limits
<MDL - Undetected at the method detection limit
Note: For further information on data qualifiers see QA Report in Appendix B

TABLE 4-3. Surface Samples: Particle Size Distribution

Station Locator	P53VG1		P53VG2		P53VG3		P53VG4	
Date Sampled	Aug 12, 96		Aug 12, 96		Aug 12, 96		Aug 12, 96	
Sample Number	L9209-1		L9209-2		L9209-3		L9209-4	
% Solids	65.7		60.4		58.4		72.4	
Phi Size (%)	Qual	Value	Qual	Value	Qual	Value	Qual	Value
Sands and Gravels								
p-2.00(less than) *		0.6		0.6		1.1		0.7
p-2.00 *		0.1	<MDL	0.1		0.2		0.1
p-1.00 *		1		0.9		0.5		1.5
p+0.00 *		2.3		3.9		0.9		4.2
p+1.00 *		18.7		20.1		10.8		28.7
p+2.00 *		49.9		33.9		45.1		42.6
p+3.00 *		11.9		14.6		12.1		5.8
p+4.00 *		2		3.3		3.1		1.6
Total % Sands		86.5		77.4		73.8		85.2
Silts and Clays								
p+5.00 *	<MDL	0.1		3.9		7.6		3.2
p+6.00 *		2		2.8		2.8		1.9
p+7.00 *		3.9		5.2		3.6		1.7
p+8.00 *		2.4		4.7		5.3		3.3
p+9.00 *		1.4		1.8		1.9		1.5
p+10.0 *		0.7		0.8		0.8		0.7
p+10.0(more than) *		3.3		3.6		4.3		2.4
Total % Silts and Clays		13.8		22.8		26.3		14.7

<RDL - Detected below quantification limits
* indicates wet weight used for this parameter
For further information on data qualifiers see Appendix B.

<MDL - Undetected at the method detection limit
E - Estimate based on high relative percent difference in duplicate, high relative standard deviation in triplicate, or high or low surrogate recoveries

TABLE 4-3. Surface Samples: Particle Size Distribution (continued)

Station Locator	P53VG5		P53VG5 (Rep)		P53VG6		P53VG7	
Date Sampled	Aug 12, 96		Aug 12, 96		Aug 12, 96		Aug 12, 96	
Sample Number	L9209-5		L9209-11		L9209-6		L9209-7	
% Solids	52.7		61.7		57.2		75.4	
Phi Size (%)	Qual	Value	Qual	Value	Qual	Value	Qual	Value
Sands and Gravels								
p-2.00(less than) *		0.2		0.5		0.8		0.3
p-2.00 *		0.4		0.5	<MDL	0.1		0.1
p-1.00 *		0.4		0.8		0.5		1.9
p+0.00 *		1.1		2.9		1.2		6.9
p+1.00 *		9.3		22.5		11.5		36.7
p+2.00 *		31.1		41.4		35.8		41.6
p+3.00 *		11		7.7		16.1		5.6
p+4.00 *		4.6		2.5		4.6		0.9
Total % Sands		58.1		78.8		70.6		94
Silts and Clays								
p+5.00 *		4.8		1.9		6.4		1.4
p+6.00 *		5.2		2.8		3.1	<MDL	0.1
p+7.00 *		7.7		2		4.3		0.4
p+8.00 *		8.2		4.5		6.1		1.9
p+9.00 *		4.5		3		3.5		0.3
p+10.0 *		2.3		1.6		1.7	<MDL	0.1
p+10.0(more than) *		9.2		5.6		4.4		1.9
Total % Silts and Clays		41.9		21.4		29.5		6.1

<RDL - Detected below quantification limits
* indicates wet weight used for this parameter
For further information on data qualifiers see Appendix B.

<MDL - Undetected at the method detection limit
E - Estimate based on high relative percent difference in duplicate, high relative standard deviation in triplicate, or high or low surrogate recoveries

TABLE 4-3. Surface Samples: Particle Size Distribution (continued)

Station Locator	P53VG3 (2 to 10cm)		P53VG4 (2 to 10cm)		P53VG5 (2 to 10cm)	
Date Sampled	Aug 12, 96		Aug 12, 96		Aug 12, 96	
Sample Number	L9209-8		L9209-9		L9209-10	
% Solids	71.8		75.9		61.1	
Phi Size (%)	Qual	Value	Qual	Value	Qual	Value
Sands and Gravels						
p-2.00(less than) *		0.4		0.2		0.3
p-2.00 *	<MDL	0.1	<MDL	0.1	<MDL	0.1
p-1.00 *		1		1.4		0.6
p+0.00 *		2		5.7		1.7
p+1.00 *		21.1		36.5		20.2
p+2.00 *		53		44.3		36.1
p+3.00 *		10.3		4		9.6
p+4.00 *		1.3		0.7		3
Total % Sands		89.2		92.9		71.6
Silts and Clays						
p+5.00 *		5.6		2.1		3.9
p+6.00 *	<MDL	0.1		0.5		6.2
p+7.00 *	<MDL	0.1		0.9		3.7
p+8.00 *		2.2		2.1		5
p+9.00 *		0.9		0.3		2.5
p+10.0 *		0.3	<MDL	0.1		1.2
p+10.0(more than) *		1.8		1.2		5.8
Total % Silts and Clays		11		7.2		28.3

<RDL - Detected below quantification limits

<MDL - Undetected at the method detection limit

* indicates wet weight used for this parameter

E - Estimate based on high relative percent difference in duplicate, high relative standard deviation in triplicate, or high or low surrogate recoveries

For further information on data qualifiers see Appendix B.

SECTION 5
BENTHIC RECOLONIZATION

In August 1996, the monitoring team collected benthic taxonomy samples from the Pier 53 remediation area and from a reference station near Richmond Beach. This section describes the methods used and reports the results of the sampling. It also compares the results of the benthic taxonomy study with results from previous taxonomic sampling of the Pier 53 remediation area.

METHODS

The monitoring plan defined four benthic taxonomy sampling stations situated to provide spatial coverage across the remediation area (Figure 5-1). Two stations are in the ENR (VG3 and VG4), and two stations are in the 3-foot cap area (VG1 and VG2). All four stations are at water depths of 51 to 59 feet, in areas where the bottom slope is less steep than it is inshore, and situated near the center of the cap to minimize interference from offsite benthic organisms that could skew the test results.

In 1996, a benthic taxonomic reference station was sampled for the first time for comparisons with the Pier 53 benthic stations. The reference station was located just offshore of Richmond Beach. Reference stations are used to represent background or undisturbed conditions for comparison to the stations in the areas being studied. Also, reference stations allow a comparison to the SMS.

The reference station was chosen from several potential reference stations that were studied as part of the Puget Sound Ambient Monitoring Programs *Marine Sediment Monitoring* (Tetra Tech 1990). These potential reference stations were analyzed for chemical and physical parameters, sediment toxicity, benthic community, and anthropogenic alteration. If a station was deemed acceptable in all of these categories it was listed as a potential reference station.

A reference station for Pier 53 was chosen from this list with the further criteria that sediment grain size, water depth, total organic carbon content of the sediment, and the general geographic area were similar to the Pier 53 remediation area. Based on this, the Richmond Beach station was determined to be the most suitable as a reference.

During sampling at Richmond Beach, a field test of the sediment at the station was conducted to estimate percent fines to further aid in determining the suitability of the station as a reference for the Pier 53 remediation area. The percent fines were estimated by a wet sieving process using a 63µm standard sieve. A known amount of sediment was washed through the sieve using water from a hose. All of the sediment that did not wash through the screen was measured and an estimate of the percentage of the fines that did wash through the screen was made.

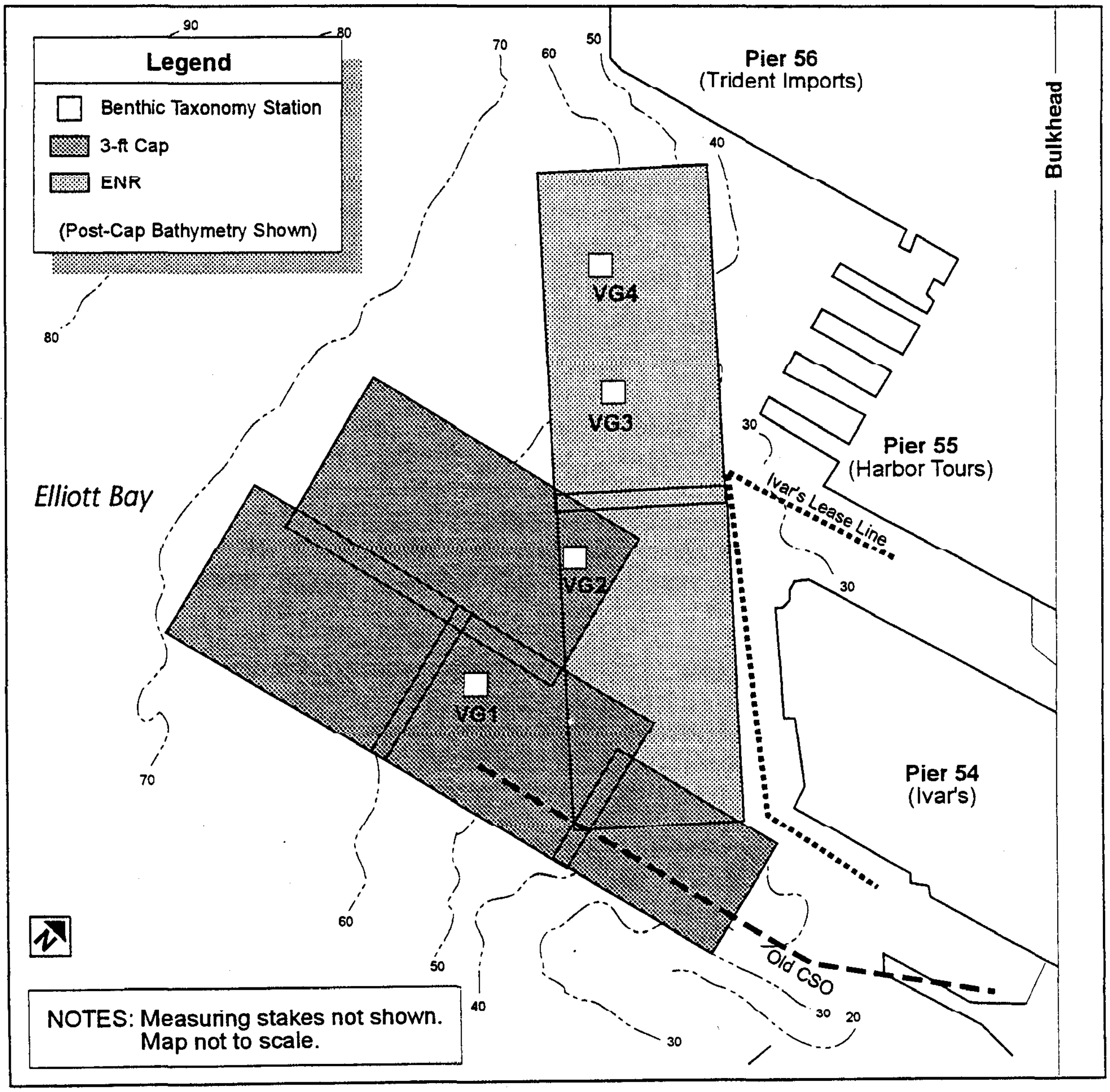


Figure 5-1. Benthic Taxonomy Stations

Benthic taxonomy samples were collected using a 0.1-m^2 van Veen grab sampler operated from the *RV Liberty*. Five replicate samples were taken at each station. Samples were screened onboard by Fukuyama and Hironaka Inc. When a sample was collected and brought onboard, the sampler was set into a screening tray. The sediment sample thickness was measured to ensure a minimum depth penetration of 10 cm. If a sample was acceptable, it was emptied into the screening tray where fine material was carefully washed through the 1-mm mesh screen with water from a hose. Each sample was screened to remove as much sediment and debris as possible. Material retained in the screen was put into a jar and labeled with the station name and replicate number, preserved with buffered formalin, and transferred at least a week later from formalin to alcohol. Taxonomic analysis was conducted by Marine Taxonomic Services.

Some taxonomic names have changed since the last time the remediation area was sampled in 1993. Recent studies have shown that some individual species, which were originally identified in other parts of the world (e.g. the Atlantic Ocean) and thought to be occur worldwide, have now been determined to be two or more different species (Howard Jones 1997 personal communication). When comparing 1996 data to previous studies, the new name is used and the old one is noted.

Locating a suitable reference station for the Pier 53 area has proven difficult. Studies have determined that the makeup of a benthic community is mostly dependent on grain size (Tetra Tech 1990) but geographic location also plays a role. The native bottom in the Pier 53 area is composed of mostly fine-grain muds. The cap, however, is composed of mostly medium-grain sands. Larval recruitment onto the cap is most likely to come first from nearby fine-grain areas surrounding the cap. Over time, the sandy conditions on the cap would favor organisms that are suited to sandy areas. At the same time, deposition is continually making the cap grain size finer. An environment where sand is the predominant grain size means that currents are eroding the finer particles that would otherwise settle on the bottom. These currents, in addition to coarser grain size, have an effect on the type of benthic community that would develop in the area. The Pier 53 area is unique in that it contains coarse sediments in a depositional area where there are no strong currents or other attributes associated with a coarse-grain area. The continual dynamics of the shifting of grain size on the cap made it difficult to duplicate exact conditions for a reference station.

RESULTS

Benthic community analysis showed that the recolonization process of the cap is continuing and that the benthic community is changing over time. The abundance of mollusks and crustaceans increased while the abundance of polychaetes declined. Certain species that were dominant in previous studies are no longer dominant and have been replaced by other species. The changes in the benthic community appear to be linked to a shift toward finer particles in the grain-size makeup of the cap. It also appears that chemical concentrations on the cap may be having an effect on the benthic community.

Abundance and Diversity

A total of 13,922 individual organisms were collected from the four stations within the Pier 53 remediation area in 1996. And a total of 217 species were counted. Mollusks were highest in abundance with 6,383 individuals, while polychaetes were the most diverse with 123 species (Tables 5-1 and 5-2).

Spatially, VG4, the taxonomic station in the far northern end of the remediation area and on the ENR, showed the greatest abundance with 4,291

TABLE 5-1. Number of Individuals per Station

Total of 5 Replicates x 0.1 m²

Group	VG1	VG2	VG3	VG4	Remediation Area Totals	Reference
Polychaete	1169	617	1076	898	3760	327
Mollusk	1113	1361	1746	2163	6383	224
Crustacean	1168	442	802	1193	3605	1473
Other	57	36	44	37	174	42
Total	3507	2456	3668	4291	13922	2066

TABLE 5-2. Number of Species per Station

Total of 5 Replicates x 0.1 m²

Group	VG1	VG2	VG3	VG4	Remediation Area Totals	Reference
Polychaete	80	69	70	69	123	63
Mollusk	29	24	25	27	38	36
Crustacean	29	20	23	29	41	46
Other	10	8	8	8	15	11
Total	148	121	126	133	217	156

individuals. VG1, which is farthest south and on the 3-foot cap, showed the greatest diversity with 148 species. Both VG1 and VG4 showed increases in the number of individuals, while VG2 and VG3, in the middle of the remediation area, showed decreases. Productivity differences between the ENR and the 3-foot cap were not apparent.

The total number of species counted at all four stations remained constant since 1993 with fluctuations occurring at individual stations. The total number of species increased at VG1, decreased at VG2 and VG3, and remained about the same at VG4. Polychaetes again showed the highest number of species counted at all four stations followed by mollusks and then crustaceans. The total number of polychaete species remained unchanged from 1993 while crustacean species increased slightly and mollusk species decreased. The total number of species from each of the three taxonomic groups increased at VG1 and decreased at VG2, VG3, and VG4.

The 1996 data showed that the number of polychaete individuals was lower while the numbers of mollusks and crustaceans were higher than in 1993.

Polychaete individuals decreased at all stations, ranging from 47 to 86 percent. Both mollusks and crustaceans increased at all stations, ranging from 82 to 224 percent for mollusks and from 26 to 200 percent for crustaceans. *Axinopsida serricata*, a small clam, was the most abundant species at three of the four stations and the second most abundant at the fourth station. *Euphilomedes carcharodonta* an ostracod, was the most abundant species at one station and the second most abundant at the other three stations (Tables 5-3 through 5-6). The most abundant species from the remediation area are, in order: *A. serricata, E. carcharodonta, Prionospio jubata* (formerly *Prionospio steenstirupi*) and *Parvilucina tenuisculpta.*

TABLE 5-3. Dominant Species at VG1

Species	5 Rep Total	% of Population	Total %
Euphilomedes carcharodonta	1004	28.6	28.6
Axinopsida serricata	801	22.8	51.4
**Prionospio jubata*	312	8.9	60.3
Lumbrineridae sp. Indet.	199	5.7	66
Parvilucina tenuisculpta	145	4.1	70.1
Spiochaetopterus costarum	130	3.7	73.8
Lumbrineris californiensis	54	1.5	75.3

TABLE 5-4. Dominant Species at VG2

Species	5 Rep Total	% of Population	Total %
Axinopsida serricata	1030	41.9	41.9
Euphilomedes carcharodonta	337	13.7	55.6
**Prionospio jubata*	165	6.7	62.3
Parvilucina tenuisculpta	132	5.4	67.7
Lumbrineridae sp. Indet.	84	3.4	71.1
Macoma sp. Juv.	56	2.3	73.4
Macoma carlottensis	45	1.8	75.2

TABLE 5-5. Dominant Species at VG3

Species	5 Rep Total	% of Population	Total %
Axinopsida serricata	1372	37.4	37.4
Euphilomedes carcharodonta	631	17.2	54.6
**Prionospio jubata*	281	7.7	62.3
Parvilucina tenuisculpta	218	5.9	68.2
Lumbrineridae sp. Indet.	142	3.9	72.1
Scoletoma luti	82	2.2	74.3
Lumbrineris californiensis	68	1.9	76.2

TABLE 5-6. Dominant Species at VG4			
Species	**5 Rep Total**	**% of Population**	**Total %**
Axinopsida serricata	1691	39.4	39.4
Euphilomedes carcharodonta	1021	23.8	63.2
**Prionospio jubata*	277	6.5	69.7
Parvilucina tenuisculpta	276	6.4	76.1

*Formerly *Prionospio steenstirupi*

At the reference station, 2,066 individuals were counted. Crustaceans were most abundant followed by polychaetes and mollusks. A total of 156 species was counted, composed of 63 polychaete, 36 mollusk, and 46 crustacean species. In general, the reference station showed a greater number of species and fewer individuals than stations within the remediation area. The reference station was numerically dominated by crustaceans, while stations in the remediation area were generally dominated by mollusks (Table 5-7).

TABLE 5-7. Dominant Species at Reference Station			
Species	**5 Rep Total**	**% of Population**	**Total %**
Euphilomedes carcharodonta	1149	57.1	57.1
Parvilucina tenuisculpta	61	3.0	60.1
Rhepoxynius abronius	52	2.6	62.7
Psephidia lordi	43	2.1	64.8
Pholoides aspera	24	1.2	66.0
**Prionospio jubata*	24	1.2	67.2
Lumbrineris californiensis	21	1.0	68.3
Crangon alaskensis	21	1.0	69.3
Nemertinea sp. Indet.	21	1.0	70.3
Eumida longicornuta	19	0.9	71.3
Macoma yoldiformis	19	0.9	72.2
Terebellidae sp. Juv.	16	0.8	73.0
Westwoodilla caecula	16	0.8	73.8
Chaetozone sp. Indet.	15	0.7	74.6
Pinnixia schmitti	14	0.7	75.3

*Formerly *Prionospio steenstirupi*

During the sampling of the Richmond Beach reference station, field screening for particle size distribution showed that the sediments were approximately 6 percent fine material. This was within 10 percent of the estimated percent fines of the four benthic taxonomic stations from the remediation area and was deemed acceptable for use as a reference sample. Later, laboratory analysis showed that the Richmond Beach reference station was 5.4 percent fine material. This was within 10 percent of the top 10 cm samples from VG3 and VG4. Particle size distribution was analyzed for only the top 2-cm sample at VG1 and VG2. The reference station was within 10 percent of VG1 and was within 20 percent of VG2. The top 10 cm at VG3 and VG4 showed less fines than in the top 2 cm and it is expected that the top 10 cm of VG1 and VG2 also contained less fines.

The Richmond Beach reference station was in 60 feet of water. This is similar to the remediation area stations that range in depth from 51 to 59 feet.

Comparing major taxa from the remediation area to the reference station shows that all four stations in the remediation area had higher abundances of total individuals, polychaetes, and mollusks than the reference station. The reference station showed a higher abundance of crustaceans than any station in the remediation area and that the reference station was higher in crustacean abundance than one station (VG2) by more than 50 percent. This difference is considered to be significant, causing VG2 to fail a comparison with the SQS for benthic infauna.

A total of 156 species was counted at the reference station, compared to a range of 121 to 148 for the remediation area. The 63 polychaete species at the reference station compared to a range of 69 to 80 for the remediation area. The 36 mollusk species at the reference station compared to range of 24 to 29 for the remediation area. The 46 crustacean species at the reference station compared to a range of 20 to 29 for the remediation area. The 20 crustacean species counted at VG2 were different than the reference station by greater than 50 percent, indicating possible adverse benthic effects.

Biomass

The biomass, or weight of the organisms collected, has increased steadily in the remediation area since capping. All stations showed increases ranging from 16 percent at VG2 to 137 percent at VG1. Mollusks showed the greatest increase in biomass since 1993 and have the highest total biomass of any taxonomic group (Table 5-8). For all four stations, biomass was concentrated in the mollusk and polychaete populations. Biomass increased for all stations and taxonomic groups except for polychaete biomass at VG2, suggesting that mollusks are replacing polychaetes in the benthic community at this station.

TABLE 5-8. Biomass Average per Station

Average of 5 Replicates x 0.1 m^2					
Group	VG1	VG2	VG3	VG4	Refererence
Polychaetes	2.31	1.26	2.56	2.44	0.654
Mollusks	2.06	2.10	1.79	2.73	2.38
Crustaceans	0.648	0.246	0.524	0.664	0.742
Misc	0.0644	0.148	0.330	0.553	7.30
Totals	5.09	3.76	5.20	6.38	*11.1

*5.99 Reference average without high misc replicate

Biomass was generally lower at the reference station than at stations in the remediation area. Polychaete and mollusk biomass was lower at the reference station, while crustacean biomass was slightly higher at the reference station. Interpretation of biomass results at the reference station were complicated by large animals in a few of the replicates.

PSD and TOC

Particle size distribution data shows that the grain-size makeup of the surface of the cap has become finer in the 4 1/2 years since the cap was placed. Table 5-9 shows the range of fines at the taxonomy stations sampled during the pre-cap study and at the four on-cap taxonomy stations sampled since the cap was placed. The median percentage of fine material on the cap increased by over 150 percent between the 1992 baseline study and the 1993 study. The median percentage of fine material increased again by almost 100 percent between the 1993 study and the 1996 study. For comparison, the median percentage of fine material at taxonomy stations on the Denny Way sediment cap four years after capping had increased just over 100 percent since the baseline sampling. Also, the range of fines at the Denny Way taxonomy stations four years after capping was 7.5 to 8.0 percent compared to 13.8 to 26.3 percent at Pier 53 four years after capping. The higher rate of deposition and greater change in the grain-size makeup on the Pier 53 cap was probably caused by construction activities and docking and departing ferries at the nearby ferry terminal.

TOC has decreased between the 1992 baseline study and 1996. Table 5-10 shows the range of TOC in samples collected from before the cap was placed through 1996. Median percentage of TOC at taxonomy stations was 2.86 in 1992 and decreased to 2.35 in 1993 and decreased again to 1.47 in 1996. It is not clear why TOC would decrease over time.

TABLE 5-9. Percent Fines Range From Pre-Cap to 1996 at Benthic Taxonomy Stations

Year of Study	Range
Pre-cap 1992	47.4 to 57.7
Baseline 1992	3.84 to 5.28
1993	8.40 to 15.3
1996	13.8 to 26.3

TABLE 5-10. Percent TOC Range From Pre-Cap to 1996 at Benthic Taxonomy Stations

Year of Study	Range
Pre-cap 1992	4.0 to 5.3
Baseline 1992	0.92 to 4.8
1993	1.2 to 3.5
1996	0.75 to 2.2

Indices

The succession of benthic species recolonizing a sediment cap or other bottom areas of marine environments that have been denuded of benthic infauna is similar to the successional changes of a benthic community in response to pollution (Pearson and Rosenberg, 1978).

Early in the recolonization process a community develops that is composed of a few opportunistic species and very high numbers of individuals. These opportunistic species are short-lived and small so biomass is low. As recolonization progresses, the overall number of individuals declines as the few opportunistic species are replaced by a greater diversity of species. Biomass increases since many of the new species are larger and longer lived than the initial opportunistic species. Stable and undisturbed benthic communities are characterized by greater diversity of species, higher biomass, and lower number of individuals than during the initial phases of recolonization (Pearson and Rosenberg, 1978).

Indices are a useful tool to chart the progress of benthic recolonization, reducing a lot of complex data for comparison and interpretation (Valiela 1984). Indices were calculated for the Infaunal Trophic Index (Thom et al. 1980), Swartz dominance index, and the Shannon-Wiener diversity index (from Valiela 1984). Results are shown in Table 5-11.

TABLE 5-11. Benthic Indices

Index	VG1	VG2	VG3	VG4	Reference
ITI	64	64	64	64	68
Swartz Dominance	7	7	7	4	15
SW Diversity	3.87	3.57	3.62	3.3	3.36

The Infaunal Trophic Index (ITI) is based on the feeding or trophic types of a benthic community. Studies have shown that in undisturbed areas, the benthic community is predominantly filter feeding organisms. Close to a source of organic contamination, the benthic community changes to one that is predominately subsurface deposit feeding organisms. The ITI is calculated by grouping benthic infauna by feeding type at a given station and assigning a higher score to filter-feeding species and a lower score to surface and subsurface deposit-feeding species. A higher ITI number indicates that station is more like background or undisturbed conditions and a lower number may indicate possible adverse effects from organic inputs (Thom et al. 1979).

Each station in the remediation area had an ITI value of 64. The reference station had a similar value of 68. The reference station showed slightly higher numbers of filter-feeding organisms from the Onuphidae, and Terebellidae families plus gammarid amphipods *Rhepoxynius abronius* and *Ampelisca*. Additionally, remediation area stations showed higher numbers of surface-detritus-feeding organisms from the Chaetopteridae family and the bivalve *Parvilucina*. Despite these differences, the ITI did not show great differences between the reference station and the remediation area stations.

Swartz's Dominance Index (SDI) is a measure of the diversity of the benthic community at a station. The SDI is the number of species at a station that make up 75 percent of the population (Swartz et al. 1985 from Striplin 1996). The higher the number of species that are dominant at a station means higher diversity. Typically a site affected by pollution will be dominated by a few species.

VG1, VG2, VG3 showed SDI values of 7, while VG4 showed a value of 4. An SDI value of less than 5 is considered to be stressed. The reference station showed an SDI value of 15. Comparing the SDI values from the reference area to VG1, VG2, and VG3 shows that these stations may be moderately stressed. At the reference station, *E. carcharodonta* made up 55.6 percent of the population with the next closest species comprising 3 percent. In the remediation area, *E. carcharodonta* and *A. serricata.* together made up between 51.4 and 63.2 percent of the population.

The Shannon-Wiener diversity index is a measure of species diversity which takes into account both the number of species and the proportion of the number of individuals. This index will give a higher number for benthic communities where the numbers of species is greater and the number of individuals is lower.

The results show that the reference station diversity value fell within the range of the remediation area values. The reference station was 3.36 and the remediation area stations ranged from 3.30 to 3.87. This index showed that the reference station was similar to the remediation area stations.

DISCUSSION

Overall, the increase in the numbers of mollusks and crustaceans show that the recolonization process of the cap is continuing and that the benthic community is changing over time. The changes in the benthic community appear to be linked to the shift toward a finer grain-size makeup. The particle-size shift was expected because the sand cap was placed on top of the native, mostly fine-grain muds. Eventually natural sedimentation along the Seattle waterfront will completely cover the cap with fine-grain muds.

The 1996 data showed that both VG2 and VG3 decreased in both the number of individuals and the number of species when compared to 1993. Of the remediation area stations, these two stations showed much higher percentage of fines in the top 2 cm ranging from 26.3 to 22.8 percent, which was approximately 2 times higher than VG1 and VG4. The lower abundance and numbers of species at VG2 and VG3 are probably due to the higher percent fines. Fine grain habitats don't necessarily mean that there will be less abundance and diversity. In this case, however, the rate of change to finer particles possibly caused environmental stress to species whose feeding strategies require unchanging substrate characteristics and favored established species that are silt tolerant and whose feeding strategies are unaffected or enhanced by a changing substrate. The favored species are also able to take advantage of the vacancies left by the species that were not silt tolerant.

Aphelochaeta sp. N1 (known previously as *Aphelochaeta multifilis*), and *Asabellides lineata* were dominant in 1993, but in 1996 few were counted. At the same time, the numbers of *A. serricata, E. carcharodonta, P. jubata,* and *P. tenuisculpta* increased and all four species have become dominant. This shift in dominant species is probably linked to the grain-size change. Cirratulids, such as *Aphelochaeta*, have been associated with coarse sediments in Puget Sound (Comisky et al. 1984). They are sedentary worms living in the substrate and are surface deposit feeders (Kozloff 1990). This feeding strategy probably makes Aphelochaeta unable to adapt to the ongoing changes in the substrate. This species was not dominant in the pre-cap samples and will not likely dominate in the future. At the same time *Axinopsida serricata*, a burrowing surface deposit feeder (Comisky et al. 1984), was not dominant in the 1992 post-cap baseline study but has been increasing ever since capping. It was dominant in the pre-cap samples and is expected to continue to dominate the benthic community as the remediation area becomes more silty.

Another factor in the change in community structure was the increase in chemical contamination. Chemical results in 1993 showed that the cap had been recontaminated with high levels of PAHs and mercury. At that time, however, the benthic community did not appear to show any adverse affects. It is possible that sampling was conducted too soon after the recontamination occurred in 1993 for the benthic community to show chronic effects. During the time between 1993 and 1996, the high PAH concentrations have decreased but new contamination is now present. In 1993 the ampharetid *Asabellides lineata* was dominant in the benthic community and in 1996 it was completely absent. Ampharetids have been used as an indicator species that are "sensitive or intolerant to toxic stress" (Metro 1987). Also, the Infaunal Trophic Index identifies ampharetids as species that are common in control regions (Thom et al. 1979). Between the grain size shift and continued recontamination of the remediation area, ampharetids have decreased from 1,314 total individuals in 1993 to 57 in 1996.

A comparison of samples taken in 1996 to samples taken before the remediation area was capped showed that the post-cap benthic community is becoming more like the pre-cap community. In March 1992, six benthic stations were sampled within the projected remediation area boundary immediately prior to capping. These pre-cap stations are shown in Fig 5-2. Methods, number of replicates per station, and taxonomic analysis were the same for the pre-cap analysis as for all post-cap monitoring. Exact comparisons between pre-cap and 1996 results are difficult because sampling times during the year and station locations were not the same. However, the pre-cap samples do give a good picture of what the benthic community was like in the remediation area before capping.

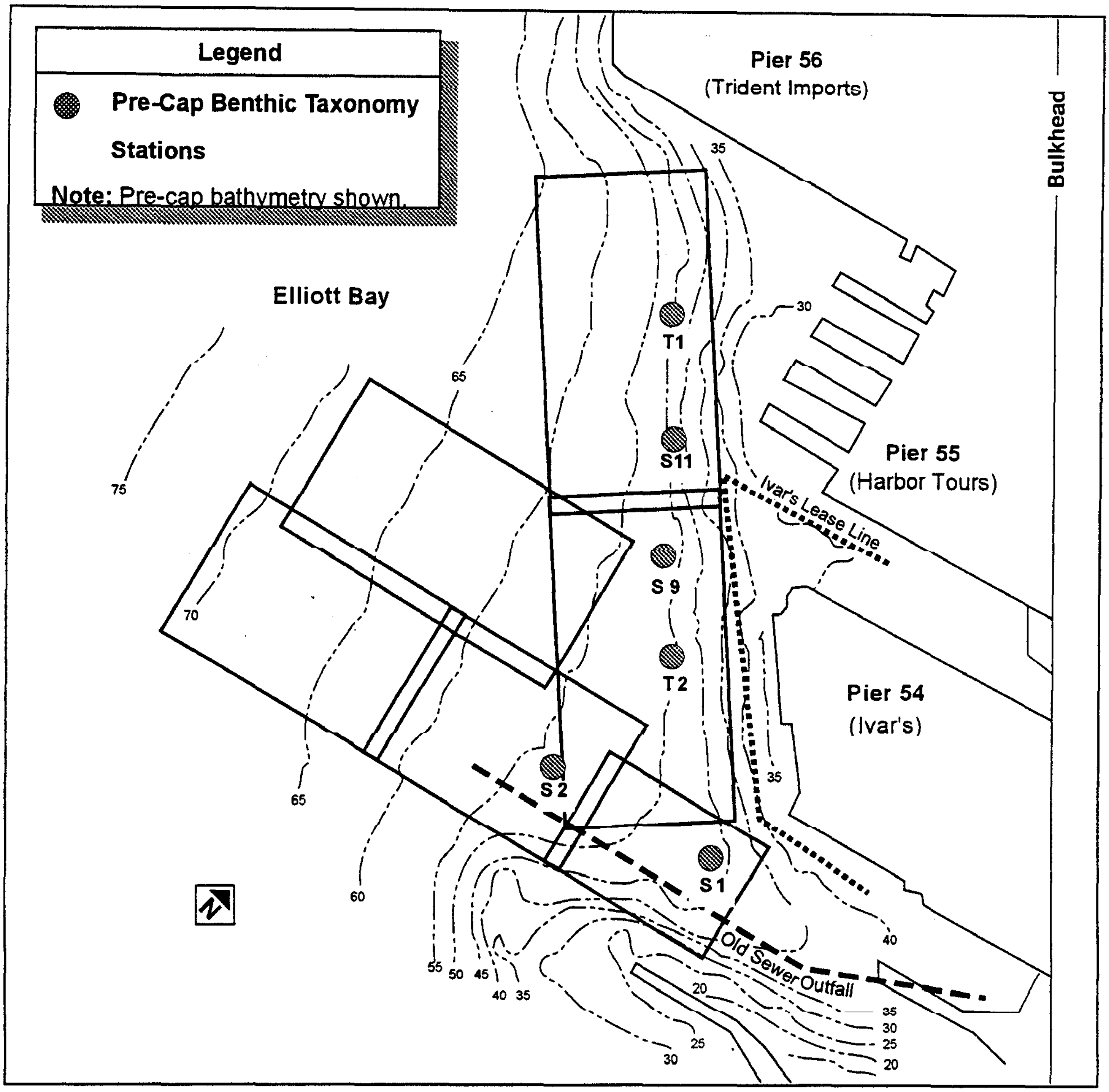


Figure 5-2. Pre-Cap Benthic Taxonomy Stations

Axinopsida serricata was the most dominant species at all six pre-cap stations and was the most dominant species at three of the four stations in 1996. Other infauna that were dominant in both studies include *E carcharodonta*, *Prionospio jubata* (formerly *P. steenstirupi*), Lumbrineridae, *Macoma*, and *Parvilucina tenuisculpta*. *A. serricata*, *P. jubata* and *E. carcharodonta* have been dominant in all post-cap samples except the 1992 baseline samples, which were taken only a few months after capping. Tables 5-12 through 5-17 shows dominant species in the pre-cap study.

TABLE 5-12. Dominant Species at Precap Station S1			
Species	5 Rep Total	% of Population	Total %
Axinopsida serricata	517	23.91	23.91
**Prionospio jubata*	374	17.30	41.21
Heteromastus filobranchus	170	7.86	49.07
Lumbrineris sp. Indet.	133	6.15	55.23
Parvilucina tenuisculpta	125	5.78	61.01
Euphilomedes carcharondonta	102	4.72	65.73
Macoma sp. Juv.	68	3.15	68.87
Nephtys cornuta	51	2.36	71.23
Notomastus tenuis	49	2.27	73.50
Exogone lourei	41	1.90	75.39

TABLE 5-13. Dominant Species at Precap Station S2			
Species	5 Rep Total	% of Population	Total %
Axinopsida serricata	1090	32.47	32.47
Euphilomedes carcharondonta	365	10.87	43.34
Heteromastus filobranchus	285	8.49	51.83
**Prionospio jubata*	252	7.51	59.34
Parvilucina tenuisculpta	169	5.03	64.37
Lumbrineris sp. Indet.	166	4.94	69.32
Notomastus tenuis	113	3.37	72.68
Macoma sp. Juv.	67	2.00	74.68
Nephtys cornuta	66	1.97	76.65

TABLE 5-14. Dominant Species at Precap Station S9			
Species	5 Rep Total	% of Population	Total %
Axinopsida serricata	1008	30.51	30.51
**Prionospio jubata*	539	16.31	46.82
Euphilomedes carcharondonta	237	7.17	54.00
Heteromastus filobranchus	177	5.36	59.35
Lumbrineris sp. Indet.	153	4.63	63.98
Parvilucina tenuisculpta	97	2.94	66.92
Notomastus tenuis	78	2.36	69.28
Euphilomedes producta	69	2.09	71.37
Macoma sp. Juv.	56	1.69	73.06
Polydora brachycephala	47	1.42	74.49
Nephtys cornuta	45	1.36	75.85

*Formerly *Prionospio steenstirupi*

TABLE 5-15. Dominant Species at Precap Station S11

Species	5 Rep Total	% of Population	Total %
Axinopsida serricata	1231	30.71	30.71
**Prionospio jubata*	630	15.71	46.42
Euphilomedes carcharondonta	505	12.60	59.02
Lumbrineris sp. Indet.	326	8.13	67.15
Euphilomedes producta	86	2.15	69.29
Notomastus tenuis	72	1.80	71.09
Heteromastus filobranchus	69	1.72	72.81
Exogone lourei	63	1.57	74.38
Parvilucina tenuisculpta	58	1.45	75.83

TABLE 5-16. Dominant Species at Precap Station T1

Species	5 Rep Total	% of Population	Total %
Axinopsida serricata	1710	34.56	34.56
**Prionospio jubata*	729	14.73	49.29
Euphilomedes carcharondonta	526	10.63	59.92
Lumbrineris sp. Indet.	266	5.38	65.30
Nucula tenuis	146	2.95	68.25
Heteromastus filobranchus	134	2.71	70.96
Euphilomedes producta	95	1.92	72.88
Nephtys cornuta	90	1.82	74.70
Notomastus tenuis	79	1.60	76.29

TABLE 5-17. Dominant Species at Precap Station T2

Species	5 Rep Total	% of Population	Total %
Axinopsida serricata	2263	40.01	40.01
**Prionospio jubata*	776	13.72	53.73
Euphilomedes carcharondonta	611	10.80	64.53
Heteromastus filobranchus	207	3.66	68.19
Lumbrineris sp. Indet.	155	2.74	70.93
Euphilomedes producta	123	2.17	73.11
Notomastus tenuis	106	1.87	74.98
Nephtys cornuta	84	1.49	76.47

*Formerly *Prionospio steenstirupi*

Recruitment of benthic invertebrates from the surrounding area will tend to make the benthic community on the cap similar to the pre-cap community. However, the transformation of the present community to become more like the pre-cap community is most likely because the grain-size makeup of the cap is becoming more like the pre-cap native bottom muds.

SECTION 6
CONCLUSIONS

Results of monitoring at Pier 53 in 1996, almost 4 1/2 years after placing the cap and ENR, show that the 3-foot cap and ENR have been successful in achieving their primary purpose of isolating contaminated bottom sediments from the marine environment. However, the surface of the area has been re-contaminated by 4-methylphenol and phenol. The source of the new contamination was not readily apparent and further study will be needed.

CONCLUSIONS

Specific conclusions from the 1996 monitoring of the Pier 53 remediation area are as follows:

- The 3-foot cap and ENR are stable. They are not eroding or settling into the native bottom muds.
- Contaminants are not migrating from the underlying sediments up into the 3-foot cap and ENR. Results of core samples show few chemicals were detected within the 3-foot cap and ENR. When chemicals were detected, the concentrations were low, near the detection limits.
- The surface of the 3-foot cap and ENR have been re-contaminated by 4-methylphenol and phenol, as indicated by chemical analyses of 2-cm-deep and 10-cm-deep surface samples. These samples showed that the southeast corner of the remediation area exceeded state sediment standards. The source of the new contamination was not readily apparent and further study will be needed.
- PCBs, the pesticide 4,4 DDD, chlorinated benzenes, and phthalates all were found on the cap for the first time. At this time these chemicals are in low concentrations, but they should be monitored for future trends. If levels continue to increase, sources should be investigated.
- The 1996 data indicated that the number of polychaete individuals were lower while the numbers of mollusks and crustaceans were higher than in 1993. This shift in species dominance shows that the recolonization process of the cap is continuing and that the benthic community is changing over time. These changes in the benthic community appear to be linked to a greater percentage of fine-grain sediments in the remediation area. This particle-size shift was

expected because the sand cap was placed on top of the native, mostly fine-grain muds. Another possible factor in the change in community structure has been the increase in chemical contamination. In 1993, the Ampharetid *Asabellides lineata* was dominant in the benthic community, however, in 1996 it was completely absent. Ampharetids have been used as an indicator species that are "sensitive or intolerant to toxic stress" (Metro 1987). Additionally, a comparison of samples taken in 1996 to samples taken in March 1992 before the remediation area was capped showed that the post-cap benthic community is becoming more like the pre-cap community.

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APPENDIX A

MONITORING PLAN FOR PIER 53

MONITORING PLAN FOR PIER 53; SEDIMENT CAPPING SITE AND ENHANCED NATURAL RECOVERY AREA
SEPTEMBER 1992

CITY OF SEATTLE
DRAINAGE AND WASTEWATER UTILITY
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SEATTLE 98104-1598

MUNICIPALITY OF METROPOLITAN SEATTLE
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MONITORING PLAN FOR PIER 53; SEDIMENT CAPPING SITE AND ENHANCED NATURAL RECOVERY AREA SEPTEMBER 1992

Project Description-Site Selection and Remediation Methods

This project site was selected as the City of Seattle's first sediment remediation site in Elliott Bay. Site selection was based on several factors including degree of contamination, completion of source control efforts, and simplification of property ownership issues (refer to unpublished draft report "Metro Toxic Sediment Remediation Project", Parametrix, August 1991). An interagency advisory panel, including EPA and Ecology was consulted to determine the criteria for site selection. One suggestion of the panel was that initial remediation efforts be confined to parcels of public ownership, in order to minimize legal disputes regarding access and responsibility. The Pier 53 site is on property owned by the Washington State Department of Natural Resources and is at the location of a former deep water sewer outfall. The deep water outfall has been abandoned. There is presently a combined sewer overflow adjacent to the site which has been controlled to a maximum of one event per year. There is also a stormwater outfall at the same location, which is at the end of Madison Street.

Potentially contaminated areas exist adjacent to the site under piers 53, 54, and 55. These areas are not accessible for capping by the proposed placement method and were not included in the project scope. During the course of project monitoring, sediment samples will be taken from adjacent properties and provided to Ecology for consideration of future remediation action. If any recontamination of the site occurs, these adjacent properties will be evaluated as potential material sources. At this time the migration effects of contaminated sediments from adjacent sites onto the clean cap material are unknown; the data collected from this site will be valuable for planning and coordinating future remediation projects along the central waterfront.

The project involves two different approaches to sediment remediation. The primary approach is to place a three foot cap of clean dredged material to isolate the contaminated sediments. This cap will be placed on the deeper portions of the project site, covering approximately 2.9 acres. The second approach involves the experimental placement of a one foot layer of clean dredged material on the near shore portion of the site, covering an area of 1.6 acres. This is referred to as enhanced natural recovery. This experimental remediation action was required by Washington State DNR as a condition of project approval in order to minimize the potential future navigational impacts of capping and also to provide some experimental data on the feasibility of using a thinner layer of material to accomplish remediation in shallower areas.

The intent of the three foot cap is to isolate the underlying contaminated sediments and to provide a clean substrate for bottom dwelling and bottom feeding organisms. A three foot cap depth is generally considered to be sufficient to prevent burrowing organisms from breaching the lower cap boundary and entering the underlying contaminated sediments. This method has been used before as a remediation technique in both Commencement Bay and Elliott Bay. The Elliott Bay project is at the Denny Way site, which was capped by METRO in 1990. The proposed project would use clean dredged materials from the turning basin in the Duwamish River, which was also the material source for the Denny Way site. Sediment will be provided and placed by the US Army Corps of Engineers using split hull scows similar to those used at the Denny Way site.

The intent of the one foot thick enhanced natural recovery area is to attempt a recovery method that would be applicable to shallow urban areas where a thicker cap may affect navigational uses or would be logistically difficult to place, such as under piers or adjacent to bulkheads. There are three potential benefits to this approach. A one foot sediment placement would minimize the loss of navigational depth. It may also allow the larger organisms existing on the site to migrate through the sediment and to recolonize the new material. Lastly, the placement of small amounts of clean material may help accelerate the natural degradation of organic chemicals by the biological community.

Objectives

Environmental monitoring for the project involves both short term activities needed to facilitate material placement and to establish baseline information, plus longer term activities needed to document the functional success of the remediation efforts. The strategy for long term monitoring is to do a baseline monitoring within three months of placement, and to repeat monitoring both one, two, and ten years after placement. One other year of monitoring will be added, the timing of which will be decided based on the results of the first two years of monitoring.

There are seven main objectives associated with the monitoring program as listed below. A summary of the sampling activities and schedule are provided in Table 1 and sampling stations are shown in Figure 1.

OBJECTIVE 1 — Provide baseline taxonomic data.

OBJECTIVE 2 — Guide and document the sediment placement, thickness, and long term stability.

OBJECTIVE 3 — Document how well the three foot cap and the enhanced natural recovery area function to isolate contaminated sediments from migrating upwards into the cap, and to document the extent of that contamination if it occurs.

OBJECTIVE 4 — Identify whether chemicals accumulate on the remediation site such that they indicate migration of materials from off-site.

OBJECTIVE 5 Determine the amount and type of benthic recolonization that occurs on the project site and determine whether there are differences in the character and rate of recolonization between the three foot cap and the one foot thick enhanced natural recovery area.

OBJECTIVE 6 Review and evaluate the monitoring data with the regulatory agencies to determine (1) if the three foot cap is functioning as expected to isolate contaminated sediments; (2) if a one foot layer of sediment will function as expected such that biological mixing occurs to enhance natural recovery; (3) whether further actions are warranted for either the capping site or the enhanced natural recovery area.

OBJECTIVE 7 To provide data that may inform and assist the NOAA panel and other agency teams in developing future clean up plans for Elliott Bay.

Cap Placement and Thickness

Bottom stakes will be used to document the placement and thickness of capping" sediments. These will be set by divers inside the area of intended remediation in order to verify the thickness of the placed materials. Stake locations are shown on Figure 1. Initial readings to verify the depth of the new material will be made during the initial monitoring period. An independent check on the thickness of the "capping" materials will also be obtained when sediment cores are collected and processed during the post-placement monitoring discussed in the next section.

A sediment-profile camera survey of the project area and the adjacent seafloor will be conducted in conjunction with the benthic infaunal sampling. One objective of this survey will be to map the areal distribution of capping material at the site. Surface (0-20 cm) sediment grain-size and microstratigraphic layering will be determined from the images and mapped. The sediment-profile surveys, consisting of approximately 100 sampling locations, will be conducted several times throughout the monitoring program, including years 1 and 2. These surveys will allow the distribution of capping material to be mapped over time. These data will supplement the stake observations and core data, and provide a measure of cap dispersal and erosion.

Two follow-up diver surveys of "cap" thickness will be conducted within the four years as summarized in Table 1. These will be conducted at approximately 27 and 51 months after the material is placed to see if there are any obvious differences in the thickness of that material. An analysis of each years data will be included in a report and discussed during a report review meeting and during the four year review. Decisions about when to conduct further bathymetricor diver surveys beyond 51 months will be made in conjunction with Ecology, DNR, EPA, and the Corps of Engineers during the four year review process.

Isolation of Contaminants

Sediment cores will be used to determined if there is any vertical migration of chemicals up into the clean "cap" material. A total of five coring stations will be established as shown in Figure 1. Three coring stations are located in the area of the three foot cap, and two coring stations are located in the area of the one foot experimental enhanced recovery area. These coring stations provide spatial coverage across the project site and are intentionally located a minimum of 50 feet away from other sampling stations so that any potential release of contaminated sediment from the cores will not affect other surface sediment sampling stations.

One core will be collected from each of the five stations. Each core will extend completely through the clean remediation material and into the underlying contaminated sediments about one foot, as shown in Figure 3. Six-inch long sections of the cores will be retained as samples for chemical analysis. Where the three-foot cap is placed, one (1) 6-inch section will be taken below the interface and four (4) of the 6-inch core sections will be taken from above the interface, for a total of five sections. Where the one foot thick material is placed, one (1) 6-inch section will be taken below the interface but only one (1) or two (2) 6-inch sections will be taken from above the interface, depending on the actual material depth achieved by placement. Because mixing can occur around the interface due to the physical process of sediment placement, it is important to leave a space of at least one inch above the interface before taking the first sample. The exact distance will be determined after inspecting the interface of each baseline core, but will remain the same for future cores.

Sediment cores required to establish baseline data will be collected as soon as practical within three months after cap placement. All sections of each baseline core will be analyzed for metal and organic priority pollutants including as a minimum, those required by Washington State Sediment Standards (ref: WAC-173-204). Future core samples will be collected adjacent to the baseline stations to allow comparison of data. All sample sections will be collected for each core taken after the baseline cores, but initially only the first section above the interface will be analyzed for those chemicals found in the underlying contaminated sediments, to determine whether any chemical migration is evident. If chemical migration appears evident, sections further up the core will then be analyzed to determine how far chemical migration extends into the clean "cap" material. Decisions about whether to analyze additional sections will be made within the storage times established under the Puget Sound Protocols.

Additionally, if chemical contamination appears in the enhanced natural recovery area (one foot thick sediments) two avenues of contamination will be considered. If the contamination occurs at the top of the cap material, biological mixing from underlying sediment or deposition of new contamination will be suspected. If the contamination occurs in the bottom only, contamination from migration will be suspected.

Evaluation of vertical migration in the botton of the "capping" materials will be limited to only chemicals that were present in the underlying sediments. Data will be normalized to dry weight to allow comparisons. Vertical migration from the "cap" downward will be evaluated if there is evidence of significant chemical accumulation on the project site based on surface sediment samples. Also, a direct measure of cap thickness will be made and compared to the thickness indicated by the bottom depth surveys.

Initial core sampling will be done within three months of "cap" placement. Subsequent sampling will be done one year, four years, and ten years after the initial sampling. An analysis of each years data will be included in a monitoring report and the results discussed during a report review meeting and during the four year review. Decisions regarding the possibility of an additional core sampling between the four year and ten year sampling events will be made in conjunction with Ecology, DNR, EPA, and the Corps during the four year review process scheduled for 1996.

Surface Contamination of Project Site and Adjacent Property

To provide information requested by Ecology and EPA, surface contamination of adjacent property will be determined by collecting and analyzing samples from six stations in 1992 as shown on Figure 1 and 2. Four of these sample sites are located east of the project under the piers; samples from these sites will be collected either by diver or by small grab. Two of the stations are located south of the project site and will be collected with a Van Veen grab sampler. A stainless steel "cookie cutter" will be used to collect the top two centimeters of sediment from three replicate samples per station. These sub-samples will be composited, and then analyzed for priority pollutants, metal and organic including all the routine Ecology sediment chemical parameters. Data for all stations will be normalized to dry weight for comparison between stations and years. Data from these six stations will be provided to Ecology for comparison to other areas along the Seattle waterfront.

Accumulation of surface sediment contamination on the project site will be evaluated by collecting and analyzing samples from seven stations as shown in Figure 1. Samples will be collected with a Van Veen grab sampler. A stainless steel "cookie cutter" will be used to collect the top two centimeters of sediment from three replicate samples per station. These sub-samples will be composited, and then analyzed for priority pollutants, metal and organic, including all the routine Ecology sediment quality chemicals. Data for all stations will also be carbon normalized for comparison to the state sediment standards.

Chemistry data will be compared to the previously collected data (baseline and 15 month) to determine whether a change has occurred. If significant accumulation has occurred, there will be an assessment of the chemistry data from adjacent sites (as noted above) to evaluate whether they are a contributing source.

Initial surface sediment samples will be taken three months after placement. Subsequent samples will be taken one year, four years, and ten years after initial sampling. An analysis of each years data will be included in the monitoring report and discussed during a report review meeting and during the four year review. Decisions about the need, the frequency, and the extent of surface sediment sampling for the period between the four year and ten year samples will be made in conjunction with Ecology, DNR, EPA, and Corps of Engineers during the four year review process in 1996.

Benthic Recolonization

Benthic conditions immediately prior to capping will be documented by collecting and analyzing sediment samples from two stations in the enhanced natrual recovery area. A Van Veen sampler will be used to collect five replicates per station and samples will be processed according to Puget Sound protocols. Benthic taxonomy samples will be screened through a standard 1.0 mm mesh and all organisms identified to the lowest practical taxonomic level (preferably to species).

To evaluate recolonization of the project site, taxonomic data will be collected from two stations on the three foot cap and two stations on the enhanced natural recovery area as shown on Figure 1. This should provide a reasonable representation of the type of recolonization that occurs over the entire projet site. Also, this allows a comparison between recolonization on the three foot cap and the one foot thick enhanced natural recovery area. The first post-placement sampling will occur in summer of 1992. A Van Veen sampler will be used to collect five replicates per station and samples will be processed according to Puget Sound protocols. Benthic taxonomy samples will be screened through a standard 1.0 mm mesh and all organisms identified to the lowest practical taxonomic level (preferably to species). Table 1 shows the schedule for benthic taxonomy sampling which will yield initial samples at about 5 months, after cap placement. Subsequent samples will be taken one year, four years and ten years after initial sampling. Decisions about taxonomy sampling between the four year and ten year sampling event will be determined in conjunction with Ecology, DNR, EPA, and the Corps of Engineers. Data will be included in a monitoring report and then discussed during a report review meeting and during the four year review. This recolonization analysis will involve comparing each years data to the previous data and at the end of four years to an appropriate reference station.

As described above, a sediment-profile survey of the site will be conducted to map the near-surface distribution of capping material at and adjacent to the site. During the first year survey, approximately 100 images will be collected and given a "quick look" analysis to determine the grain size, Redox Potential Discontinuity depth, depth of penetration, and infaunal successional stage. During subsequent years surveys, up to 24 images will be selected for a more detailed analysis of geochemical and biological parameters with a technique known as REMOTS analysis (Rhoads and Germano, 1986; 1982). These 24 images will be selected to include the three foot capping area, the natural recovery area, and the areas adjacent to the project site. The REMOTS image analysis will include the mapping of "apparent" Redox Potential Discontinuity (RPD) depths and infaunal successional stages. These data will be used, in conjunction with the benthic infaunal data, to document the pattern(s) of benthic recolonization and biogenic sediment reworking across the study area. Sediment-profile surveys will be conducted at the same intervals as the benthic taxonomy sampling.

Review and Evaluation Process

A review process will be conducted on a regular basis to evaluate the monitoring data and determine if the cap is functioning as expected. To help facilitate this review, a monitoring report will be prepared that presents and analyzes the data. The monitoring report will be produced once each year that new monitoring data is obtained. Table 2 provides an outline of the topics to be addressed in the monitoring report.

Each monitoring report will be distributed to DNR, Ecology, EPA, the Corps of Engineers, and other interested groups, including the NOAA panel that will direct the City of Seattle/Metro settlement action. A meeting will be held to discuss and evaluate the report and conclusions for each year that a report is issued. A major monitoring review will be conducted after four years and will include discussions about monitoring needs beyond four years. These discussions will consider whether the cap is functioning as expected and what contingency actions might be warranted if the cap is not functioning as expected, including whether resulting conditions at the cap surface warrant further action.

Table I. Summary Schedule of Monitoring Activities for Pier 53 Capping

DESCRIPTION OF ACTIVITY	Construction Phase	Ten Year Plan Post Cap Monitoring										
	1992	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002*
Set Botton Stakes	X	X										
Bottom stake measurements by diver	X	May	August			August						August
Sediment cores for chemistry, 5 stations total:												
3 stations on 3' cap (5 depth segments)		May	August			August						August
2 stations on enhanced natural recovery area (2 or 3 depth segments)		May	August			August						August
Surface grabs for chemistry–adjacent to site, 6 stations (3 stations top 2 CM + top 6 CM) (3 stations top 2 CM only)		May										
Surface grabs for chemistry, 7 stations on project site (top 2 cm)		May	August			August						August
Surface grabs to document taxonomy prior to project work, 2 stations	X											
Surface grabs for taxonomy:												
2 stations on enchanced natural recovery area		August	August			August						August
2 stations on 3' cap		August	August			August						August
REMOTS camera survey		August	August			August						August
Monitoring report for given year (due January of following year)		X	X			X						X
Monitoring revew meetings		X	X			X						X
Four year project review												X

NOTES:

a) Baseline sampling will be conducted as soon as practical within the first three months after cap placement.

b) Monitoring review meetings may be held within the first two months of subsequent year.

c) *Decision to sample in 2002 will be based on meeting in 1996.

d) Sampling targeted for August may also be completed in September, if necessary.

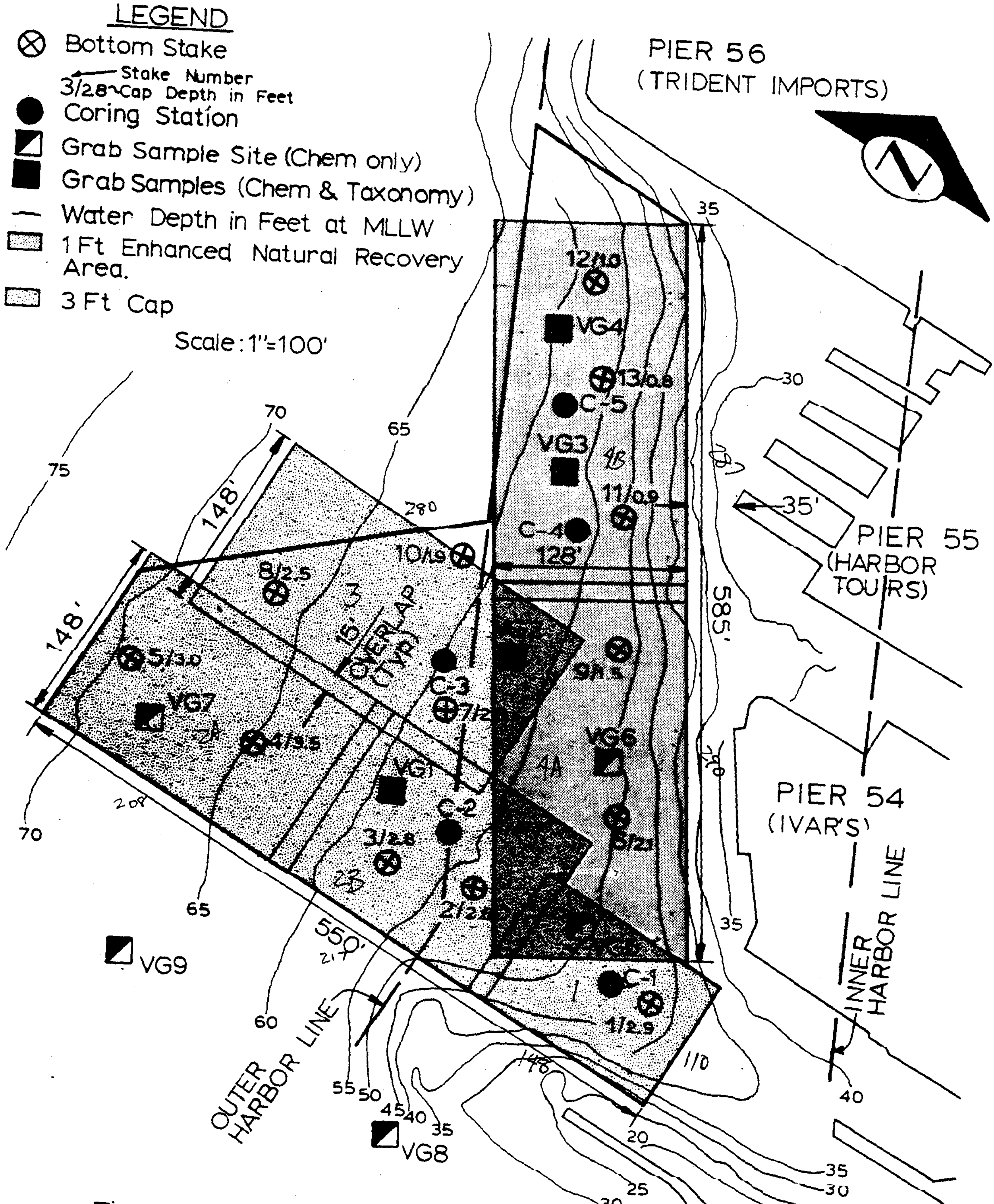

Figure 1. Sampling Station Locations
(also showing location of barge passes)

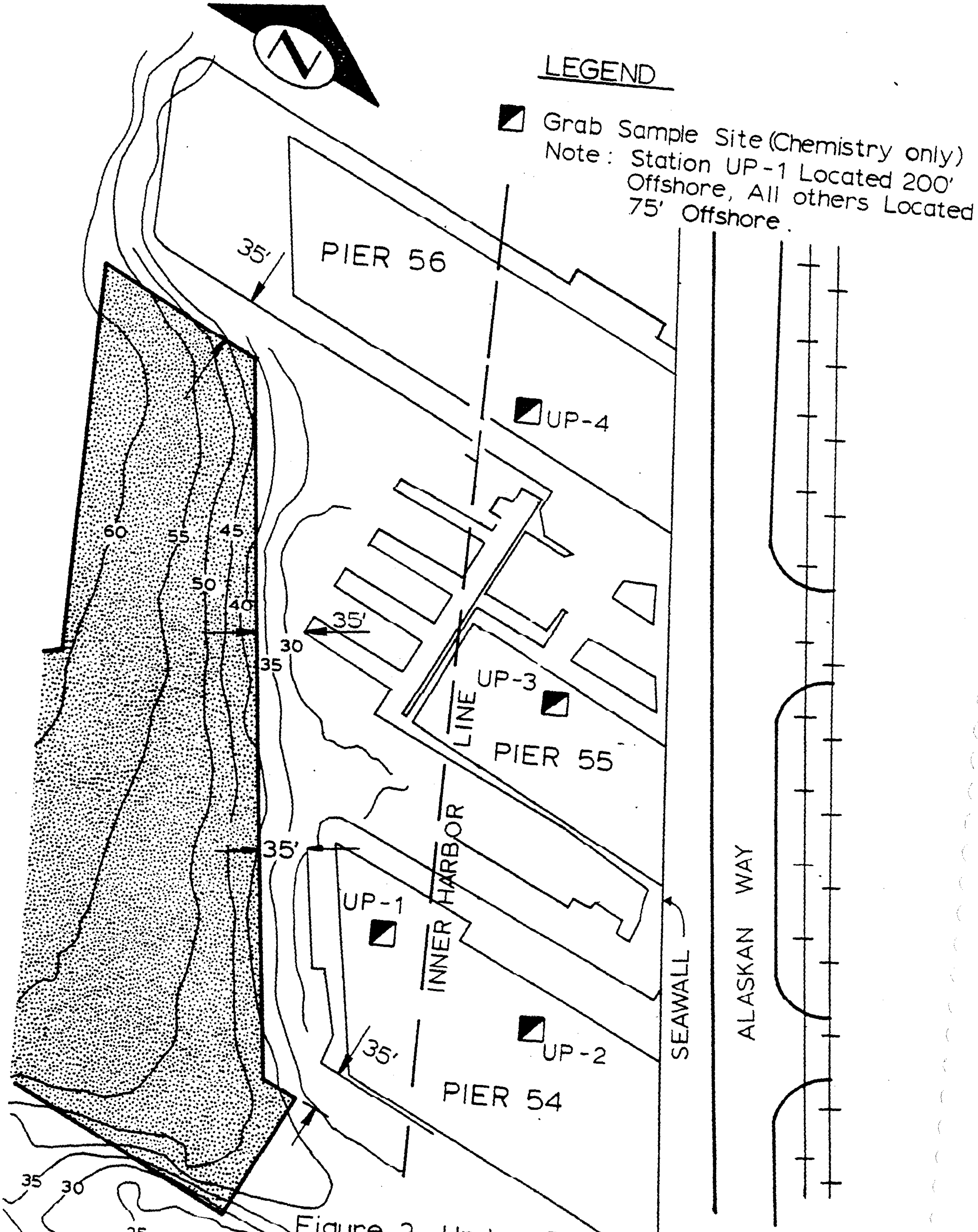

Figure 2. Under Pier Sampling Stations.

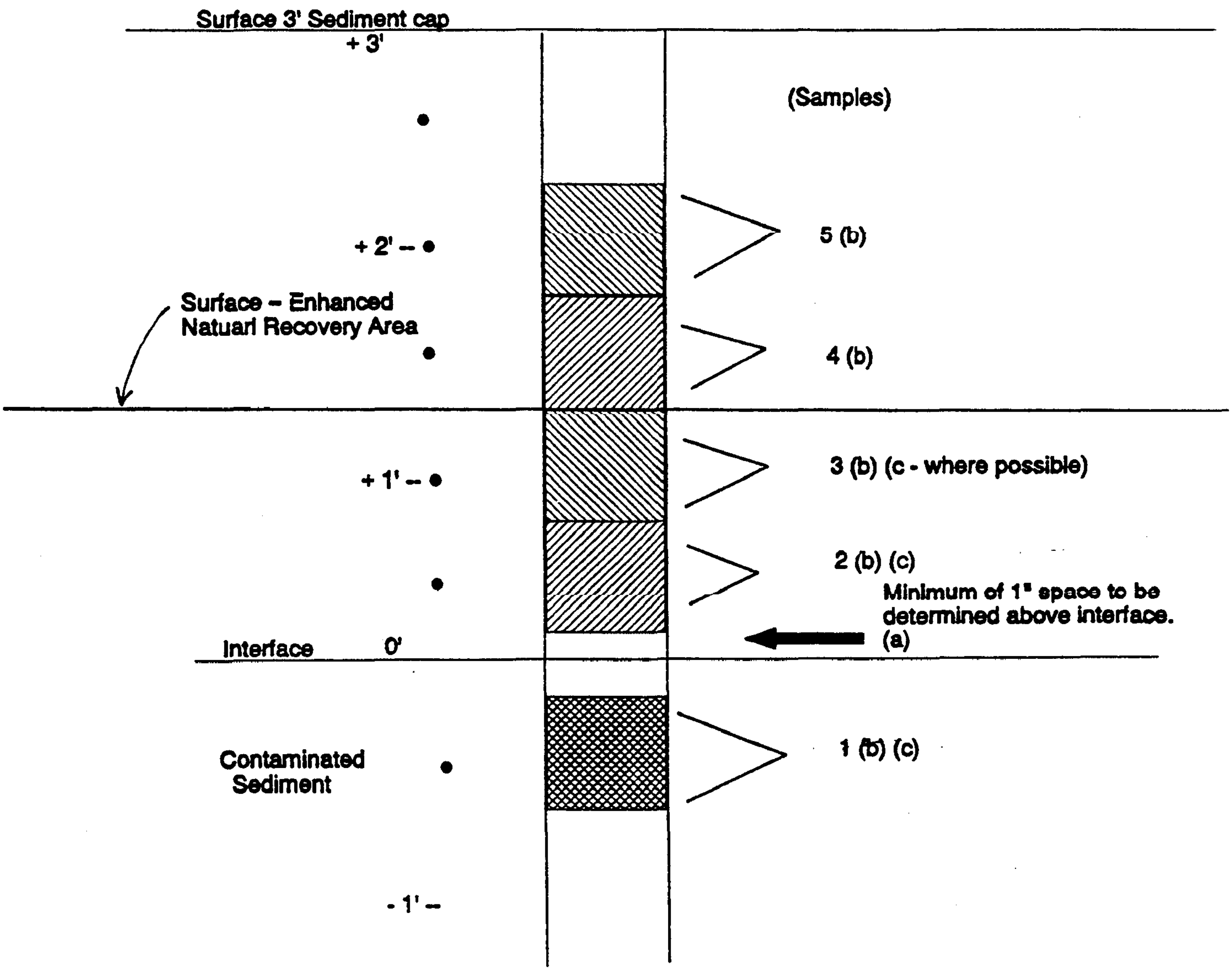

Figure 3. Cross section of sediment core showing the sections that will be taken for chemical analysis.

(a) Determine based on degree of mixing apparent at the interface.

(b) Section taken on 3' sediment cap.

(c) Section taken on enhanced natural recovery area.

Table 2

MONITORING REPORT OUTLINE

Section 1: Background

Provide information on when and how the sediments were placed, including amount of sediment used.

List permits and licenses obtained and existing permit conditions.

Section 2: Placement and Thickness of Sediment Cap and Enhanced Natural Recovery Area

Provide map showing position and thickness of sediment cap and enhanced natural recovery area as determined by barge dumping records.

Provide a corrected map of thickness of sediment cap and of enhanced natural recovery area based on data bottom stakes and sediment cores.

Compare each subsequent survey with the previous survey and discuss whether the sediment cap and enhanced natural recovery area appear to be remaining stable.

Section 3: Isolation of Contaminants

Chemical data from baseline cores will be presented in tables and discussed regarding the following:

- Identify exact sampling locations on project site.
- Identify presence of chemicals in both the underlying sediments and "capping" material.
- Compare observed chemistry to the turning basin pre-dredged data.
- Check uniformity of chemistry between core sections.
- Display profile plots of representative chemicals.

Subsequent core data will be added to the tables to allow comparisons and then discussed regarding the following:

- Identify apparent chemical increases in both the sediment cap and the enhanced natural recovery area.
- Compare to chemicals in underlying sediments.
- Display profile plots of representative chemicals.

- If chemical levels in the sediment cap and/or the enhanced natural recovery area become significantly elevated, these values will be compared to Washington State Sediment Standards.

Section 4: Surface Contamination of Project Site and Adjacent Property

Chemistry data from baseline surface grab samples will be presented in tables and discussed regarding the following:

- Identify exact sampling location on project site and adjacent property.
- Identify chemicals present on project site and adjacent property.
- Compare surface chemistry on project site to turning basin pre-dredge data and to new core data from project site.
- Identify spatial differences in concentrations on project site.
- Provide data from adjacent property to Ecology for comparison to other locations on the Seattle waterfront (1992 report only).

Subsequent surface chemistry data will be added to the tables to allow comparisons and discussed regarding the following:

- Identify chemicals that appear to increase.
- Display plots of representative chemicals showing change over time.
- Identify spatial differences and implication to possible sources.
- If chemicals show a trend of significantly increasing concentrations, conditions on adjacent property will be evaluated as a potential source of contaminants.
- If chemical levels in the sediment cap or in the area of enhanced natural recovery become significantly elevated, the values will be compared to available Puget Sound Sediment Standards.

Section 5: Benthic Recolonization

Detailed taxonomy data will be presented in tables and discussed regarding the following:

- Identify exact sampling location on cap.
- Develop summary data regarding number of taxa and biomass.
- Display plots showing changes over time in number of taxa biomass.
- Compare the population resulting in the sediment cap and the enhanced natural recovery area after five years to populations found in similar type habitats as determined from previously collected data or a recent sample from an appropriate reference area.
- Compare the recolonization on the sediment cap and on the enhanced natural recovery area.

Section 6: Conclusions

- Regarding stability of the three foot sediment cap and of the enhanced natural recovery area.
- Regarding isolation of contaminants on the three foot sediment cap and on the enhanced natural recovery area.
- Regarding contamination of surface of the three foot sediment cap and of the enhanced natural recovery area.
- Regarding status of benthic recolonization of the three foot sediment cap and the enhanced natural recovery area.
- Regarding recommendations for future actions.

APPENDIX B

METRO ENVIRONMENTAL LABORATORY QUALITY ASSURANCE REVIEW

KING COUNTY ENVIRONMENTAL LABORATORY

QUALITY ASSURANCE REVIEW

for

PIER 53 SEDIMENT CAP
MONITORING PROJECT

Prepared by:

____
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Environmental Specialist II

Reviewed by:

____
Scott J. Mickelson
Environmental Specialist III

November 18, 1996

King County Environmental Laboratory
322 West Ewing Street
Seattle, Washington 98119-1507

KING COUNTY ENVIRONMENTAL LABORATORY

QUALITY ASSURANCE REVIEW

for

PIER 53 SEDIMENT CAP MONITORING PROJECT

November 18, 1996

King County Environmental Laboratory
322 West Ewing Street
Seattle, Washington 98119-1507

INTRODUCTION

This Quality Assurance (QA) review accompanies data submitted in connection with marine sediment sampling at the Pier 53 Cap. The QA review is organized into the four sections listed below.

- General Comments
- Conventionals Chemistry
- Metals Chemistry
- Organics Chemistry

An overview of the approach used for this QA review is detailed in the General Comments section. Additional information specific to each analysis is included in the appropriate analytical section.

This QA review has been primarily conducted in accordance with guidelines established through the Puget Sound Dredged Disposal Analysis (PSDDA) program, outlined in *Puget Sound Dredged Disposal Analysis Guidance Manual, Data Quality Evaluation for Proposed Dredged Material Disposal Projects*. Other approaches incorporated in this QA review have been established through collaboration between the King County Environmental Laboratory (KC Laboratory) and the Washington State Department of Ecology (Ecology) Sediment Management Unit.

GENERAL COMMENTS

Scope of Samples Submitted

This QA review is associated with marine sediment samples collected in August, 1996 at the Pier 53-55 Sediment Cap. The samples collected and the proposed analytical scheme are summarized in Table 1. Except where noted in the subcontracting sections of this QA review, all analyses have been conducted by the KC Laboratory. The data are reported with associated data qualifiers and have undergone QA1 review, as summarized in this narrative report.

Completeness

Completeness has been evaluated for this data submission and QA review by considering the following criteria:

- Comparing available data with the planned project analytical scheme summarized in Table 1.
- Compliance with storage conditions and holding times.
- Compliance with the complete set of quality control (QC) samples outlined in Table 2.

Methods

Analytical methods are noted in the applicable analytical sections of this QA review.

Target Lists

The reported target lists have been compared to the target analytes listed in *Table 1- Marine Sediment Quality Standards Chemical Criteria* contained in Chapter 173-204 WAC and the PSDDA *Chemicals of Concern* list.

Detection Limits

The KC Laboratory distinguishes between the Reporting Detection Limit (RDL) and the Method Detection Limit (MDL).

- The RDL is defined as *the minimum concentration of a chemical constituent that can be reliably quantified.*
- The MDL is defined as *the minimum concentration of a chemical constituent that can be detected.*

Some subcontractor laboratory data is available with an MDL only, in accordance with the subcontracting laboratory policies. All analytical data are reported with either a result and/or detection limit(s).

Storage Conditions and Holding Times

Storage conditions and holding times have been evaluated using guidelines established during the Third Annual PSDDA Review Meeting. The approach used to evaluate Total Organic Carbon for holding time has been established between the KC Laboratory and Ecology during previous QA1 review efforts.

Method Blanks

Method blanks have been evaluated for the presence of positive analyte results at or greater than the MDL.

Standard Reference Material

Data have been qualified based on available standard reference material (SRM) results. Instances of data reported without associated SRM analysis are noted in the narrative.

Matrix Spikes

Matrix spike results have been used to qualify data for both organics and metals analyses. Matrix spikes are not required for Conventionals parameters.

Replicate Samples

Data have been qualified based on replicate results. However, not all replicate data have been used as an indicator for data qualification. Only sets of replicate results which contain at least one result significantly greater than the MDL have been considered for data qualification. Where an RDL is present, only replicate data that contains at least one result greater than the RDL have been considered for data qualification. These guidelines have been used to account for the fact that precision obtained near the MDL is not representative of precision obtained throughout the entire analytical range.

Data Qualifiers

The data qualification system used for this data submission is presented in Table 3. These data qualifiers address situations which require qualification, according to QA1 guidance. The exact qualifiers used generally conform to QA1 guidance. The KC Laboratory qualifiers indicating <MDL and <RDL have been used as replacements for the *T* and *U* specified under QA1 guidance. Changes made to SRM data qualification criteria have been discussed with and approved by the Sediment Management Unit of Ecology.

Units and Significant Figures

Data have been reported in accordance with laboratory policy at the time of data generation. When an RDL and MDL are reported, data have been reported to three significant figures above the RDL, and two significant figures equal to or below the RDL. Data with only an MDL have been reported to two significant figures.

Data are stored in a wet weight basis on the KC Laboratory's data base and converted to dry weight during the reporting process. Should only one reported digit be available, rounding error can be significant. This rounding error can occur during the conversion from wet to dry weight.

Subcontracted Analyses

Analyses which have been subcontracted, and the issues associated with these subcontracted analyses are noted in this narrative.

CONVENTIONALS CHEMISTRY

Completeness
Conventionals data are reported for samples 9209-1 through 9209-11, and 9316-1 through 9316-3. These samples were analyzed for total solids, total organic carbon (TOC) and particle size distribution (PSD) in association with the complete set of QC samples outlined in Table 2.

Subcontracted Analyses
PSD analysis was subcontracted to AmTest, Inc. in Redmond, Washington.

Methods
Total solids analysis was performed in accordance with Standard Method (SM) 2540-B. TOC analysis was performed in accordance with SM5310-B. PSD analysis was performed in accordance with ASTM and Puget Sound Protocols methodologies (*Recommended Protocols for Measuring Conventional Sediment Variables in Puget Sound* - page 9 - PSEP, 1986).

Detection Limits, Units, and Significant Figures
Data are reported in accordance with laboratory policy at the time the data were generated. A positive result and/or MDL and RDL have been reported for all conventionals parameters analyzed by the KC Laboratory. A positive result and/or MDL has been reported for subcontracted analyses. Sample results are reported in units of mg/Kg on a dry weight basis for TOC. Sample results are reported in percent for total solids and PSD. Data are reported to three significant figures for results greater than the RDL and two significant figures for results equal to or less than the RDL. For results reported with less than two or three significant figures, significant zeroes are implied.

Storage Conditions and Holding Times
Sample storage conditions and holding times have been evaluated using guidelines established during the Third Annual PSDDA Review Meeting. The criteria used to evaluate storage conditions and holding times for conventionals analyses are listed in the table below.

Parameter	Frozen Holding Time	Refrigerated Holding Time
PSD	Not Recommended	6 Months
Solids	6 Months	14 Days
TOC	6 Months	14 Days

Sample storage conditions and holding times were met for all samples in this data submission.

Method Blanks
Method blanks were analyzed in connection with TOC and total solids analyses. All method blank results were less than the MDL.

Standard Reference Material
The SRM analyzed in association with TOC analysis is Buffalo River Sediment. All SRM recoveries were within the 80 to 120% QC limits.

Laboratory Replicate Samples

Laboratory triplicate samples were analyzed in association with all conventionals parameters. Percent relative standard deviation (%RSD) for laboratory triplicate results was less than the 20% QC limit for all triplicate analyses for TOC and total solids.

The average %RSD over all grain size fractions for each of two triplicate analyses performed in association with PSD analysis ranged from 24 to 26%. Laboratory triplicate results were reviewed to determine if a consistent difference occurred over all grain size fractions. Variations in triplicate results appear to be random and a function of inherent variations in samples rather than QC problems. As a result, PSD data have not been qualified based on laboratory triplicate analysis.

METALS CHEMISTRY

Completeness
Metals data are reported for samples 9209-1 through 9209-11 and 9316-1 through 9316-3. These samples were analyzed for mercury and other metals in association with the complete set of QC samples outlined in Table 2.

Methods
Mercury analysis was performed in accordance with EPA Method 7471. All other metals analyses were performed in accordance with EPA Method 3050/6010.

Target List
The reported target list includes all metals specified in *Table 1 - Marine Sediment Quality Standards Chemical Criteria* contained in Chapter 173-204 WAC and the PSDDA *Chemicals of Concern* list. Additional metals have been reported as available.

Detection Limits, Units, and Significant Figures
Data are reported in accordance with laboratory policy at the time the data were generated. A positive result and/or MDL and RDL have been reported for all metals. Sample results are reported in units of mg/Kg on a dry weight basis. Data are reported to three significant figures for results greater than the RDL and two significant figures for results equal to or less than the RDL. For results reported with less than two or three significant figures, significant zeroes are implied.

Storage Conditions and Holding Times
Sample storage conditions and holding times have been evaluated using guidelines established during the Third Annual PSDDA Review Meeting. The criteria used to evaluate storage conditions and holding times for metals analyses are listed in the table below.

Parameter	Frozen Holding Time	Refrigerated Holding Time
Mercury	28 Days	Not Recommended
Metals	2 Years	6 Months

Sample storage conditions and holding times were met for all samples in this data submission.

Method Blank
All metals and mercury method blank results were less than the MDL.

Standard Reference Material
The SRM analyzed in association with samples included in this data submission is PACS 1 certified by the National Research Council of Canada. This SRM does not contain silver. An SRM recovery less than 80% has not been used alone to qualify data because the digestion technique used for sample analysis is different from the technique used during analysis to determine the SRM certified values. Only those metals for which the SRM recovery was less than 80% and the matrix spike recovery was less than 75% have been qualified.

An SRM recovery less than 80% and a matrix spike recovery less than 75% were reported for antimony for each QC batch in this data submission. Associated antimony results for all samples have been qualified with the *G* flag.

Matrix Spike

For samples 9209-1 through 9209-11, a matrix spike recovery less than 75% was reported for iron and antimony. Associated sample results for iron and antimony have been qualified with the *G* flag. A matrix spike recovery greater than 125% was reported for aluminum. Associated sample results for aluminum have been qualified with the *L* flag.

Samples 9316-1 through 9316-3 had matrix spike recoveries less than 75% reported for antimony. Associated sample results for antimony has been qualified with the *G* flag. A matrix spike recovery greater than 125% was reported for aluminum. Associated sample results for aluminum have been qualified with the *L* flag.

Laboratory Duplicate Samples

All metals RPD results were less than the QC limit of 20%.

ORGANICS CHEMISTRY

Completeness

Organics data are reported for samples *9209-1* through *9209-11* and *9316-1* through *9316-3*. These samples were analyzed for chlorinated pesticides, polychlorinated biphenyls (PCBs), and base/neutral/acid extractable semivolatile compounds (BNAs) in association with the complete set of QC samples outlined in Table 2. Additionally, samples 9209-1 through 9209-11 were analyzed for volatile organic compounds (VOAs).

Methods

Analysis of chlorinated pesticides and PCBs was performed in accordance with EPA method 8080 (SW-846). Analysis of VOAs was performed in accordance with EPA method 8260 (SW-846). Analysis of BNAs was performed in accordance with EPA method 8270 (SW-846). BNA extracts were also analyzed by selected ion monitoring (SIM) to attain lower detection limits for chlorinated benzene compounds.

Target List

The reported BNA target list includes all compounds specified in *Table 1 - Marine Sediment Quality Standards Chemical Criteria* contained in Chapter 173-204 WAC, with the exception of benzo(j)fluoranthene. The KC Laboratory has verified that analytical conditions are sufficient to calculate a total benzofluoranthenes result using the reported *b* and *k* isomers. Reported PCB data include Aroclors 1016, 1221, 1232, 1242, 1248, 1254, and 1260. The reported chlorinated pesticides target list includes all compounds found on the PSDDA *Chemicals of Concern* list. DDT, DDE and DDD have been reported as 4,4' isomers.

Detection Limits, Units, and Significant Figures

Data are reported in accordance with laboratory policy at the time the data were generated. A positive result and/or MDL and RDL have been reported for all organic compounds. Sample results are reported in units of ug/Kg on a dry weight basis. Data are reported to three significant figures for results greater than the RDL and two significant figures for results equal to or less than the RDL. For results reported with less than two or three significant figures, significant zeroes are implied.

Storage Conditions and Holding Times

Sample storage conditions and holding times have been evaluated using guidelines established during the Third Annual PSDDA Review Meeting. The criteria used to evaluate storage conditions and holding times for organics analyses are listed in the table below.

Parameter	Frozen Holding Time	Refrigerated Holding Time
Pest/PCBs	1 Year to Extract 40 Days to Analyze	14 Days to Extract 40 Days to Analyze
BNAs	1 Year to Extract 40 Days to Analyze	14 Days to Extract 40 Days to Analyze
VOAs	Not Recommended	14 Days to Analyze

Sample storage conditions and holding times were met for all Pesticide/PCB, BNA, and Chlorobenzene samples in this data submission. VOA samples 9209-2 through 9209-9 and 9209-11 were analyzed one day out of holding time. Associated sample results have been qualified with the *H* flag.

Method Blanks

All chlorinated pesticide/PCB, chlorobenzene, and BNA method blank results were less than the MDL. Acetone was detected in the VOA method blank associated with samples 9209-1 through 9209-11. Associated acetone sample data have been qualified with the *B* flag.

Surrogate Recoveries

All surrogate recoveries for chlorinated pesticide/PCBs and VOAs were within acceptable QC limits.

BNA sample data are qualified when the average surrogate recovery for either or both the acid and base/neutral fractions are outside QC limits. Sample 9316-3 had an average surrogate less than 50% for both the base/neutral and acid fractions. Associated sample data have been qualified with the *G* flag.

Chlorobenzene sample data are qualified when the single surrogate recovery is outside QC limits. Samples 9209-9 and 9316-1 through 9316-3 have been qualified with the *G* flag based on surrogate recoveries less than 50%.

Standard Reference Material

The marine sediment SRM analyzed in association with the chlorinated pesticide/PCB analysis normally is 1941a, certified by the National Institute of Standards and Technology. There was no SRM associated with chlorinated pesticide/PCB analysis in this data submission. An SRM is not included during SIM analysis of chlorobenzene compounds. An SRM is not included during VOA analysis.

The marine sediment SRM analyzed in association with the reported BNA analytical results is HS4, certified by the National Research Council of Canada. HS4 contains a partial list of compounds for BNA analysis. BNA data for all samples in this data submission have been qualified based on the SRM recoveries summarized in the following table.

Samples 9209-1 through 9209-11, 9316-1 through 9316-3

Compound	% Recovery	Flag
Napthalene	12	G
Fluorene	42	G
Phenanthrene	40	G
Anthracene	31	G
Fluoranthene	45	G
Pyrene	50	G
Benzo(a)anthracene	56	G
Benzo(k)fluoranthene	66	G
Benzo(a)pyrene	47	G
Indeno(1,2,3-cd)pyrene	47	G
Benzo(g,h,i)perylene	45	G

Matrix Spike

Chlorinated pesticide/PCB data did not require any qualification based upon associated matrix spike results.

BNA data for samples 9209-1 through 9209-8 and 9209-10 through 9209-11 have been qualified based on the matrix spike recoveries summarized in the following table.

Compound	% Recovery	Flag
Phenol	43	G
bis(2-Chloroethyl) Ether	41	G
2-Chlorophenol	40	G
2-Methylphenol	43	G
bis(2-Chloroisopropyl) Ether	39	G
4-Methylphenol	45	G
N-Nitroso-di-n-propylamine	37	G
Hexachloroethane	37	G
Nitrobenzene	41	G
Isophorone	39	G
2-Nitrophenol	40	G
2,4-Dimethylphenol	29	G
2,4-Dichlorophenol	49	G
Napthalene	41	G
4-Chloroaniline	17	G
bis(2-Chloroethoxy) methane	40	G
Hexachlorobutadiene	39	G
2-Methylnapthalene	44	G
Hexachlorocyclopentadiene	17	G
2-Chloronapthalene	49	G
3-Nitroaniline	33	G
2,4-Dinitrophenol	36	G
Pentachlorophenal	27	G
Benzidine	0	X
3,3'-Dichlorobenzidine	24	G
N-Nitrosodimethylamine	40	G
Aniline	12	G
Benzyl alcohol	40	G
Benzoic acid	165	L

BNA data for sample 9209-9 have been qualified based on the matrix spike recoveries summarized in the following table.

Compound	% Recovery	Flag
bis(2-Chloroethyl) Ether	34	G
Hexachloroethane	48	G
4-Chloroaniline	20	G
Hexachlorocyclopentadiene	35	G
3-Nitroaniline	49	G
Pentachlorophenal	42	G
Benzidine	0	X
3,3'-Dichlorobenzidine	37	G
N-Nitrosodimethylamine	42	G
Aniline	46	G

BNA data for samples 9316-1 through 9316-3 have been qualified based on the matrix spike recoveries summarized in the following table.

Compound	% Recovery	Flag
N-Nitrosodimethylamine	35	G
Hexachloroethane	44	G
Hexachlorobutadiene	49	G
Hexachlorocyclopentadiene	43	G
Benzidine	0	X
Pentachlorophenal	20	G
Aniline	22	G
3,3'-Dichlorobenzidine	32	G
4-Chloroaniline	30	G

Chlorobenzene data for samples 9209-1 through 9209-8 and 9209-10 through 9209-11 have been qualified based on the matrix spike recoveries summarized in the following table.

Compound	% Recovery	Flag
1,3-Dichlorobenzene	42	G
1,4-Dichlorobenzene	38	G
1,2-Dichlorobenzene	33	G
1,2,4-Trichlorobenzene	42	G

Chlorobenzene data for samples 9209-9 have been qualified based on the matrix spike recoveries summarized in the following table.

Compound	% Recovery	Flag
1,3-Dichlorobenzene	48	G
1,4-Dichlorobenzene	41	G
1,2-Dichlorobenzene	47	G

Chlorobenzene data for samples 9316-1 through 9316-3 have been qualified based on the matrix spike recoveries summarized in the following table.

Compound	% Recovery	Flag
1,3-Dichlorobenzene	45	G
1,4-Dichlorobenzene	39	G
1,2-Dichlorobenzene	44	G

VOA data for samples 9209-1 through 9209-11 have been qualified based on the matrix spike recoveries summarized in the following table.

Compound	% Recovery	Flag
Acrolein	0	X
Vinyl Acetate	0	X

Laboratory Replicate Samples

The RPD results for all chlorinated pesticide/PCB, chlorobenzene, and VOA laboratory duplicate samples were less than the QC limit of 100%.

Pentachlorophenol data for samples 9209-1 through 9209-8, and 9209-10, and 9209-11 have been qualified with the *E* flag based on laboratory duplicate sample results with an RPD greater than 100%.

Coprostanol data for samples 9316-1 through 9316-3 have been qualified with the *E* flag based on a laboratory duplicate result with an RPD greater than 100%.

TABLE 1
PIER 53 SEDIMENT CAP STUDY
SAMPLE INVENTORY

Sample	BNAs	Pesticides and PCBs	Chloro Benzenes	VOAs	Metals	Mercury	TOC	Total Solids	PSD	Comments
9209-1	X	X	X	X	X	X	X	X	X	
9209-2	X	X	X	X	X	X	X	X	X	
9209-3	X	X	X	X	X	X	X	X	X	
9209-4	X	X	X	X	X	X	X	X	X	
9209-5	X	X	X	X	X	X	X	X	X	
9209-6	X	X	X	X	X	X	X	X	X	
9209-7	X	X	X	X	X	X	X	X	X	
9209-8	X	X	X	X	X	X	X	X	X	
9209-9	X	X	X	X	X	X	X	X	X	
9209-10	X	X	X	X	X	X	X	X	X	
9209-11	X	X	X	X	X	X	X	X	X	Field Replicate
9316-1	X	X	X		X	X	X	X	X	
9316-2	X	X	X		X	X	X	X	X	
9316-3	X	X	X		X	X	X	X	X	

TABLE 2
QC SAMPLE FREQUENCY FOR SEDIMENT CHEMISTRY PARAMETERS

Parameter	Blank	Duplicate	Triplicate	Matrix Spike	SRM	Surrogate
Particle Size Distribution	NA	10% of Samples	10% of Samples	NA	NA	NA
Total Solids	NA	5% Minimum, 1 Per Batch	5% Minimum, 1 Per Batch	NA	NA	NA
Total Organic Carbon	1 Per Batch	5% Minimum, 1 Per Batch	5% Minimum, 1 Per Batch	NA	1 Per Batch	NA
Mercury	1 Per Batch	5% Minimum, 1 Per Batch	NA	5% Minimum, 1 Per Batch	1 Per Batch	NA
Metals	1 Per Batch	5% Minimum, 1 Per Batch	NA	5% Minimum, 1 Per Batch	1 Per Batch	NA
BNAs	1 Per Batch	5% Min., 1 Per Extr. Batch	1 Per Batch of > 20 Samples	5% Min., 1 Per Extr. Batch	1 Per Extraction Batch	Yes
Chlorinated Pesticides and PCBs	1 Per Batch	5% Min., 1 Per Extr. Batch	1 Per Batch of > 20 Samples	5% Min., 1 Per Extr. Batch	1 Per Extraction Batch	Yes
VOAs	1 Per Batch	5% Min., 1 Per Extr. Batch	1 Per Batch of > 20 Samples	5% Min., 1 Per Extr. Batch	NA	Yes
Chlorobenzenes	1 Per Batch	5% Min., 1 Per Extr. Batch	1 Per Batch of > 20 Samples	5% Min., 1 Per Extr. Batch	NA	Yes

TABLE 3
SUMMARY OF DATA QUALIFIERS

Condition to Qualify	METRO Data Qualifier	Organics QC Limits	Metals QC Limits	Conventionals QC Limits	Comment
very low matrix spike recovery	X	< 10 %	< 10 %	NA	
low matrix spike recovery	G	< 50%	< 75%	NA	
high matrix spike recovery	L	> 150%	>125%	NA	
low SRM recovery	G	< 80%*	NA	< 80%*	
high SRM recovery	L	>120%*	>120%	>120%*	
high duplicate RPD	E	>100 %	>20%	> 20 %	use duplicate is routine QC for organics
high triplicate RSD	E	> 100%	NA	> 20 %	use triplicate is routine QC for conventionals
less than the reporting detection limit	< RDL	NA	NA	NA	
less than the method detection limit	< MDL	NA	NA	NA	
contamination reported in blank	B	> MDL	> MDL	> MDL	
very biased data, based on surrogate recoveries	X	all fraction surrogates are <10%	NA	NA	use average surrogate recovery for BNA
biased data, based on low surrogate recoveries	G	all fraction surrogates are < 50%	NA	NA	use average surrogate recovery for BNA
biased data, based on high surrogate recoveries	L	all fraction surrogates are >150%	NA	NA	use average surrogate recovery for BNA
estimate based on presumptive evidence	J# used to indicate the presence of TIC's	NA	NA	NA	
rejected, unusable for all purposes	R	NA	NA	NA	
a sample handling criteria has been exceeded	H	NA	NA	NA	includes container, preservation, hold time, sampling technique

*Note that PSDDA guidance uses a 95% confidence window for this parameter/qualification

APPENDIX C

CHEMISTRY DATA

King County Environmental Lab Analytical Report

PROJECT: 423056

	Locator: P53VG1	Locator: P53VG2	Locator: P53VG3
Sampled:	Aug 12, 96	Aug 12, 96	Aug 12, 96
Lab ID:	L9209-1	L9209-2	L9209-3
Matrix:	SALTWTRSED	SALTWTRSED	SALTWTRSED
% Solids:	65.7	60.4	58.4

ORGANICS

Locator P53VG1 (MDL, RDL – Dry Weight Basis)

Parameters	Value	Qual	MDL	RDL	Units
M.Code=SW-846 8080					
4,4'-DDD		<MDL	2	4.06	ug/Kg
4,4'-DDE		<MDL	2	4.06	ug/Kg
4,4'-DDT		<MDL	2	4.06	ug/Kg
Aldrin		<MDL	2	4.06	ug/Kg
Alpha-BHC		<MDL	2	4.06	ug/Kg
Aroclor 1016		<MDL	20	40.6	ug/Kg
Aroclor 1221		<MDL	20	40.6	ug/Kg
Aroclor 1232		<MDL	20	40.6	ug/Kg
Aroclor 1242		<MDL	20	40.6	ug/Kg
Aroclor 1248		<MDL	20	40.6	ug/Kg
Aroclor 1254		<MDL	20	40.6	ug/Kg
Aroclor 1260		<MDL	20	40.6	ug/Kg
Beta-BHC		<MDL	2	4.06	ug/Kg
Chlordane		<MDL	10	20.2	ug/Kg
Delta-BHC		<MDL	2	4.06	ug/Kg
Dieldrin		<MDL	2	4.06	ug/Kg
Endosulfan I		<MDL	2	4.06	ug/Kg
Endosulfan II		<MDL	2	4.06	ug/Kg
Endosulfan Sulfate		<MDL	2	4.06	ug/Kg
Endrin		<MDL	2	4.06	ug/Kg
Endrin Aldehyde		<MDL	2	4.06	ug/Kg
Gamma-BHC (Lindane)		<MDL	2	4.06	ug/Kg
Heptachlor		<MDL	2	4.06	ug/Kg
Heptachlor Epoxide		<MDL	2	4.06	ug/Kg
Methoxychlor		<MDL	10	20.2	ug/Kg
Toxaphene		<MDL	20	40.6	ug/Kg
M.Code=SW-846 8260					
1,1,1-Trichloroethane		<MDL	7.6	15.2	ug/Kg
1,1,2,2-Tetrachloroethane		<MDL	7.6	15.2	ug/Kg
1,1,2-Trichloroethane		<MDL	7.6	15.2	ug/Kg
1,1,2-Trichloroethylene		<MDL	7.6	15.2	ug/Kg
1,1-Dichloroethane		<MDL	7.6	15.2	ug/Kg
1,1-Dichloroethylene		<MDL	7.6	15.2	ug/Kg
1,2-Dichloroethane		<MDL	7.6	15.2	ug/Kg
1,2-Dichloropropane		<MDL	7.6	15.2	ug/Kg
2-Butanone (MEK)		<MDL	38	76.1	ug/Kg
2-Chloroethylvinyl ether		<MDL	7.6	15.2	ug/Kg

Locator P53VG2 (MDL, RDL – Dry Weight Basis)

Parameters	Value	Qual	MDL	RDL	Units
M.Code=SW-846 8080					
4,4'-DDD		<MDL	2.2	4.42	ug/Kg
4,4'-DDE		<MDL	2.2	4.42	ug/Kg
4,4'-DDT		<MDL	2.2	4.42	ug/Kg
Aldrin		<MDL	2.2	4.42	ug/Kg
Alpha-BHC		<MDL	2.2	4.42	ug/Kg
Aroclor 1016		<MDL	22	44.2	ug/Kg
Aroclor 1221		<MDL	22	44.2	ug/Kg
Aroclor 1232		<MDL	22	44.2	ug/Kg
Aroclor 1242		<MDL	22	44.2	ug/Kg
Aroclor 1248		<MDL	22	44.2	ug/Kg
Aroclor 1254		<MDL	22	44.2	ug/Kg
Aroclor 1260	36	<RDL	22	44.2	ug/Kg
Beta-BHC		<MDL	2.2	4.42	ug/Kg
Chlordane		<MDL	11	22	ug/Kg
Delta-BHC		<MDL	2.2	4.42	ug/Kg
Dieldrin		<MDL	2.2	4.42	ug/Kg
Endosulfan I	3.8	<RDL	2.2	4.42	ug/Kg
Endosulfan II		<MDL	2.2	4.42	ug/Kg
Endosulfan Sulfate		<MDL	2.2	4.42	ug/Kg
Endrin		<MDL	2.2	4.42	ug/Kg
Endrin Aldehyde		<MDL	2.2	4.42	ug/Kg
Gamma-BHC (Lindane)		<MDL	2.2	4.42	ug/Kg
Heptachlor		<MDL	2.2	4.42	ug/Kg
Heptachlor Epoxide		<MDL	2.2	4.42	ug/Kg
Methoxychlor		<MDL	11	22	ug/Kg
Toxaphene		<MDL	22	44.2	ug/Kg
M.Code=SW-846 8260					
1,1,1-Trichloroethane		<MDL,H	8.3	16.6	ug/Kg
1,1,2,2-Tetrachloroethane		<MDL,H	8.3	16.6	ug/Kg
1,1,2-Trichloroethane		<MDL,H	8.3	16.6	ug/Kg
1,1,2-Trichloroethylene		<MDL,H	8.3	16.6	ug/Kg
1,1-Dichloroethane		<MDL,H	8.3	16.6	ug/Kg
1,1-Dichloroethylene		<MDL,H	8.3	16.6	ug/Kg
1,2-Dichloroethane		<MDL,H	8.3	16.6	ug/Kg
1,2-Dichloropropane		<MDL,H	8.3	16.6	ug/Kg
2-Butanone (MEK)		<MDL,H	41	82.8	ug/Kg
2-Chloroethylvinyl ether		<MDL,H	8.3	16.6	ug/Kg

Locator P53VG3 (MDL, RDL – Dry Weight Basis)

Parameters	Value	Qual	MDL	RDL	Units
M.Code=SW-846 8080					
4,4'-DDD		<MDL	2.2	4.57	ug/Kg
4,4'-DDE		<MDL	2.2	4.57	ug/Kg
4,4'-DDT		<MDL	2.2	4.57	ug/Kg
Aldrin		<MDL	2.2	4.57	ug/Kg
Alpha-BHC		<MDL	2.2	4.57	ug/Kg
Aroclor 1016		<MDL	22	45.7	ug/Kg
Aroclor 1221		<MDL	22	45.7	ug/Kg
Aroclor 1232		<MDL	22	45.7	ug/Kg
Aroclor 1242		<MDL	22	45.7	ug/Kg
Aroclor 1248		<MDL	22	45.7	ug/Kg
Aroclor 1254		<MDL	22	45.7	ug/Kg
Aroclor 1260	26	<RDL	22	45.7	ug/Kg
Beta-BHC		<MDL	2.2	4.57	ug/Kg
Chlordane		<MDL	11	22.8	ug/Kg
Delta-BHC		<MDL	2.2	4.57	ug/Kg
Dieldrin		<MDL	2.2	4.57	ug/Kg
Endosulfan I	4.3	<RDL	2.2	4.57	ug/Kg
Endosulfan II		<MDL	2.2	4.57	ug/Kg
Endosulfan Sulfate		<MDL	2.2	4.57	ug/Kg
Endrin		<MDL	2.2	4.57	ug/Kg
Endrin Aldehyde		<MDL	2.2	4.57	ug/Kg
Gamma-BHC (Lindane)		<MDL	2.2	4.57	ug/Kg
Heptachlor		<MDL	2.2	4.57	ug/Kg
Heptachlor Epoxide		<MDL	2.2	4.57	ug/Kg
Methoxychlor		<MDL	11	22.8	ug/Kg
Toxaphene		<MDL	22	45.7	ug/Kg
M.Code=SW-846 8260					
1,1,1-Trichloroethane		<MDL,H	8.6	17.1	ug/Kg
1,1,2,2-Tetrachloroethane		<MDL,H	8.6	17.1	ug/Kg
1,1,2-Trichloroethane		<MDL,H	8.6	17.1	ug/Kg
1,1,2-Trichloroethylene		<MDL,H	8.6	17.1	ug/Kg
1,1-Dichloroethane		<MDL,H	8.6	17.1	ug/Kg
1,1-Dichloroethylene		<MDL,H	8.6	17.1	ug/Kg
1,2-Dichloroethane		<MDL,H	8.6	17.1	ug/Kg
1,2-Dichloropropane		<MDL,H	8.6	17.1	ug/Kg
2-Butanone (MEK)		<MDL,H	43	85.6	ug/Kg
2-Chloroethylvinyl ether		<MDL,H	8.6	17.1	ug/Kg

King County Environmental Lab Analytical Report

PROJECT: 423056

	Sample 1	Sample 2	Sample 3
Locator:	P53VG1	P53VG2	P53VG3
Sampled:	Aug 12, 96	Aug 12, 96	Aug 12, 96
Lab ID:	L9209-1	L9209-2	L9209-3
Matrix:	SALTWTRSED	SALTWTRSED	SALTWTRSED
% Solids:	65.7	60.4	58.4

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis			
2-Hexanone		<MDL	38	76.1	ug/Kg		<MDL,H	41	82.8	ug/Kg		<MDL,H	43	85.6	ug/Kg
4-Methyl-2-Pentanone (MIBK)		<MDL	38	76.1	ug/Kg		<MDL,H	41	82.8	ug/Kg		<MDL,H	43	85.6	ug/Kg
Acetone	72	<RDL,B	20	76.1	ug/Kg	99.7	B,H	22	82.8	ug/Kg	98.5	B,H	22	85.6	ug/Kg
Acrolein		<MDL,X	38	76.1	ug/Kg		<MDL,X,H	41	82.8	ug/Kg		<MDL,X,H	43	85.6	ug/Kg
Acrylonitrile		<MDL	38	76.1	ug/Kg		<MDL,H	41	82.8	ug/Kg		<MDL,H	43	85.6	ug/Kg
Benzene		<MDL	7.6	15.2	ug/Kg		<MDL,H	8.3	16.6	ug/Kg		<MDL,H	8.6	17.1	ug/Kg
Bromodichloromethane		<MDL	7.6	15.2	ug/Kg		<MDL,H	8.3	16.6	ug/Kg		<MDL,H	8.6	17.1	ug/Kg
Bromoform		<MDL	7.6	15.2	ug/Kg		<MDL,H	8.3	16.6	ug/Kg		<MDL,H	8.6	17.1	ug/Kg
Bromomethane		<MDL	7.6	15.2	ug/Kg		<MDL,H	8.3	16.6	ug/Kg		<MDL,H	8.6	17.1	ug/Kg
Carbon Disulfide		<MDL	7.6	15.2	ug/Kg		<MDL,H	8.3	16.6	ug/Kg		<MDL,H	8.6	17.1	ug/Kg
Carbon Tetrachloride		<MDL	7.6	15.2	ug/Kg		<MDL,H	8.3	16.6	ug/Kg		<MDL,H	8.6	17.1	ug/Kg
Chlorobenzene		<MDL	7.6	15.2	ug/Kg		<MDL,H	8.3	16.6	ug/Kg		<MDL,H	8.6	17.1	ug/Kg
Chlorodibromomethane		<MDL	7.6	15.2	ug/Kg		<MDL,H	8.3	16.6	ug/Kg		<MDL,H	8.6	17.1	ug/Kg
Chloroethane		<MDL	7.6	15.2	ug/Kg		<MDL,H	8.3	16.6	ug/Kg		<MDL,H	8.6	17.1	ug/Kg
Chloroform		<MDL	7.6	15.2	ug/Kg		<MDL,H	8.3	16.6	ug/Kg		<MDL,H	8.6	17.1	ug/Kg
Chloromethane		<MDL	7.6	15.2	ug/Kg		<MDL,H	8.3	16.6	ug/Kg		<MDL,H	8.6	17.1	ug/Kg
Chloromethane		<MDL	7.6	15.2	ug/Kg		<MDL,H	8.3	16.6	ug/Kg		<MDL,H	8.6	17.1	ug/Kg
Cis-1,3-Dichloropropene		<MDL	7.6	15.2	ug/Kg		<MDL,H	8.3	16.6	ug/Kg		<MDL,H	8.6	17.1	ug/Kg
Ethylbenzene		<MDL	7.6	15.2	ug/Kg		<MDL,H	8.3	16.6	ug/Kg		<MDL,H	8.6	17.1	ug/Kg
Methylene Chloride		<MDL	7.6	76.1	ug/Kg		<MDL,H	8.3	82.8	ug/Kg		<MDL,H	8.6	85.6	ug/Kg
Styrene		<MDL	7.6	15.2	ug/Kg		<MDL,H	8.3	16.6	ug/Kg		<MDL,H	8.6	17.1	ug/Kg
Tetrachloroethylene		<MDL	7.6	15.2	ug/Kg		<MDL,H	8.3	16.6	ug/Kg		<MDL,H	8.6	17.1	ug/Kg
Toluene		<MDL	7.6	15.2	ug/Kg		<MDL,H	8.3	16.6	ug/Kg		<MDL,H	8.6	17.1	ug/Kg
Total Xylenes		<MDL	7.6	15.2	ug/Kg		<MDL,H	8.3	16.6	ug/Kg		<MDL,H	8.6	17.1	ug/Kg
Trans-1,2-Dichloroethylene		<MDL	7.6	15.2	ug/Kg		<MDL,H	8.3	16.6	ug/Kg		<MDL,H	8.6	17.1	ug/Kg
Trans-1,3-Dichloropropene		<MDL	7.6	15.2	ug/Kg		<MDL,H	8.3	16.6	ug/Kg		<MDL,H	8.6	17.1	ug/Kg
Trichlorofluoromethane		<MDL	7.6	15.2	ug/Kg		<MDL,H	8.3	16.6	ug/Kg		<MDL,H	8.6	17.1	ug/Kg
Vinyl Acetate		<MDL,X	38	76.1	ug/Kg		<MDL,X,H	41	82.8	ug/Kg		<MDL,X,H	43	85.6	ug/Kg
Vinyl Chloride		<MDL	7.6	15.2	ug/Kg		<MDL,H	8.3	16.6	ug/Kg		<MDL,H	8.6	17.1	ug/Kg
M.Code=SW-846 8270															
1,2-Diphenylhydrazine		<MDL	81	163	ug/Kg		<MDL	88	177	ug/Kg		<MDL	91	183	ug/Kg
2,4,5-Trichlorophenol		<MDL	170	324	ug/Kg		<MDL	180	353	ug/Kg		<MDL	190	365	ug/Kg
2,4,6-Trichlorophenol		<MDL	170	324	ug/Kg		<MDL	180	353	ug/Kg		<MDL	190	365	ug/Kg
2,4-Dichlorophenol		<MDL,G	41	81.1	ug/Kg		<MDL,G	45	88.2	ug/Kg		<MDL,G	46	91.3	ug/Kg
2,4-Dimethylphenol		<MDL,G	41	81.1	ug/Kg		<MDL,G	45	88.2	ug/Kg		<MDL,G	46	91.3	ug/Kg
2,4-Dinitrophenol		<MDL,G	81	163	ug/Kg		<MDL,G	88	177	ug/Kg		<MDL,G	91	183	ug/Kg
2,4-Dinitrotoluene		<MDL	17	32.4	ug/Kg		<MDL	18	35.3	ug/Kg		<MDL	19	36.5	ug/Kg
2,6-Dinitrotoluene		<MDL	17	32.4	ug/Kg		<MDL	18	35.3	ug/Kg		<MDL	19	36.5	ug/Kg
2-Chloronaphthalene		<MDL,G	24	40.6	ug/Kg		<MDL,G	26	44.2	ug/Kg		<MDL,G	27	45.7	ug/Kg
2-Chlorophenol		<MDL,G	81	163	ug/Kg		<MDL,G	88	177	ug/Kg		<MDL,G	91	183	ug/Kg

King County Environmental Lab Analytical Report

PROJECT: 423056

	P53VG1	P53VG2	P53VG3
Locator:	P53VG1	P53VG2	P53VG3
Sampled:	Aug 12, 96	Aug 12, 96	Aug 12, 96
Lab ID:	L9209-1	L9209-2	L9209-3
Matrix:	SALTWTRSED	SALTWTRSED	SALTWTRSED
% Solids:	65.7	60.4	58.4

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis			
2-Methylnaphthalene		<MDL,G	65	122	ug/Kg		<MDL,G	71	132	ug/Kg		<MDL,G	74	137	ug/Kg
2-Methylphenol		<MDL,G	41	81.1	ug/Kg		<MDL,G	45	88.2	ug/Kg		<MDL,G	46	91.3	ug/Kg
2-Nitroaniline		<MDL	170	244	ug/Kg		<MDL	180	265	ug/Kg		<MDL	190	274	ug/Kg
2-Nitrophenol		<MDL,G	41	81.1	ug/Kg		<MDL,G	45	88.2	ug/Kg		<MDL,G	46	91.3	ug/Kg
3,3'-Dichlorobenzidine		<MDL,G	41	81.1	ug/Kg		<MDL,G	45	88.2	ug/Kg		<MDL,G	46	91.3	ug/Kg
3-Nitroaniline		<MDL,G	170	244	ug/Kg		<MDL,G	180	265	ug/Kg		<MDL,G	190	274	ug/Kg
4,6-Dinitro-O-Cresol		<MDL	81	163	ug/Kg		<MDL	88	177	ug/Kg		<MDL	91	183	ug/Kg
4-Bromophenyl Phenyl Ether		<MDL	17	24.4	ug/Kg		<MDL	18	26.5	ug/Kg		<MDL	19	27.4	ug/Kg
4-Chloro-3-Methylphenol		<MDL	81	163	ug/Kg		<MDL	88	177	ug/Kg		<MDL	91	183	ug/Kg
4-Chloroaniline		<MDL,G	81	163	ug/Kg		<MDL,G	88	177	ug/Kg		<MDL,G	91	183	ug/Kg
4-Chlorophenyl Phenyl Ether		<MDL	24	40.6	ug/Kg		<MDL	26	44.2	ug/Kg		<MDL	27	45.7	ug/Kg
4-Methylphenol	440	G	41	81.1	ug/Kg	556	G	45	88.2	ug/Kg	574	G	46	91.3	ug/Kg
4-Nitroaniline		<MDL	170	244	ug/Kg		<MDL	180	265	ug/Kg		<MDL	190	274	ug/Kg
4-Nitrophenol		<MDL	81	163	ug/Kg		<MDL	88	177	ug/Kg		<MDL	91	183	ug/Kg
Acenaphthene	37.3		17	32.4	ug/Kg	36.8		18	35.3	ug/Kg	41.6		19	36.5	ug/Kg
Acenaphthylene		<MDL	24	40.6	ug/Kg	28	<RDL	26	44.2	ug/Kg		<MDL	27	45.7	ug/Kg
Aniline		<MDL,G	81	163	ug/Kg		<MDL,G	88	177	ug/Kg		<MDL,G	91	183	ug/Kg
Anthracene	163	G	24	40.6	ug/Kg	224	G	26	44.2	ug/Kg	247	G	27	45.7	ug/Kg
Benzidine		<MDL,X	970	1950	ug/Kg		<MDL,X	1100	2120	ug/Kg		<MDL,X	1100	2190	ug/Kg
Benzo(a)anthracene	346	G	24	40.6	ug/Kg	510	G	26	44.2	ug/Kg	481	G	27	45.7	ug/Kg
Benzo(a)pyrene	370	G	41	81.1	ug/Kg	594	G	45	88.2	ug/Kg	587	G	46	91.3	ug/Kg
Benzo(b)fluoranthene	473		65	122	ug/Kg	853		71	132	ug/Kg	800		74	137	ug/Kg
Benzo(g,h,i)perylene	196	G	41	81.1	ug/Kg	263	G	45	88.2	ug/Kg	289	G	46	91.3	ug/Kg
Benzo(k)fluoranthene	221	G	65	122	ug/Kg	306	G	71	132	ug/Kg	329	G	74	137	ug/Kg
Benzoic Acid		<MDL,L	170	244	ug/Kg		<MDL,L	180	265	ug/Kg		<MDL,L	190	274	ug/Kg
Benzyl Alcohol		<MDL,G	41	81.1	ug/Kg		<MDL,G	45	88.2	ug/Kg		<MDL,G	46	91.3	ug/Kg
Benzyl Butyl Phthalate	41.4		24	40.6	ug/Kg	35	<RDL	26	44.2	ug/Kg	41	<RDL	27	45.7	ug/Kg
Bis(2-Chloroethoxy)Methane		<MDL,G	41	81.1	ug/Kg		<MDL,G	45	88.2	ug/Kg		<MDL,G	46	91.3	ug/Kg
Bis(2-Chloroethyl)Ether		<MDL,G	24	40.6	ug/Kg		<MDL,G	26	44.2	ug/Kg		<MDL,G	27	45.7	ug/Kg
Bis(2-Chloroisopropyl)Ether		<MDL,G	81	163	ug/Kg		<MDL,G	88	177	ug/Kg		<MDL,G	91	183	ug/Kg
Bis(2-Ethylhexyl)Phthalate	143		24	40.6	ug/Kg	263		26	44.2	ug/Kg	289		27	45.7	ug/Kg
Carbazole		<MDL	41	81.1	ug/Kg	51	<RDL	45	88.2	ug/Kg	57	<RDL	46	91.3	ug/Kg
Chrysene	522		24	40.6	ug/Kg	863		26	44.2	ug/Kg	801		27	45.7	ug/Kg
Coprostanol	400		170	244	ug/Kg	384		180	265	ug/Kg	190	<RDL	190	274	ug/Kg
Di-N-Butyl Phthalate		<MDL	41	81.1	ug/Kg		<MDL	45	88.2	ug/Kg		<MDL	46	91.3	ug/Kg
Di-N-Octyl Phthalate		<MDL	24	40.6	ug/Kg		<MDL	26	44.2	ug/Kg		<MDL	27	45.7	ug/Kg
Dibenzo(a,h)anthracene		<MDL	65	122	ug/Kg	79	<RDL	71	132	ug/Kg	77	<RDL	74	137	ug/Kg
Dibenzofuran		<MDL	41	81.1	ug/Kg		<MDL	45	88.2	ug/Kg		<MDL	46	91.3	ug/Kg
Diethyl Phthalate		<MDL	41	81.1	ug/Kg		<MDL	45	88.2	ug/Kg		<MDL	46	91.3	ug/Kg
Dimethyl Phthalate		<MDL	17	24.4	ug/Kg		<MDL	18	26.5	ug/Kg		<MDL	19	27.4	ug/Kg

King County Environmental Lab Analytical Report

PROJECT: 423056	Locator: P53VG1					Locator: P53VG2					Locator: P53VG3				
	Sampled: Aug 12, 96					Sampled: Aug 12, 96					Sampled: Aug 12, 96				
	Lab ID: L9209-1					Lab ID: L9209-2					Lab ID: L9209-3				
	Matrix: SALTWTRSED					Matrix: SALTWTRSED					Matrix: SALTWTRSED				
	% Solids: 65.7					% Solids: 60.4					% Solids: 58.4				
Parameters	Value	Qual	MDL - Dry Weight Basis	RDL	Units	Value	Qual	MDL - Dry Weight Basis	RDL	Units	Value	Qual	MDL - Dry Weight Basis	RDL	Units
Fluoranthene	559	G	24	48.7	ug/Kg	632	G	26	53	ug/Kg	616	G	27	54.8	ug/Kg
Fluorene	63.6	G	24	40.6	ug/Kg	68.5	G	26	44.2	ug/Kg	67	G	27	45.7	ug/Kg
Hexachlorobutadiene		<MDL,G	41	81.1	ug/Kg		<MDL,G	45	88.2	ug/Kg		<MDL,G	46	91.3	ug/Kg
Hexachlorocyclopentadiene		<MDL,G	41	81.1	ug/Kg		<MDL,G	45	88.2	ug/Kg		<MDL,G	46	91.3	ug/Kg
Hexachloroethane		<MDL,G	41	81.1	ug/Kg		<MDL,G	45	88.2	ug/Kg		<MDL,G	46	91.3	ug/Kg
Indeno(1,2,3-Cd)Pyrene	199	G	41	81.1	ug/Kg	285	G	45	88.2	ug/Kg	296	G	46	91.3	ug/Kg
Isophorone		<MDL,G	41	81.1	ug/Kg		<MDL,G	45	88.2	ug/Kg		<MDL,G	46	91.3	ug/Kg
N-Nitrosodi-N-Propylamine		<MDL,G	41	81.1	ug/Kg		<MDL,G	45	88.2	ug/Kg		<MDL,G	46	91.3	ug/Kg
N-Nitrosodimethylamine		<MDL,G	170	244	ug/Kg		<MDL,G	180	265	ug/Kg		<MDL,G	190	274	ug/Kg
N-Nitrosodiphenylamine		<MDL	41	81.1	ug/Kg		<MDL	45	88.2	ug/Kg		<MDL	46	91.3	ug/Kg
Naphthalene		<MDL,G	65	122	ug/Kg		<MDL,G	71	132	ug/Kg		<MDL,G	74	137	ug/Kg
Nitrobenzene		<MDL,G	41	81.1	ug/Kg		<MDL,G	45	88.2	ug/Kg		<MDL,G	46	91.3	ug/Kg
Pentachlorophenol		<MDL,E,G	41	81.1	ug/Kg		<MDL,E,G	45	88.2	ug/Kg		<MDL,E,G	46	91.3	ug/Kg
Phenanthrene	332	G	24	40.6	ug/Kg	359	G	26	44.2	ug/Kg	375	G	27	45.7	ug/Kg
Phenol	306	G	170	244	ug/Kg	402	G	180	265	ug/Kg	481	G	190	274	ug/Kg
Pyrene	553	G	24	40.6	ug/Kg	642	G	26	44.2	ug/Kg	726	G	27	45.7	ug/Kg
M.Code=SW-846 8270 (SIN)															
1,2,4-Trichlorobenzene		<MDL,G	1.1	2.02	ug/Kg		<MDL,G	1.1	2.2	ug/Kg		<MDL,G	1.2	2.28	ug/Kg
1,2-Dichlorobenzene		<MDL,G	1.1	2.02	ug/Kg		<MDL,G	1.1	2.2	ug/Kg		<MDL,G	1.2	2.28	ug/Kg
1,3-Dichlorobenzene		<MDL,G	1.1	2.02	ug/Kg		<MDL,G	1.1	2.2	ug/Kg		<MDL,G	1.2	2.28	ug/Kg
1,4-Dichlorobenzene		<MDL,G	1.1	2.02	ug/Kg		<MDL,G	1.1	2.2	ug/Kg		<MDL,G	1.2	2.28	ug/Kg
Hexachlorobenzene		<MDL,G	1.1	2.02	ug/Kg		<MDL,G	1.1	2.2	ug/Kg		<MDL,G	1.2	2.28	ug/Kg
* indicates wet weight used for this parameter															
METALS															
M.Code=METRO 16-01-001															
Mercury, Total, CVAA	0.14	<RDL	0.026	0.256	mg/Kg	0.16	<RDL	0.026	0.268	mg/Kg	0.21	<RDL	0.029	0.293	mg/Kg
M.Code=METRO 16-02-004															
Aluminum, Total, ICP	13400	L	7.5	37.1	mg/Kg	15100	L	8.3	41.7	mg/Kg	16100	L	8.4	42	mg/Kg
Antimony, Total, ICP		<MDL,G	2.3	11.2	mg/Kg		<MDL,G	2.5	12.5	mg/Kg		<MDL,G	2.6	12.6	mg/Kg
Arsenic, Total, ICP	5.8	<RDL	3.7	18.6	mg/Kg	7.6	<RDL	4.1	20.9	mg/Kg	5.5	<RDL	4.1	20.9	mg/Kg
Barium, Total, ICP															
Beryllium, Total, ICP	0.18	<RDL	0.075	0.371	mg/Kg	0.22	<RDL	0.083	0.417	mg/Kg	0.21	<RDL	0.084	0.42	mg/Kg
Cadmium, Total, ICP		<MDL	0.23	1.12	mg/Kg	0.33	<RDL	0.25	1.25	mg/Kg		<MDL	0.26	1.26	mg/Kg
Calcium, Total, ICP	4440		3.7	18.6	mg/Kg	4820		4.1	20.9	mg/Kg	5330		4.1	20.9	mg/Kg
Chromium, Total, ICP	17.8		0.37	1.86	mg/Kg	21.2		0.41	2.09	mg/Kg	22.3		0.41	2.09	mg/Kg
Copper, Total, ICP	24.7		0.3	1.49	mg/Kg	33.4		0.33	1.67	mg/Kg	36.3		0.34	1.68	mg/Kg
Iron, Total, ICP	21600	G	3.7	18.6	mg/Kg	23700	G	4.1	20.9	mg/Kg	23600	G	4.1	20.9	mg/Kg
Lead, Total, ICP	17.4		2.3	11.2	mg/Kg	24.3		2.5	12.5	mg/Kg	26.4		2.6	12.6	mg/Kg
Magnesium, Total, ICP	5510		2.3	11.2	mg/Kg	5810		2.5	12.5	mg/Kg	6180		2.6	12.6	mg/Kg

King County Environmental Lab Analytical Report

PROJECT: 423056

	Locator: P53VG1	Locator: P53VG2	Locator: P53VG3
Sampled:	Aug 12, 96	Aug 12, 96	Aug 12, 96
Lab ID:	L9209-1	L9209-2	L9209-3
Matrix:	SALTWTRSED	SALTWTRSED	SALTWTRSED
% Solids:	65.7	60.4	58.4

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
			- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis		
Molybdenum, Total, ICP	1.8	<RDL	1.5	7.43	mg/Kg		<MDL	1.7	8.34	mg/Kg		<MDL	1.7	8.39	mg/Kg
Nickel, Total, ICP	17.2		1.5	7.43	mg/Kg	17.1		1.7	8.34	mg/Kg	18.5		1.7	8.39	mg/Kg
Potassium, Total, ICP	1630		150	743	mg/Kg	1940		170	834	mg/Kg	2000		170	839	mg/Kg
Selenium, Total, ICP		<MDL	3.7	18.6	mg/Kg		<MDL	4.1	20.9	mg/Kg		<MDL	4.1	20.9	mg/Kg
Silver, Total, ICP		<MDL	0.3	1.49	mg/Kg		<MDL	0.33	1.67	mg/Kg		<MDL	0.34	1.68	mg/Kg
Sodium, Total, ICP															
Thallium, Total, ICP		<MDL	15	74.3	mg/Kg		<MDL	17	83.4	mg/Kg		<MDL	17	83.9	mg/Kg
Zinc, Total, ICP	63.9		0.37	1.86	mg/Kg	73.3		0.41	2.09	mg/Kg	78.4		0.41	2.09	mg/Kg

* indicates wet weight used for this parameter

CONVENTIONALS

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
M.Code=PSEP p9															
p+0.00 *	2.3		0.1		%	3.9		0.1		%	0.9		0.1		%
p+1.00 *	18.7		0.1		%	20.1		0.1		%	10.8		0.1		%
p+10.0 *	0.7		0.1		%	0.8		0.1		%	0.8		0.1		%
p+10.0(more than) *	3.3		0.1		%	3.6		0.1		%	4.3		0.1		%
p+2.00 *	49.9		0.1		%	33.9		0.1		%	45.1		0.1		%
p+3.00 *	11.9		0.1		%	14.6		0.1		%	12.1		0.1		%
p+4.00 *	2		0.1		%	3.3		0.1		%	3.1		0.1		%
p+5.00 *		<MDL	0.1		%	3.9		0.1		%	7.6		0.1		%
p+6.00 *	2		0.1		%	2.8		0.1		%	2.8		0.1		%
p+7.00 *	3.9		0.1		%	5.2		0.1		%	3.6		0.1		%
p+8.00 *	2.4		0.1		%	4.7		0.1		%	5.3		0.1		%
p+9.00 *	1.4		0.1		%	1.8		0.1		%	1.9		0.1		%
p-1.00 *	1		0.1		%	0.9		0.1		%	0.5		0.1		%
p-2.00 *	0.1		0.1		%		<MDL	0.1		%	0.2		0.1		%
p-2.00(less than) *	0.6		0.1		%	0.6		0.1		%	1.1		0.1		%
M.Code=SM5310-B															
Total Organic Carbon	7520		7.6	15.2	mg/Kg	22000		8.3	16.6	mg/Kg	9850		8.6	17.1	mg/Kg

* indicates wet weight used for this parameter

King County Environmental Lab Analytical Report

PROJECT: 423056

	Locator: P53VG4	Locator: P53VG5	Locator: P53VG5
Sampled:	Aug 12, 96	Aug 12, 96	Aug 12, 96
Lab ID:	L9209-4	L9209-5	L9209-11
Matrix:	SALTWTRSED	SALTWTRSED	SALTWTRSED
% Solids:	72.4	52.7	61.7

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis			
ORGANICS															
M.Code=SW-846 8080															
4,4'-DDD		<MDL	1.8	3.69	ug/Kg		<MDL	2.5	5.07	ug/Kg	4.72		2.1	4.33	ug/Kg
4,4'-DDE		<MDL	1.8	3.69	ug/Kg		<MDL	2.5	5.07	ug/Kg		<MDL	2.1	4.33	ug/Kg
4,4'-DDT		<MDL	1.8	3.69	ug/Kg		<MDL	2.5	5.07	ug/Kg		<MDL	2.1	4.33	ug/Kg
Aldrin		<MDL	1.8	3.69	ug/Kg		<MDL	2.5	5.07	ug/Kg		<MDL	2.1	4.33	ug/Kg
Alpha-BHC		<MDL	1.8	3.69	ug/Kg		<MDL	2.5	5.07	ug/Kg		<MDL	2.1	4.33	ug/Kg
Aroclor 1016		<MDL	18	36.9	ug/Kg		<MDL	25	50.7	ug/Kg		<MDL	21	43.3	ug/Kg
Aroclor 1221		<MDL	18	36.9	ug/Kg		<MDL	25	50.7	ug/Kg		<MDL	21	43.3	ug/Kg
Aroclor 1232		<MDL	18	36.9	ug/Kg		<MDL	25	50.7	ug/Kg		<MDL	21	43.3	ug/Kg
Aroclor 1242		<MDL	18	36.9	ug/Kg		<MDL	25	50.7	ug/Kg		<MDL	21	43.3	ug/Kg
Aroclor 1248		<MDL	18	36.9	ug/Kg		<MDL	25	50.7	ug/Kg		<MDL	21	43.3	ug/Kg
Aroclor 1254		<MDL	18	36.9	ug/Kg	71.9		25	50.7	ug/Kg	36	<RDL	21	43.3	ug/Kg
Aroclor 1260		<MDL	18	36.9	ug/Kg	79.5		25	50.7	ug/Kg	36	<RDL	21	43.3	ug/Kg
Beta-BHC		<MDL	1.8	3.69	ug/Kg		<MDL	2.5	5.07	ug/Kg		<MDL	2.1	4.33	ug/Kg
Chlordane		<MDL	9.3	18.4	ug/Kg		<MDL	13	25.2	ug/Kg		<MDL	11	21.6	ug/Kg
Delta-BHC		<MDL	1.8	3.69	ug/Kg		<MDL	2.5	5.07	ug/Kg		<MDL	2.1	4.33	ug/Kg
Dieldrin		<MDL	1.8	3.69	ug/Kg		<MDL	2.5	5.07	ug/Kg		<MDL	2.1	4.33	ug/Kg
Endosulfan I		<MDL	1.8	3.69	ug/Kg	12		2.5	5.07	ug/Kg	7.07		2.1	4.33	ug/Kg
Endosulfan II		<MDL	1.8	3.69	ug/Kg		<MDL	2.5	5.07	ug/Kg		<MDL	2.1	4.33	ug/Kg
Endosulfan Sulfate		<MDL	1.8	3.69	ug/Kg		<MDL	2.5	5.07	ug/Kg		<MDL	2.1	4.33	ug/Kg
Endrin		<MDL	1.8	3.69	ug/Kg		<MDL	2.5	5.07	ug/Kg		<MDL	2.1	4.33	ug/Kg
Endrin Aldehyde		<MDL	1.8	3.69	ug/Kg		<MDL	2.5	5.07	ug/Kg		<MDL	2.1	4.33	ug/Kg
Gamma-BHC (Lindane)		<MDL	1.8	3.69	ug/Kg		<MDL	2.5	5.07	ug/Kg		<MDL	2.1	4.33	ug/Kg
Heptachlor		<MDL	1.8	3.69	ug/Kg		<MDL	2.5	5.07	ug/Kg		<MDL	2.1	4.33	ug/Kg
Heptachlor Epoxide		<MDL	1.8	3.69	ug/Kg		<MDL	2.5	5.07	ug/Kg		<MDL	2.1	4.33	ug/Kg
Methoxychlor		<MDL	9.3	18.4	ug/Kg		<MDL	13	25.2	ug/Kg		<MDL	11	21.6	ug/Kg
Toxaphene		<MDL	18	36.9	ug/Kg		<MDL	25	50.7	ug/Kg		<MDL	21	43.3	ug/Kg
M.Code=SW-846 8260															
1,1,1-Trichloroethane		<MDL,H	6.9	13.8	ug/Kg		<MDL,H	9.5	19	ug/Kg		<MDL,H	8.1	16.2	ug/Kg
1,1,2,2-Tetrachloroethane		<MDL,H	6.9	13.8	ug/Kg		<MDL,H	9.5	19	ug/Kg		<MDL,H	8.1	16.2	ug/Kg
1,1,2-Trichloroethane		<MDL,H	6.9	13.8	ug/Kg		<MDL,H	9.5	19	ug/Kg		<MDL,H	8.1	16.2	ug/Kg
1,1,2-Trichloroethylene		<MDL,H	6.9	13.8	ug/Kg		<MDL,H	9.5	19	ug/Kg		<MDL,H	8.1	16.2	ug/Kg
1,1-Dichloroethane		<MDL,H	6.9	13.8	ug/Kg		<MDL,H	9.5	19	ug/Kg		<MDL,H	8.1	16.2	ug/Kg
1,1-Dichloroethylene		<MDL,H	6.9	13.8	ug/Kg		<MDL,H	9.5	19	ug/Kg		<MDL,H	8.1	16.2	ug/Kg
1,2-Dichloroethane		<MDL,H	6.9	13.8	ug/Kg		<MDL,H	9.5	19	ug/Kg		<MDL,H	8.1	16.2	ug/Kg
1,2-Dichloropropane		<MDL,H	6.9	13.8	ug/Kg		<MDL,H	9.5	19	ug/Kg		<MDL,H	8.1	16.2	ug/Kg
2-Butanone (MEK)		<MDL,H	35	69.1	ug/Kg		<MDL,H	47	94.9	ug/Kg		<MDL,H	41	81	ug/Kg
2-Chloroethylvinyl ether		<MDL,H	6.9	13.8	ug/Kg		<MDL,H	9.5	19	ug/Kg		<MDL,H	8.1	16.2	ug/Kg

King County Environmental Lab Analytical Report

PROJECT: 423056

	Locator: P53VG4	Locator: P53VG5	Locator: P53VG5
Sampled:	Aug 12, 96	Aug 12, 96	Aug 12, 96
Lab ID:	L9209-4	L9209-5	L9209-11
Matrix:	SALTWTRSED	SALTWTRSED	SALTWTRSED
% Solids:	72.4	52.7	61.7

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
			- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis		
2-Hexanone		<MDL,H	35	69.1	ug/Kg		<MDL,H	47	94.9	ug/Kg		<MDL,H	41	81	ug/Kg
4-Methyl-2-Pentanone (MIBK)		<MDL,H	35	69.1	ug/Kg		<MDL,H	47	94.9	ug/Kg		<MDL,H	41	81	ug/Kg
Acetone	69	<RDL,B,H	18	69.1	ug/Kg	168	B,H	25	94.9	ug/Kg	119	B,H	21	81	ug/Kg
Acrolein		<MDL,X,H	35	69.1	ug/Kg		<MDL,X,H	47	94.9	ug/Kg		<MDL,X,H	41	81	ug/Kg
Acrylonitrile		<MDL,H	35	69.1	ug/Kg		<MDL,H	47	94.9	ug/Kg		<MDL,H	41	81	ug/Kg
Benzene		<MDL,H	6.9	13.8	ug/Kg		<MDL,H	9.5	19	ug/Kg		<MDL,H	8.1	16.2	ug/Kg
Bromodichloromethane		<MDL,H	6.9	13.8	ug/Kg		<MDL,H	9.5	19	ug/Kg		<MDL,H	8.1	16.2	ug/Kg
Bromoform		<MDL,H	6.9	13.8	ug/Kg		<MDL,H	9.5	19	ug/Kg		<MDL,H	8.1	16.2	ug/Kg
Bromomethane		<MDL,H	6.9	13.8	ug/Kg		<MDL,H	9.5	19	ug/Kg		<MDL,H	8.1	16.2	ug/Kg
Carbon Disulfide		<MDL,H	6.9	13.8	ug/Kg		<MDL,H	9.5	19	ug/Kg		<MDL,H	8.1	16.2	ug/Kg
Carbon Tetrachloride		<MDL,H	6.9	13.8	ug/Kg		<MDL,H	9.5	19	ug/Kg		<MDL,H	8.1	16.2	ug/Kg
Chlorobenzene		<MDL,H	6.9	13.8	ug/Kg		<MDL,H	9.5	19	ug/Kg		<MDL,H	8.1	16.2	ug/Kg
Chlorodibromomethane		<MDL,H	6.9	13.8	ug/Kg		<MDL,H	9.5	19	ug/Kg		<MDL,H	8.1	16.2	ug/Kg
Chloroethane		<MDL,H	6.9	13.8	ug/Kg		<MDL,H	9.5	19	ug/Kg		<MDL,H	8.1	16.2	ug/Kg
Chloroform		<MDL,H	6.9	13.8	ug/Kg		<MDL,H	9.5	19	ug/Kg		<MDL,H	8.1	16.2	ug/Kg
Chloromethane		<MDL,H	6.9	13.8	ug/Kg		<MDL,H	9.5	19	ug/Kg		<MDL,H	8.1	16.2	ug/Kg
Chloromethane		<MDL,H	6.9	13.8	ug/Kg		<MDL,H	9.5	19	ug/Kg		<MDL,H	8.1	16.2	ug/Kg
Cis-1,3-Dichloropropene		<MDL,H	6.9	13.8	ug/Kg		<MDL,H	9.5	19	ug/Kg		<MDL,H	8.1	16.2	ug/Kg
Ethylbenzene		<MDL,H	6.9	13.8	ug/Kg		<MDL,H	9.5	19	ug/Kg		<MDL,H	8.1	16.2	ug/Kg
Methylene Chloride		<MDL,H	6.9	69.1	ug/Kg		<MDL,H	9.5	94.9	ug/Kg		<MDL,H	8.1	81	ug/Kg
Styrene		<MDL,H	6.9	13.8	ug/Kg		<MDL,H	9.5	19	ug/Kg		<MDL,H	8.1	16.2	ug/Kg
Tetrachloroethylene		<MDL,H	6.9	13.8	ug/Kg		<MDL,H	9.5	19	ug/Kg		<MDL,H	8.1	16.2	ug/Kg
Toluene		<MDL,H	6.9	13.8	ug/Kg		<MDL,H	9.5	19	ug/Kg		<MDL,H	8.1	16.2	ug/Kg
Total Xylenes		<MDL,H	6.9	13.8	ug/Kg		<MDL,H	9.5	19	ug/Kg		<MDL,H	8.1	16.2	ug/Kg
Trans-1,2-Dichloroethylene		<MDL,H	6.9	13.8	ug/Kg		<MDL,H	9.5	19	ug/Kg		<MDL,H	8.1	16.2	ug/Kg
Trans-1,3-Dichloropropene		<MDL,H	6.9	13.8	ug/Kg		<MDL,H	9.5	19	ug/Kg		<MDL,H	8.1	16.2	ug/Kg
Trichlorofluoromethane		<MDL,H	6.9	13.8	ug/Kg		<MDL,H	9.5	19	ug/Kg		<MDL,H	8.1	16.2	ug/Kg
Vinyl Acetate		<MDL,X,H	35	69.1	ug/Kg		<MDL,X,H	47	94.9	ug/Kg		<MDL,X,H	41	81	ug/Kg
Vinyl Chloride		<MDL,H	6.9	13.8	ug/Kg		<MDL,H	9.5	19	ug/Kg		<MDL,H	8.1	16.2	ug/Kg
M.Code=SW-846 8270															
1,2-Diphenylhydrazine		<MDL	73	148	ug/Kg		<MDL	100	203	ug/Kg		<MDL	86	173	ug/Kg
2,4,5-Trichlorophenol		<MDL	150	294	ug/Kg		<MDL	210	404	ug/Kg		<MDL	180	345	ug/Kg
2,4,6-Trichlorophenol		<MDL	150	294	ug/Kg		<MDL	210	404	ug/Kg		<MDL	180	345	ug/Kg
2,4-Dichlorophenol		<MDL,G	37	73.6	ug/Kg		<MDL,G	51	101	ug/Kg		<MDL,G	44	86.4	ug/Kg
2,4-Dimethylphenol		<MDL,G	37	73.6	ug/Kg		<MDL,G	51	101	ug/Kg		<MDL,G	44	86.4	ug/Kg
2,4-Dinitrophenol		<MDL,G	73	148	ug/Kg		<MDL,G	100	203	ug/Kg		<MDL,G	86	173	ug/Kg
2,4-Dinitrotoluene		<MDL	15	29.4	ug/Kg		<MDL	21	40.4	ug/Kg		<MDL	18	34.5	ug/Kg
2,6-Dinitrotoluene		<MDL	15	29.4	ug/Kg		<MDL	21	40.4	ug/Kg		<MDL	18	34.5	ug/Kg
2-Chloronaphthalene		<MDL,G	22	36.9	ug/Kg		<MDL,G	30	50.7	ug/Kg		<MDL,G	26	43.3	ug/Kg
2-Chlorophenol		<MDL,G	73	148	ug/Kg		<MDL,G	100	203	ug/Kg		<MDL,G	86	173	ug/Kg

King County Environmental Lab Analytical Report

PROJECT: 423056

	Locator: P53VG4					Locator: F53VG5					Locator: P53VG5				
	Sampled: Aug 12, 96					Sampled: Aug 12, 96					Sampled: Aug 12, 96				
	Lab ID: L9209-4					Lab ID: L9209-5					Lab ID: L9209-11				
	Matrix: SALTWTRSED					Matrix: SALTWTRSED					Matrix: SALTWTRSED				
	% Solids: 72.4					% Solids: 52.7					% Solids: 61.7				
Parameters	Value	Qual	MDL - Dry Weight Basis	RDL	Units	Value	Qual	MDL - Dry Weight Basis	RDL	Units	Value	Qual	MDL - Dry Weight Basis	RDL	Units
2-Methylnaphthalene		<MDL,G	59	110	ug/Kg	110	<RDL,G	82	152	ug/Kg		<MDL,G	70	130	ug/Kg
2-Methylphenol		<MDL,G	37	73.6	ug/Kg		<MDL,G	51	101	ug/Kg		<MDL,G	44	86.4	ug/Kg
2-Nitroaniline		<MDL	150	221	ug/Kg		<MDL	210	304	ug/Kg		<MDL	180	259	ug/Kg
2-Nitrophenol		<MDL,G	37	73.6	ug/Kg		<MDL,G	51	101	ug/Kg		<MDL,G	44	86.4	ug/Kg
3,3'-Dichlorobenzidine		<MDL,G	37	73.6	ug/Kg		<MDL,G	51	101	ug/Kg		<MDL,G	44	86.4	ug/Kg
3-Nitroaniline		<MDL,G	150	221	ug/Kg		<MDL,G	210	304	ug/Kg		<MDL,G	180	259	ug/Kg
4,6-Dinitro-O-Cresol		<MDL	73	148	ug/Kg		<MDL	100	203	ug/Kg		<MDL	86	173	ug/Kg
4-Bromophenyl Phenyl Ether		<MDL	15	22.1	ug/Kg		<MDL	21	30.4	ug/Kg		<MDL	18	25.9	ug/Kg
4-Chloro-3-Methylphenol		<MDL	73	148	ug/Kg		<MDL	100	203	ug/Kg		<MDL	86	173	ug/Kg
4-Chloroaniline		<MDL,G	73	148	ug/Kg		<MDL,G	100	203	ug/Kg		<MDL,G	86	173	ug/Kg
4-Chlorophenyl Phenyl Ether		<MDL	22	36.9	ug/Kg		<MDL	30	50.7	ug/Kg		<MDL	26	43.3	ug/Kg
4-Methylphenol	291	G	37	73.6	ug/Kg	2160	G	51	101	ug/Kg	985	G	44	86.4	ug/Kg
4-Nitroaniline		<MDL	150	221	ug/Kg		<MDL	210	304	ug/Kg		<MDL	180	259	ug/Kg
4-Nitrophenol		<MDL	73	148	ug/Kg		<MDL	100	203	ug/Kg		<MDL	86	173	ug/Kg
Acenaphthene	34.5		15	29.4	ug/Kg	273		21	40.4	ug/Kg	134		18	34.5	ug/Kg
Acenaphthylene		<MDL	22	36.9	ug/Kg	111		30	50.7	ug/Kg	61.4		26	43.3	ug/Kg
Aniline		<MDL,G	73	148	ug/Kg		<MDL,G	100	203	ug/Kg		<MDL,G	86	173	ug/Kg
Anthracene	209	G	22	36.9	ug/Kg	930	G	30	50.7	ug/Kg	525	●	26	43.3	ug/Kg
Benzidine		<MDL,X	880	1770	ug/Kg		<MDL,X	1200	2430	ug/Kg		<MDL,X	1000	2070	ug/Kg
Benzo(a)anthracene	309	G	22	36.9	ug/Kg	2200	G	30	50.7	ug/Kg	1160	G	26	43.3	ug/Kg
Benzo(a)pyrene	359	G	37	73.6	ug/Kg	2350	G	51	101	ug/Kg	1220	G	44	86.4	ug/Kg
Benzo(b)fluoranthene	508		59	110	ug/Kg	3430		82	152	ug/Kg	1730		70	130	ug/Kg
Benzo(g,h,i)perylene	159	G	37	73.6	ug/Kg	691	G	51	101	ug/Kg	303	G	44	86.4	ug/Kg
Benzo(k)fluoranthene	195	G	59	110	ug/Kg	1220	G	82	152	ug/Kg	718	G	70	130	ug/Kg
Benzoic Acid		<MDL,L	150	221	ug/Kg	270	<RDL,L	210	304	ug/Kg		<MDL,L	180	259	ug/Kg
Benzyl Alcohol		<MDL,G	37	73.6	ug/Kg		<MDL,G	51	101	ug/Kg		<MDL,G	44	86.4	ug/Kg
Benzyl Butyl Phthalate	26	<RDL	22	36.9	ug/Kg	38	<RDL	30	50.7	ug/Kg		<MDL	26	43.3	ug/Kg
Bis(2-Chloroethoxy)Methane		<MDL,G	37	73.6	ug/Kg		<MDL,G	51	101	ug/Kg		<MDL,G	44	86.4	ug/Kg
Bis(2-Chloroethyl)Ether		<MDL,G	22	36.9	ug/Kg		<MDL,G	30	50.7	ug/Kg		<MDL,G	26	43.3	ug/Kg
Bis(2-Chloroisopropyl)Ether		<MDL,G	73	148	ug/Kg		<MDL,G	100	203	ug/Kg		<MDL,G	86	173	ug/Kg
Bis(2-Ethylhexyl)Phthalate	372		22	36.9	ug/Kg	349		30	50.7	ug/Kg	259		26	43.3	ug/Kg
Carbazole	57	<RDL	37	73.6	ug/Kg	207		51	101	ug/Kg	125		44	86.4	ug/Kg
Chrysene	490		22	36.9	ug/Kg	3230		30	50.7	ug/Kg	1520		26	43.3	ug/Kg
Coprostanol		<MDL	150	221	ug/Kg	822		210	304	ug/Kg	517		180	259	ug/Kg
Di-N-Butyl Phthalate		<MDL	37	73.6	ug/Kg		<MDL	51	101	ug/Kg		<MDL	44	86.4	ug/Kg
Di-N-Octyl Phthalate		<MDL	22	36.9	ug/Kg	32	<RDL	30	50.7	ug/Kg		<MDL	26	43.3	ug/Kg
Dibenzo(a,h)anthracene		<MDL	59	110	ug/Kg	230		82	152	ug/Kg	120	<RDL	70	130	ug/Kg
Dibenzofuran		<MDL	37	73.6	ug/Kg	262		51	101	ug/Kg	129		44	86.4	ug/Kg
Diethyl Phthalate		<MDL	37	73.6	ug/Kg		<MDL	51	101	ug/Kg		<MDL	44	86.4	ug/Kg
Dimethyl Phthalate		<MDL	15	22.1	ug/Kg		<MDL	21	30.4	ug/Kg		<MDL	18	25.9	ug/Kg

King County Environmental Lab Analytical Report

PROJECT: 423056

	Sample 1	Sample 2	Sample 3
Locator:	P53VG4	P53VG5	P53VG5
Sampled:	Aug 12, 96	Aug 12, 96	Aug 12, 96
Lab ID:	L9209-4	L9209-5	L9209-11
Matrix:	SALTWTRSED	SALTWTRSED	SALTWTRSED
% Solids:	72.4	52.7	61.7

Parameters	Value	Qual	MDL - Dry Weight Basis	RDL	Units	Value	Qual	MDL - Dry Weight Basis	RDL	Units	Value	Qual	MDL - Dry Weight Basis	RDL	Units
Fluoranthene	446	G	22	44.2	ug/Kg	2790	G	30	60.7	ug/Kg	1750	G	26	51.9	ug/Kg
Fluorene	66.7	G	22	36.9	ug/Kg	385	G	30	50.7	ug/Kg	193	G	26	43.3	ug/Kg
Hexachlorobutadiene		<MDL,G	37	73.6	ug/Kg		<MDL,G	51	101	ug/Kg		<MDL,G	44	86.4	ug/Kg
Hexachlorocyclopentadiene		<MDL,G	37	73.6	ug/Kg		<MDL,G	51	101	ug/Kg		<MDL,G	44	86.4	ug/Kg
Hexachloroethane		<MDL,G	37	73.6	ug/Kg		<MDL,G	51	101	ug/Kg		<MDL,G	44	86.4	ug/Kg
Indeno(1,2,3-Cd)Pyrene	171	G	37	73.6	ug/Kg	829	G	51	101	ug/Kg	452	G	44	86.4	ug/Kg
Isophorone		<MDL,G	37	73.6	ug/Kg		<MDL,G	51	101	ug/Kg		<MDL,G	44	86.4	ug/Kg
N-Nitrosodi-N-Propylamine	.	<MDL,G	37	73.6	ug/Kg		<MDL,G	51	101	ug/Kg		<MDL,G	44	86.4	ug/Kg
N-Nitrosodimethylamine		<MDL,G	150	221	ug/Kg		<MDL,G	210	304	ug/Kg		<MDL,G	180	259	ug/Kg
N-Nitrosodiphenylamine		<MDL	37	73.6	ug/Kg		<MDL	51	101	ug/Kg		<MDL	44	86.4	ug/Kg
Naphthalene		<MDL,G	59	110	ug/Kg	393	G	82	152	ug/Kg	214	G	70	130	ug/Kg
Nitrobenzene		<MDL,G	37	73.6	ug/Kg		<MDL,G	51	101	ug/Kg		<MDL,G	44	86.4	ug/Kg
Pentachlorophenol		<MDL,E,G	37	73.6	ug/Kg		<MDL,E,G	51	101	ug/Kg		<MDL,E,G	44	86.4	ug/Kg
Phenanthrene	267	G	22	36.9	ug/Kg	1390	G	30	50.7	ug/Kg	715	G	26	43.3	ug/Kg
Phenol	405	G	150	221	ug/Kg	1630	G	210	304	ug/Kg	692	G	180	259	ug/Kg
Pyrene	442	G	22	36.9	ug/Kg	4420	G	30	50.7	ug/Kg	2790	G	26	43.3	ug/Kg
M.Code=SW-846 8270 (SIM)															
1,2,4-Trichlorobenzene		<MDL,G	0.95	1.84	ug/Kg		<MDL,G	1.3	2.52	ug/Kg		<MDL,G	1.1	2.16	ug/Kg
1,2-Dichlorobenzene		<MDL,G	0.95	1.84	ug/Kg		<MDL,G	1.3	2.52	ug/Kg		<MDL,G	1.1	2.16	ug/Kg
1,3-Dichlorobenzene		<MDL,G	0.95	1.84	ug/Kg		<MDL,G	1.3	2.52	ug/Kg		<MDL,G	1.1	2.16	ug/Kg
1,4-Dichlorobenzene		<MDL,G	0.95	1.84	ug/Kg	6.68	G	1.3	2.52	ug/Kg		<MDL,G	1.1	2.16	ug/Kg
Hexachlorobenzene		<MDL,G	0.95	1.84	ug/Kg		<MDL,G	1.3	2.52	ug/Kg		<MDL,G	1.1	2.16	ug/Kg

* indicates wet weight used for tl

METALS

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
M.Code=METRO 16-01-001															
Mercury, Total, CVAA	0.087	<RDL	0.025	0.244	mg/Kg	0.467		0.032	0.328	mg/Kg	0.28	<RDL	0.031	0.306	mg/Kg
M.Code=METRO 16-02-004															
Aluminum, Total, ICP	12600	L	6.9	34.3	mg/Kg	15600	L	9.9	49.3	mg/Kg	14200	L	7.8	39.2	mg/Kg
Antimony, Total, ICP		<MDL,G	2.1	10.3	mg/Kg		<MDL,G	3	14.8	mg/Kg		<MDL,G	2.4	11.8	mg/Kg
Arsenic, Total, ICP	5.5	<RDL	3.5	17.1	mg/Kg	12	<RDL	4.9	24.7	mg/Kg	11	<RDL	3.9	19.6	mg/Kg
Barium, Total, ICP															
Beryllium, Total, ICP	0.15	<RDL	0.069	0.343	mg/Kg	0.23	<RDL	0.099	0.493	mg/Kg	0.23	<RDL	0.078	0.392	mg/Kg
Cadmium, Total, ICP		<MDL	0.21	1.03	mg/Kg	0.59	<RDL	0.3	1.48	mg/Kg	0.44	<RDL	0.24	1.18	mg/Kg
Calcium, Total, ICP	4610		3.5	17.1	mg/Kg	5370		4.9	24.7	mg/Kg	4600		3.9	19.6	mg/Kg
Chromium, Total, ICP	17.7		0.35	1.71	mg/Kg	30		0.49	2.47	mg/Kg	22.9		0.39	1.96	mg/Kg
Copper, Total, ICP	24.9		0.28	1.37	mg/Kg	62.8		0.4	1.97	mg/Kg	45.7		0.31	1.57	mg/Kg
Iron, Total, ICP	22100	G	3.5	17.1	mg/Kg	26400	G	4.9	24.7	mg/Kg	25000	G	3.9	19.6	mg/Kg
Lead, Total, ICP	16		2.1	10.3	mg/Kg	98.9		3	14.8	mg/Kg	45.5		2.4	11.8	mg/Kg
Magnesium, Total, ICP	4930		2.1	10.3	mg/Kg	6600		3	14.8	mg/Kg	5980		2.4	11.8	mg/Kg

King County Environmental Lab Analytical Report

PROJECT: 423056

	Sample 1	Sample 2	Sample 3
Locator:	P53VG4	P53VG5	P53VG5
Sampled:	Aug 12, 96	Aug 12, 96	Aug 12, 96
Lab ID:	L9209-4	L9209-5	L9209-11
Matrix:	SALTWTRSED	SALTWTRSED	SALTWTRSED
% Solids:	72.4	52.7	61.7

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
			- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis		
Molybdenum, Total, ICP		<MDL	1.4	6.84	mg/Kg		<MDL	1.9	9.87	mg/Kg		<MDL	1.6	7.84	mg/Kg
Nickel, Total, ICP	15.5		1.4	6.84	mg/Kg	25		1.9	9.87	mg/Kg	20.4		1.6	7.84	mg/Kg
Potassium, Total, ICP	1480		140	684	mg/Kg	2260		190	987	mg/Kg	1900		160	784	mg/Kg
Selenium, Total, ICP		<MDL	3.5	17.1	mg/Kg		<MDL	4.9	24.7	mg/Kg		<MDL	3.9	19.6	mg/Kg
Silver, Total, ICP		<MDL	0.28	1.37	mg/Kg	1.2	<RDL	0.4	1.97	mg/Kg	0.57	<RDL	0.31	1.57	mg/Kg
Sodium, Total, ICP															
Thallium, Total, ICP		<MDL	14	68.4	mg/Kg		<MDL	19	98.7	mg/Kg		<MDL	16	78.4	mg/Kg
Zinc, Total, ICP	63.8		0.35	1.71	mg/Kg	119		0.49	2.47	mg/Kg	94.7		0.39	1.96	mg/Kg
* Indicates wet weight used for tl															
CONVENTIONALS															
M.Code=PSEP p9															
p+0.00 *	4.2		0.1		%	1.1		0.1		%	2.9		0.1		%
p+1.00 *	28.7		0.1		%	9.3		0.1		%	22.5		0.1		%
p+10.0 *	0.7		0.1		%	2.3		0.1		%	1.6		0.1		%
p+10.0(more than) *	2.4		0.1		%	9.2		0.1		%	5.6		0.1		%
p+2.00 *	42.6		0.1		%	31.1		0.1		%	41.4		0.1		%
p+3.00 *	5.8		0.1		%	11		0.1		%	7.7		0.1		%
p+4.00 *	1.6		0.1		%	4.6		0.1		%	2.5		0.1		%
p+5.00 *	3.2		0.1		%	4.8		0.1		%	1.9		0.1		%
p+6.00 *	1.9		0.1		%	5.2		0.1		%	2.8		0.1		%
p+7.00 *	1.7		0.1		%	7.7		0.1		%	2		0.1		%
p+8.00 *	3.3		0.1		%	8.2		0.1		%	4.5		0.1		%
p+9.00 *	1.5		0.1		%	4.5		0.1		%	3		0.1		%
p-1.00 *	1.5		0.1		%	0.4		0.1		%	0.8		0.1		%
p-2.00 *	0.1		0.1		%	0.4		0.1		%	0.5		0.1		%
p-2.00(less than) *	0.7		0.1		%	0.2		0.1		%	0.5		0.1		%
M.Code=SM5310-B															
Total Organic Carbon	7750		6.9	13.8	mg/Kg	26000		9.5	19	mg/Kg	13800		8.1	16.2	mg/Kg

* indicates wet weight used for this parameter

King County Environmental Lab Analytical Report

PROJECT: 423056															
	Locator:	P53VG6				Locator:	P53VG7				Locator:	P53VG3			
	Sampled:	Aug 12, 96				Sampled:	Aug 12, 96				Sampled:	Aug 12, 96			
	Lab ID:	L9209-6				Lab ID:	L9209-7				Lab ID:	L9209-8			
	Matrix:	SALTWTRSED				Matrix:	SALTWTRSED				Matrix:	SALTWTRSED			
	% Solids:	57.2				% Solids:	75.4				% Solids:	71.8			
Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis			
ORGANICS															
M.Code=SW-846 8080															
4,4'-DDD		<MDL	2.3	4.67	ug/Kg		<MDL	1.7	3.54	ug/Kg		<MDL	1.8	3.72	ug/Kg
4,4'-DDE		<MDL	2.3	4.67	ug/Kg		<MDL	1.7	3.54	ug/Kg		<MDL	1.8	3.72	ug/Kg
4,4'-DDT		<MDL	2.3	4.67	ug/Kg		<MDL	1.7	3.54	ug/Kg		<MDL	1.8	3.72	ug/Kg
Aldrin		<MDL	2.3	4.67	ug/Kg		<MDL	1.7	3.54	ug/Kg		<MDL	1.8	3.72	ug/Kg
Alpha-BHC		<MDL	2.3	4.67	ug/Kg		<MDL	1.7	3.54	ug/Kg		<MDL	1.8	3.72	ug/Kg
Aroclor 1016		<MDL	23	46.7	ug/Kg		<MDL	17	35.4	ug/Kg		<MDL	18	37.2	ug/Kg
Aroclor 1221		<MDL	23	46.7	ug/Kg		<MDL	17	35.4	ug/Kg		<MDL	18	37.2	ug/Kg
Aroclor 1232		<MDL	23	46.7	ug/Kg		<MDL	17	35.4	ug/Kg		<MDL	18	37.2	ug/Kg
Aroclor 1242		<MDL	23	46.7	ug/Kg		<MDL	17	35.4	ug/Kg		<MDL	18	37.2	ug/Kg
Aroclor 1248		<MDL	23	46.7	ug/Kg		<MDL	17	35.4	ug/Kg		<MDL	18	37.2	ug/Kg
Aroclor 1254		<MDL	23	46.7	ug/Kg		<MDL	17	35.4	ug/Kg		<MDL	18	37.2	ug/Kg
Aroclor 1260	35	<RDL	23	46.7	ug/Kg		<MDL	17	35.4	ug/Kg		<MDL	18	37.2	ug/Kg
Beta-BHC		<MDL	2.3	4.67	ug/Kg		<MDL	1.7	3.54	ug/Kg		<MDL	1.8	3.72	ug/Kg
Chlordane		<MDL	12	23.3	ug/Kg		<MDL	8.9	17.6	ug/Kg		<MDL	9.3	18.5	ug/Kg
Delta-BHC		<MDL	2.3	4.67	ug/Kg		<MDL	1.7	3.54	ug/Kg		<MDL	1.8	3.72	ug/Kg
Dieldrin		<MDL	2.3	4.67	ug/Kg		<MDL	1.7	3.54	ug/Kg		<MDL	1.8	3.72	ug/Kg
Endosulfan I	5.94		2.3	4.67	ug/Kg		<MDL	1.7	3.54	ug/Kg		<MDL	1.8	3.72	ug/Kg
Endosulfan II		<MDL	2.3	4.67	ug/Kg		<MDL	1.7	3.54	ug/Kg		<MDL	1.8	3.72	ug/Kg
Endosulfan Sulfate		<MDL	2.3	4.67	ug/Kg		<MDL	1.7	3.54	ug/Kg		<MDL	1.8	3.72	ug/Kg
Endrin		<MDL	2.3	4.67	ug/Kg		<MDL	1.7	3.54	ug/Kg		<MDL	1.8	3.72	ug/Kg
Endrin Aldehyde		<MDL	2.3	4.67	ug/Kg		<MDL	1.7	3.54	ug/Kg		<MDL	1.8	3.72	ug/Kg
Gamma-BHC (Lindane)		<MDL	2.3	4.67	ug/Kg		<MDL	1.7	3.54	ug/Kg		<MDL	1.8	3.72	ug/Kg
Heptachlor		<MDL	2.3	4.67	ug/Kg		<MDL	1.7	3.54	ug/Kg		<MDL	1.8	3.72	ug/Kg
Heptachlor Epoxide		<MDL	2.3	4.67	ug/Kg		<MDL	1.7	3.54	ug/Kg		<MDL	1.8	3.72	ug/Kg
Methoxychlor		<MDL	12	23.3	ug/Kg		<MDL	8.9	17.6	ug/Kg		<MDL	9.3	18.5	ug/Kg
Toxaphene		<MDL	23	46.7	ug/Kg		<MDL	17	35.4	ug/Kg		<MDL	18	37.2	ug/Kg
M.Code=SW-846 8260															
1,1,1-Trichloroethane		<MDL,H	8.7	17.5	ug/Kg		<MDL,H	6.6	13.3	ug/Kg		<MDL,H	7	13.9	ug/Kg
1,1,2,2-Tetrachloroethane		<MDL,H	8.7	17.5	ug/Kg		<MDL,H	6.6	13.3	ug/Kg		<MDL,H	7	13.9	ug/Kg
1,1,2-Trichloroethane		<MDL,H	8.7	17.5	ug/Kg		<MDL,H	6.6	13.3	ug/Kg		<MDL,H	7	13.9	ug/Kg
1,1,2-Trichloroethylene		<MDL,H	8.7	17.5	ug/Kg		<MDL,H	6.6	13.3	ug/Kg		<MDL,H	7	13.9	ug/Kg
1,1-Dichloroethane		<MDL,H	8.7	17.5	ug/Kg		<MDL,H	6.6	13.3	ug/Kg		<MDL,H	7	13.9	ug/Kg
1,1-Dichloroethylene		<MDL,H	8.7	17.5	ug/Kg		<MDL,H	6.6	13.3	ug/Kg		<MDL,H	7	13.9	ug/Kg
1,2-Dichloroethane		<MDL,H	8.7	17.5	ug/Kg		<MDL,H	6.6	13.3	ug/Kg		<MDL,H	7	13.9	ug/Kg
1,2-Dichloropropane		<MDL,H	8.7	17.5	ug/Kg		<MDL,H	6.6	13.3	ug/Kg		<MDL,H	7	13.9	ug/Kg
2-Butanone (MEK)		<MDL,H	44	87.4	ug/Kg		<MDL,H	33	66.3	ug/Kg		<MDL,H	35	69.6	ug/Kg
2-Chloroethylvinyl ether		<MDL,H	8.7	17.5	ug/Kg		<MDL,H	6.6	13.3	ug/Kg		<MDL,H	7	13.9	ug/Kg

King County Environmental Lab Analytical Report

PROJECT: 423056

	Locator: P53VG6	Locator: P53VG7	Locator: P53VG3
	Sampled: Aug 12, 96	Sampled: Aug 12, 96	Sampled: Aug 12, 96
	Lab ID: L9209-6	Lab ID: L9209-7	Lab ID: L9209-8
	Matrix: SALTWTRSED	Matrix: SALTWTRSED	Matrix: SALTWTRSED
	% Solids: 57.2	% Solids: 75.4	% Solids: 71.8

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis			
2-Hexanone		<MDL,H	44	87.4	ug/Kg		<MDL,H	33	66.3	ug/Kg		<MDL,H	35	69.6	ug/Kg
4-Methyl-2-Pentanone (MIBK)		<MDL,H	44	87.4	ug/Kg		<MDL,H	33	66.3	ug/Kg		<MDL,H	35	69.6	ug/Kg
Acetone	118	B,H	23	87.4	ug/Kg	46	<RDL,B,H	17	66.3	ug/Kg	67	<RDL,B,H	18	69.6	ug/Kg
Acrolein		<MDL,X,H	44	87.4	ug/Kg		<MDL,X,H	33	66.3	ug/Kg		<MDL,X,H	35	69.6	ug/Kg
Acrylonitrile		<MDL,H	44	87.4	ug/Kg		<MDL,H	33	66.3	ug/Kg		<MDL,H	35	69.6	ug/Kg
Benzene		<MDL,H	8.7	17.5	ug/Kg		<MDL,H	6.6	13.3	ug/Kg		<MDL,H	7	13.9	ug/Kg
Bromodichloromethane		<MDL,H	8.7	17.5	ug/Kg		<MDL,H	6.6	13.3	ug/Kg		<MDL,H	7	13.9	ug/Kg
Bromoform		<MDL,H	8.7	17.5	ug/Kg		<MDL,H	6.6	13.3	ug/Kg		<MDL,H	7	13.9	ug/Kg
Bromomethane		<MDL,H	8.7	17.5	ug/Kg		<MDL,H	6.6	13.3	ug/Kg		<MDL,H	7	13.9	ug/Kg
Carbon Disulfide		<MDL,H	8.7	17.5	ug/Kg		<MDL,H	6.6	13.3	ug/Kg		<MDL,H	7	13.9	ug/Kg
Carbon Tetrachloride		<MDL,H	8.7	17.5	ug/Kg		<MDL,H	6.6	13.3	ug/Kg		<MDL,H	7	13.9	ug/Kg
Chlorobenzene		<MDL,H	8.7	17.5	ug/Kg		<MDL,H	6.6	13.3	ug/Kg		<MDL,H	7	13.9	ug/Kg
Chlorodibromomethane		<MDL,H	8.7	17.5	ug/Kg		<MDL,H	6.6	13.3	ug/Kg		<MDL,H	7	13.9	ug/Kg
Chloroethane		<MDL,H	8.7	17.5	ug/Kg		<MDL,H	6.6	13.3	ug/Kg		<MDL,H	7	13.9	ug/Kg
Chloroform		<MDL,H	8.7	17.5	ug/Kg		<MDL,H	6.6	13.3	ug/Kg		<MDL,H	7	13.9	ug/Kg
Chloromethane		<MDL,H	8.7	17.5	ug/Kg		<MDL,H	6.6	13.3	ug/Kg		<MDL,H	7	13.9	ug/Kg
Chloromethane		<MDL,H	8.7	17.5	ug/Kg		<MDL,H	6.6	13.3	ug/Kg		<MDL,H	7	13.9	ug/Kg
Cis-1,3-Dichloropropene		<MDL,H	8.7	17.5	ug/Kg		<MDL,H	6.6	13.3	ug/Kg		<MDL,H	7	13.9	ug/Kg
Ethylbenzene		<MDL,H	8.7	17.5	ug/Kg		<MDL,H	6.6	13.3	ug/Kg		<MDL,H	7	13.9	ug/Kg
Methylene Chloride		<MDL,H	8.7	87.4	ug/Kg		<MDL,H	6.6	66.3	ug/Kg		<MDL,H	7	69.6	ug/Kg
Styrene		<MDL,H	8.7	17.5	ug/Kg		<MDL,H	6.6	13.3	ug/Kg		<MDL,H	7	13.9	ug/Kg
Tetrachloroethylene		<MDL,H	8.7	17.5	ug/Kg		<MDL,H	6.6	13.3	ug/Kg		<MDL,H	7	13.9	ug/Kg
Toluene		<MDL,H	8.7	17.5	ug/Kg		<MDL,H	6.6	13.3	ug/Kg		<MDL,H	7	13.9	ug/Kg
Total Xylenes		<MDL,H	8.7	17.5	ug/Kg		<MDL,H	6.6	13.3	ug/Kg		<MDL,H	7	13.9	ug/Kg
Trans-1,2-Dichloroethylene		<MDL,H	8.7	17.5	ug/Kg		<MDL,H	6.6	13.3	ug/Kg		<MDL,H	7	13.9	ug/Kg
Trans-1,3-Dichloropropene		<MDL,H	8.7	17.5	ug/Kg		<MDL,H	6.6	13.3	ug/Kg		<MDL,H	7	13.9	ug/Kg
Trichlorofluoromethane		<MDL,H	8.7	17.5	ug/Kg		<MDL,H	6.6	13.3	ug/Kg		<MDL,H	7	13.9	ug/Kg
Vinyl Acetate		<MDL,X,H	44	87.4	ug/Kg		<MDL,X,H	33	66.3	ug/Kg		<MDL,X,H	35	69.6	ug/Kg
Vinyl Chloride		<MDL,H	8.7	17.5	ug/Kg		<MDL,H	6.6	13.3	ug/Kg		<MDL,H	7	13.9	ug/Kg
M.Code=SW-846 8270															
1,2-Diphenylhydrazine		<MDL	93	187	ug/Kg		<MDL	70	142	ug/Kg		<MDL	74	149	ug/Kg
2,4,5-Trichlorophenol		<MDL	190	372	ug/Kg		<MDL	150	282	ug/Kg		<MDL	150	297	ug/Kg
2,4,6-Trichlorophenol		<MDL	190	372	ug/Kg		<MDL	150	282	ug/Kg		<MDL	150	297	ug/Kg
2,4-Dichlorophenol		<MDL,G	47	93.2	ug/Kg		<MDL,G	36	70.7	ug/Kg		<MDL,G	38	74.2	ug/Kg
2,4-Dimethylphenol		<MDL,G	47	93.2	ug/Kg		<MDL,G	36	70.7	ug/Kg		<MDL,G	38	74.2	ug/Kg
2,4-Dinitrophenol		<MDL,G	93	187	ug/Kg		<MDL,G	70	142	ug/Kg		<MDL,G	74	149	ug/Kg
2,4-Dinitrotoluene		<MDL	19	37.2	ug/Kg		<MDL	15	28.2	ug/Kg		<MDL	15	29.7	ug/Kg
2,6-Dinitrotoluene		<MDL	19	37.2	ug/Kg		<MDL	15	28.2	ug/Kg		<MDL	15	29.7	ug/Kg
2-Chloronaphthalene		<MDL,G	28	46.7	ug/Kg		<MDL,G	21	35.4	ug/Kg		<MDL,G	22	37.2	ug/Kg
2-Chlorophenol		<MDL,G	93	187	ug/Kg		<MDL,G	70	142	ug/Kg		<MDL,G	74	149	ug/Kg

King County Environmental Lab Analytical Report

PROJECT: 423056

Locator: P53VG6
Sampled: Aug 12, 96
Lab ID: L9209-6
Matrix: SALTWTRSED
% Solids: 57.2

Parameters	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis			
2-Methylnaphthalene		<MDL,G	75	140	ug/Kg
2-Methylphenol		<MDL,G	47	93.2	ug/Kg
2-Nitroaniline		<MDL	190	280	ug/Kg
2-Nitrophenol		<MDL,G	47	93.2	ug/Kg
3,3'-Dichlorobenzidine		<MDL,G	47	93.2	ug/Kg
3-Nitroaniline		<MDL,G	190	280	ug/Kg
4,6-Dinitro-O-Cresol		<MDL	93	187	ug/Kg
4-Bromophenyl Phenyl Ether		<MDL	19	28	ug/Kg
4-Chloro-3-Methylphenol		<MDL	93	187	ug/Kg
4-Chloroaniline		<MDL,G	93	187	ug/Kg
4-Chlorophenyl Phenyl Ether		<MDL	28	46.7	ug/Kg
4-Methylphenol	423	G	47	93.2	ug/Kg
4-Nitroaniline		<MDL	190	280	ug/Kg
4-Nitrophenol		<MDL	93	187	ug/Kg
Acenaphthene	60		19	37.2	ug/Kg
Acenaphthylene	35	<RDL	28	46.7	ug/Kg
Aniline		<MDL,G	93	187	ug/Kg
Anthracene	351	G	28	46.7	ug/Kg
Benzidine		<MDL,X	1100	2240	ug/Kg
Benzo(a)anthracene	741	G	28	46.7	ug/Kg
Benzo(a)pyrene	767	G	47	93.2	ug/Kg
Benzo(b)fluoranthene	1120		75	140	ug/Kg
Benzo(g,h,i)perylene	323	G	47	93.2	ug/Kg
Benzo(k)fluoranthene	484	G	75	140	ug/Kg
Benzoic Acid		<MDL,L	190	280	ug/Kg
Benzyl Alcohol		<MDL,G	47	93.2	ug/Kg
Benzyl Butyl Phthalate	51.7		28	46.7	ug/Kg
Bis(2-Chloroethoxy)Methane		<MDL,G	47	93.2	ug/Kg
Bis(2-Chloroethyl)Ether		<MDL,G	28	46.7	ug/Kg
Bis(2-Chloroisopropyl)Ether		<MDL,G	93	187	ug/Kg
Bis(2-Ethylhexyl)Phthalate	281		28	46.7	ug/Kg
Carbazole	89	<RDL	47	93.2	ug/Kg
Chrysene	1100		28	46.7	ug/Kg
Coprostanol	190	<RDL	190	280	ug/Kg
Di-N-Butyl Phthalate		<MDL	47	93.2	ug/Kg
Di-N-Octyl Phthalate		<MDL	28	46.7	ug/Kg
Dibenzo(a,h)anthracene	100	<RDL	75	140	ug/Kg
Dibenzofuran	54	<RDL	47	93.2	ug/Kg
Diethyl Phthalate		<MDL	47	93.2	ug/Kg
Dimethyl Phthalate		<MDL	19	28	ug/Kg

Locator: P53VG7
Sampled: Aug 12, 96
Lab ID: L9209-7
Matrix: SALTWTRSED
% Solids: 75.4

Parameters	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis			
2-Methylnaphthalene		<MDL,G	57	106	ug/Kg
2-Methylphenol		<MDL,G	36	70.7	ug/Kg
2-Nitroaniline		<MDL	150	212	ug/Kg
2-Nitrophenol		<MDL,G	36	70.7	ug/Kg
3,3'-Dichlorobenzidine		<MDL,G	36	70.7	ug/Kg
3-Nitroaniline		<MDL,G	150	212	ug/Kg
4,6-Dinitro-O-Cresol		<MDL	70	142	ug/Kg
4-Bromophenyl Phenyl Ether		<MDL	15	21.2	ug/Kg
4-Chloro-3-Methylphenol		<MDL	70	142	ug/Kg
4-Chloroaniline		<MDL,G	70	142	ug/Kg
4-Chlorophenyl Phenyl Ether		<MDL	21	35.4	ug/Kg
4-Methylphenol	106	G	36	70.7	ug/Kg
4-Nitroaniline		<MDL	150	212	ug/Kg
4-Nitrophenol		<MDL	70	142	ug/Kg
Acenaphthene		<MDL	15	28.2	ug/Kg
Acenaphthylene		<MDL	21	35.4	ug/Kg
Aniline		<MDL,G	70	142	ug/Kg
Anthracene	24	<RDL,G	21	35.4	ug/Kg
Benzidine		<MDL,X	850	1700	ug/Kg
Benzo(a)anthracene	73.3	G	21	35.4	ug/Kg
Benzo(a)pyrene	69	<RDL,G	36	70.7	ug/Kg
Benzo(b)fluoranthene	110		57	106	ug/Kg
Benzo(g,h,i)perylene	36	<RDL,G	36	70.7	ug/Kg
Benzo(k)fluoranthene		<MDL,G	57	106	ug/Kg
Benzoic Acid		<MDL,L	150	212	ug/Kg
Benzyl Alcohol		<MDL,G	36	70.7	ug/Kg
Benzyl Butyl Phthalate	25	<RDL	21	35.4	ug/Kg
Bis(2-Chloroethoxy)Methane		<MDL,G	36	70.7	ug/Kg
Bis(2-Chloroethyl)Ether		<MDL,G	21	35.4	ug/Kg
Bis(2-Chloroisopropyl)Ether		<MDL,G	70	142	ug/Kg
Bis(2-Ethylhexyl)Phthalate	56.9		21	35.4	ug/Kg
Carbazole		<MDL	36	70.7	ug/Kg
Chrysene	122		21	35.4	ug/Kg
Coprostanol		<MDL	150	212	ug/Kg
Di-N-Butyl Phthalate		<MDL	36	70.7	ug/Kg
Di-N-Octyl Phthalate		<MDL	21	35.4	ug/Kg
Dibenzo(a,h)anthracene		<MDL	57	106	ug/Kg
Dibenzofuran		<MDL	36	70.7	ug/Kg
Diethyl Phthalate		<MDL	36	70.7	ug/Kg
Dimethyl Phthalate		<MDL	15	21.2	ug/Kg

Locator: P53VG3
Sampled: Aug 12, 96
Lab ID: L9209-8
Matrix: SALTWTRSED
% Solids: 71.8

Parameters	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis			
2-Methylnaphthalene		<MDL,G	60	111	ug/Kg
2-Methylphenol		<MDL,G	38	74.2	ug/Kg
2-Nitroaniline		<MDL	150	223	ug/Kg
2-Nitrophenol		<MDL,G	38	74.2	ug/Kg
3,3'-Dichlorobenzidine		<MDL,G	38	74.2	ug/Kg
3-Nitroaniline		<MDL,G	150	223	ug/Kg
4,6-Dinitro-O-Cresol		<MDL	74	149	ug/Kg
4-Bromophenyl Phenyl Ether		<MDL	15	22.3	ug/Kg
4-Chloro-3-Methylphenol		<MDL	74	149	ug/Kg
4-Chloroaniline		<MDL,G	74	149	ug/Kg
4-Chlorophenyl Phenyl Ether		<MDL	22	37.2	ug/Kg
4-Methylphenol	461	G	38	74.2	ug/Kg
4-Nitroaniline		<MDL	150	223	ug/Kg
4-Nitrophenol		<MDL	74	149	ug/Kg
Acenaphthene	15	<RDL	15	29.7	ug/Kg
Acenaphthylene		<MDL	22	37.2	ug/Kg
Aniline		<MDL,G	74	149	ug/Kg
Anthracene	73.8	G	22	37.2	ug/Kg
Benzidine		<MDL,X	890	1780	ug/Kg
Benzo(a)anthracene	184	G	22	37.2	ug/Kg
Benzo(a)pyrene	209	G	38	74.2	ug/Kg
Benzo(b)fluoranthene	291		60	111	ug/Kg
Benzo(g,h,i)perylene	92.1	G	38	74.2	ug/Kg
Benzo(k)fluoranthene	127	G	60	111	ug/Kg
Benzoic Acid		<MDL,L	150	223	ug/Kg
Benzyl Alcohol		<MDL,G	38	74.2	ug/Kg
Benzyl Butyl Phthalate		<MDL	22	37.2	ug/Kg
Bis(2-Chloroethoxy)Methane		<MDL,G	38	74.2	ug/Kg
Bis(2-Chloroethyl)Ether		<MDL,G	22	37.2	ug/Kg
Bis(2-Chloroisopropyl)Ether		<MDL,G	74	149	ug/Kg
Bis(2-Ethylhexyl)Phthalate	94.6		22	37.2	ug/Kg
Carbazole		<MDL	38	74.2	ug/Kg
Chrysene	292		22	37.2	ug/Kg
Coprostanol	170	<RDL	150	223	ug/Kg
Di-N-Butyl Phthalate		<MDL	38	74.2	ug/Kg
Di-N-Octyl Phthalate		<MDL	22	37.2	ug/Kg
Dibenzo(a,h)anthracene		<MDL	60	111	ug/Kg
Dibenzofuran		<MDL	38	74.2	ug/Kg
Diethyl Phthalate		<MDL	38	74.2	ug/Kg
Dimethyl Phthalate		<MDL	15	22.3	ug/Kg

King County Environmental Lab Analytical Report

PROJECT: 423056

	P53VG6	P53VG7	P53VG3
Locator:	P53VG6	P53VG7	P53VG3
Sampled:	Aug 12, 96	Aug 12, 96	Aug 12, 96
Lab ID:	L9209-6	L9209-7	L9209-8
Matrix:	SALTWTRSED	SALTWTRSED	SALTWTRSED
% Solids:	57.2	75.4	71.8

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
	- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis				
Fluoranthene	965	G	28	55.9	ug/Kg	153	G	21	42.4	ug/Kg	240	G	22	44.6	ug/Kg
Fluorene	113	G	28	46.7	ug/Kg		<MDL,G	21	35.4	ug/Kg		<MDL,G	22	37.2	ug/Kg
Hexachlorobutadiene		<MDL,G	47	93.2	ug/Kg		<MDL,G	36	70.7	ug/Kg		<MDL,G	38	74.2	ug/Kg
Hexachlorocyclopentadiene		<MDL,G	47	93.2	ug/Kg		<MDL,G	36	70.7	ug/Kg		<MDL,G	38	74.2	ug/Kg
Hexachloroethane		<MDL,G	47	93.2	ug/Kg		<MDL,G	36	70.7	ug/Kg		<MDL,G	38	74.2	ug/Kg
Indeno(1,2,3-Cd)Pyrene	360	G	47	93.2	ug/Kg	44	<RDL,G	36	70.7	ug/Kg	112	G	38	74.2	ug/Kg
Isophorone		<MDL,G	47	93.2	ug/Kg		<MDL,G	36	70.7	ug/Kg		<MDL,G	38	74.2	ug/Kg
N-Nitrosodi-N-Propylamine		<MDL,G	47	93.2	ug/Kg		<MDL,G	36	70.7	ug/Kg		<MDL,G	38	74.2	ug/Kg
N-Nitrosodimethylamine		<MDL,G	190	280	ug/Kg		<MDL,G	150	212	ug/Kg		<MDL,G	150	223	ug/Kg
N-Nitrosodiphenylamine		<MDL	47	93.2	ug/Kg		<MDL	36	70.7	ug/Kg		<MDL	38	74.2	ug/Kg
Naphthalene		<MDL,G	75	140	ug/Kg		<MDL,G	57	106	ug/Kg		<MDL,G	60	111	ug/Kg
Nitrobenzene		<MDL,G	47	93.2	ug/Kg		<MDL,G	36	70.7	ug/Kg		<MDL,G	38	74.2	ug/Kg
Pentachlorophenol		<MDL,E,G	47	93.2	ug/Kg		<MDL,E,G	36	70.7	ug/Kg		<MDL,E,G	38	74.2	ug/Kg
Phenanthrene	605	G	28	46.7	ug/Kg	84.5	G	21	35.4	ug/Kg	135	G	22	37.2	ug/Kg
Phenol	453	G	190	280	ug/Kg	160	<RDL,G	150	212	ug/Kg	226	G	150	223	ug/Kg
Pyrene	1070	G	28	46.7	ug/Kg	139	G	21	35.4	ug/Kg	263	G	22	37.2	ug/Kg
M.Code=SW-846 8270 (SIM)															
1,2,4-Trichlorobenzene		<MDL,G	1.2	2.33	ug/Kg		<MDL,G	0.92	1.76	ug/Kg		<MDL,G	0.96	1.85	ug/Kg
1,2-Dichlorobenzene		<MDL,G	1.2	2.33	ug/Kg		<MDL,G	0.92	1.76	ug/Kg		<MDL,G	0.96	1.85	ug/Kg
1,3-Dichlorobenzene		<MDL,G	1.2	2.33	ug/Kg		<MDL,G	0.92	1.76	ug/Kg		<MDL,G	0.96	1.85	ug/Kg
1,4-Dichlorobenzene		<MDL,G	1.2	2.33	ug/Kg		<MDL,G	0.92	1.76	ug/Kg		<MDL,G	0.96	1.85	ug/Kg
Hexachlorobenzene		<MDL,G	1.2	2.33	ug/Kg		<MDL,G	0.92	1.76	ug/Kg		<MDL,G	0.96	1.85	ug/Kg

* Indicates wet weight used for tl

METALS

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
M.Code=METRO 16-01-001															
Mercury, Total, CVAA	0.19	<RDL	0.033	0.339	mg/Kg	0.041	<RDL	0.025	0.245	mg/Kg	0.063	<RDL	0.026	0.26	mg/Kg
M.Code=METRO 16-02-004															
Aluminum, Total, ICP	14800	L	8.4	41.8	mg/Kg	9430	L	6.5	32.6	mg/Kg	11700	L	6.8	34.4	mg/Kg
Antimony, Total, ICP		<MDL,G	2.4	12.5	mg/Kg		<MDL,G	2	9.79	mg/Kg		<MDL,G	2.1	10.3	mg/Kg
Arsenic, Total, ICP	8.9	<RDL	4.2	20.8	mg/Kg	5.3	<RDL	3.3	16.3	mg/Kg	4	<RDL	3.5	17.1	mg/Kg
Barium, Total, ICP															
Beryllium, Total, ICP	0.21	<RDL	0.084	0.418	mg/Kg	0.13	<RDL	0.065	0.326	mg/Kg	0.15	<RDL	0.068	0.344	mg/Kg
Cadmium, Total, ICP	0.28	<RDL	0.24	1.25	mg/Kg		<MDL	0.2	0.979	mg/Kg		<MDL	0.21	1.03	mg/Kg
Calcium, Total, ICP	11700		4.2	20.8	mg/Kg	3810		3.3	16.3	mg/Kg	3970		3.5	17.1	mg/Kg
Chromium, Total, ICP	21.3		0.42	2.08	mg/Kg	11.8		0.33	1.63	mg/Kg	19.4		0.35	1.71	mg/Kg
Copper, Total, ICP	40.7		0.33	1.67	mg/Kg	15.8		0.27	1.31	mg/Kg	17.7		0.28	1.37	mg/Kg
Iron, Total, ICP	24300	G	4.2	20.8	mg/Kg	21200	G	3.3	16.3	mg/Kg	19800	G	3.5	17.1	mg/Kg
Lead, Total, ICP	30.9		2.4	12.5	mg/Kg	8.9	<RDL	2	9.79	mg/Kg	20.8		2.1	10.3	mg/Kg
Magnesium, Total, ICP	5930		2.4	12.5	mg/Kg	4070		2	9.79	mg/Kg	4500		2.1	10.3	mg/Kg

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PROJECT: 423056

	Sample 1	Sample 2	Sample 3
Locator:	P53VG6	P53V37	P53VG3
Sampled:	Aug 12, 96	Aug 12, 96	Aug 12, 96
Lab ID:	L9209-6	L9209-7	L9209-8
Matrix:	SALTWTRSED	SALTWTRSED	SALTWTRSED
% Solids:	57.2	75.4	71.8

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis			
Molybdenum, Total, ICP		<MDL	1.7	8.36	mg/Kg		<MDL	1.3	6.53	mg/Kg		<MDL	1.4	6.87	mg/Kg
Nickel, Total, ICP	17.2		1.7	8.36	mg/Kg	12.8		1.3	6.53	mg/Kg	13.2		1.4	6.87	mg/Kg
Potassium, Total, ICP	1980		170	836	mg/Kg	1090		130	653	mg/Kg	1360		140	687	mg/Kg
Selenium, Total, ICP		<MDL	4.2	20.8	mg/Kg		<MDL	3.3	16.3	mg/Kg		<MDL	3.5	17.1	mg/Kg
Silver, Total, ICP		<MDL	0.33	1.67	mg/Kg		<MDL	0.27	1.31	mg/Kg		<MDL	0.28	1.37	mg/Kg
Sodium, Total, ICP															
Thallium, Total, ICP		<MDL	17	83.6	mg/Kg		<MDL	13	65.3	mg/Kg		<MDL	14	68.7	mg/Kg
Zinc, Total, ICP	78.3		0.42	2.08	mg/Kg	49.3		0.33	1.63	mg/Kg	55.7		0.35	1.71	mg/Kg
* indicates wet weight used for th															
CONVENTIONALS															
M.Code=PSEP p9															
p+0.00 *	1.2		0.1		%	6.9		0.1		%	2		0.1		%
p+1.00 *	11.5		0.1		%	36.7		0.1		%	21.1		0.1		%
p+10.0 *	1.7		0.1		%		<MDL	0.1		%	0.3		0.1		%
p+10.0(more than) *	4.4		0.1		%	1.9		0.1		%	1.8		0.1		%
p+2.00 *	35.8		0.1		%	41.6		0.1		%	53		0.1		%
p+3.00 *	16.1		0.1		%	5.6		0.1		%	10.3		0.1		%
p+4.00 *	4.6		0.1		%	0.9		0.1		%	1.3		0.1		%
p+5.00 *	6.4		0.1		%	1.4		0.1		%	5.6		0.1		%
p+6.00 *	3.1		0.1		%		<MDL	0.1		%		<MDL	0.1		%
p+7.00 *	4.3		0.1		%	0.4		0.1		%		<MDL	0.1		%
p+8.00 *	6.1		0.1		%	1.9		0.1		%	2.2		0.1		%
p+9.00 *	3.5		0.1		%	0.3		0.1		%	0.9		0.1		%
p-1.00 *	0.5		0.1		%	1.9		0.1		%	1		0.1		%
p-2.00 *		<MDL	0.1		%	0.1		0.1		%		<MDL	0.1		%
p-2.00(less than) *	0.8		0.1		%	0.3		0.1		%	0.4		0.1		%
M.Code=SM5310-B															
Total Organic Carbon	26900		8.7	17.5	mg/Kg	4630		6.6	13.3	mg/Kg	3360		7	13.9	mg/Kg

* indicates wet weight used for this parameter

King County Environmental Lab Analytical Report

PROJECT: 423056

	P53VG4	P53VG5	P53C1
Locator:	P53VG4	P53VG5	P53C1
Sampled:	Aug 12, 96	Aug 12, 96	Aug 14, 96
Lab ID:	L9209-9	L9209-10	L9316-1
Matrix:	SALTWTRSED	SALTWTRSED	SALTWTRSED
% Solids:	75.9	61.1	77.7

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis			
ORGANICS															
M.Code=SW-846 8080															
4,4'-DDD		<MDL	1.7	3.52	ug/Kg	5.43		2.1	4.37	ug/Kg		<MDL	1.7	3.44	ug/Kg
4,4'-DDE		<MDL	1.7	3.52	ug/Kg		<MDL	2.1	4.37	ug/Kg		<MDL	1.7	3.44	ug/Kg
4,4'-DDT		<MDL	1.7	3.52	ug/Kg		<MDL	2.1	4.37	ug/Kg		<MDL	1.7	3.44	ug/Kg
Aldrin		<MDL	1.7	3.52	ug/Kg		<MDL	2.1	4.37	ug/Kg		<MDL	1.7	3.44	ug/Kg
Alpha-BHC		<MDL	1.7	3.52	ug/Kg		<MDL	2.1	4.37	ug/Kg		<MDL	1.7	3.44	ug/Kg
Aroclor 1016		<MDL	17	35.2	ug/Kg		<MDL	21	43.7	ug/Kg		<MDL	17	34.4	ug/Kg
Aroclor 1221		<MDL	17	35.2	ug/Kg		<MDL	21	43.7	ug/Kg		<MDL	17	34.4	ug/Kg
Aroclor 1232		<MDL	17	35.2	ug/Kg		<MDL	21	43.7	ug/Kg		<MDL	17	34.4	ug/Kg
Aroclor 1242		<MDL	17	35.2	ug/Kg		<MDL	21	43.7	ug/Kg		<MDL	17	34.4	ug/Kg
Aroclor 1248		<MDL	17	35.2	ug/Kg		<MDL	21	43.7	ug/Kg		<MDL	17	34.4	ug/Kg
Aroclor 1254		<MDL	17	35.2	ug/Kg	49.1		21	43.7	ug/Kg		<MDL	17	34.4	ug/Kg
Aroclor 1260		<MDL	17	35.2	ug/Kg	62.2		21	43.7	ug/Kg		<MDL	17	34.4	ug/Kg
Beta-BHC		<MDL	1.7	3.52	ug/Kg		<MDL	2.1	4.37	ug/Kg		<MDL	1.7	3.44	ug/Kg
Chlordane		<MDL	8.8	17.5	ug/Kg		<MDL	11	21.8	ug/Kg		<MDL	8.6	17.1	ug/Kg
Delta-BHC		<MDL	1.7	3.52	ug/Kg		<MDL	2.1	4.37	ug/Kg		<MDL	1.7	3.44	ug/Kg
Dieldrin		<MDL	1.7	3.52	ug/Kg		<MDL	2.1	4.37	ug/Kg		<MDL	1.7	3.44	ug/Kg
Endosulfan I		<MDL	1.7	3.52	ug/Kg	6.79		2.1	4.37	ug/Kg		<MDL	1.7	3.44	ug/Kg
Endosulfan II		<MDL	1.7	3.52	ug/Kg		<MDL	2.1	4.37	ug/Kg		<MDL	1.7	3.44	ug/Kg
Endosulfan Sulfate		<MDL	1.7	3.52	ug/Kg		<MDL	2.1	4.37	ug/Kg		<MDL	1.7	3.44	ug/Kg
Endrin		<MDL	1.7	3.52	ug/Kg		<MDL	2.1	4.37	ug/Kg		<MDL	1.7	3.44	ug/Kg
Endrin Aldehyde		<MDL	1.7	3.52	ug/Kg		<MDL	2.1	4.37	ug/Kg		<MDL	1.7	3.44	ug/Kg
Gamma-BHC (Lindane)		<MDL	1.7	3.52	ug/Kg		<MDL	2.1	4.37	ug/Kg		<MDL	1.7	3.44	ug/Kg
Heptachlor		<MDL	1.7	3.52	ug/Kg		<MDL	2.1	4.37	ug/Kg		<MDL	1.7	3.44	ug/Kg
Heptachlor Epoxide		<MDL	1.7	3.52	ug/Kg		<MDL	2.1	4.37	ug/Kg		<MDL	1.7	3.44	ug/Kg
Methoxychlor		<MDL	8.8	17.5	ug/Kg		<MDL	11	21.8	ug/Kg		<MDL	8.6	17.1	ug/Kg
Toxaphene		<MDL	17	35.2	ug/Kg		<MDL	21	43.7	ug/Kg		<MDL	17	34.4	ug/Kg
M.Code=SW-846 8260															
1,1,1-Trichloroethane		<MDL,H	6.6	13.2	ug/Kg		<MDL	8.2	16.4	ug/Kg					
1,1,2,2-Tetrachloroethane		<MDL,H	6.6	13.2	ug/Kg		<MDL	8.2	16.4	ug/Kg					
1,1,2-Trichloroethane		<MDL,H	6.6	13.2	ug/Kg		<MDL	8.2	16.4	ug/Kg					
1,1,2-Trichloroethylene		<MDL,H	6.6	13.2	ug/Kg		<MDL	8.2	16.4	ug/Kg					
1,1-Dichloroethane		<MDL,H	6.6	13.2	ug/Kg		<MDL	8.2	16.4	ug/Kg					
1,1-Dichloroethylene		<MDL,H	6.6	13.2	ug/Kg		<MDL	8.2	16.4	ug/Kg					
1,2-Dichloroethane		<MDL,H	6.6	13.2	ug/Kg		<MDL	8.2	16.4	ug/Kg					
1,2-Dichloropropane		<MDL,H	6.6	13.2	ug/Kg		<MDL	8.2	16.4	ug/Kg					
2-Butanone (MEK)		<MDL,H	33	65.9	ug/Kg		<MDL	41	81.8	ug/Kg					
2-Chloroethylvinyl ether		<MDL,H	6.6	13.2	ug/Kg		<MDL	8.2	16.4	ug/Kg					

King County Environmental Lab Analytical Report

PROJECT: 423056

	Sample 1	Sample 2	Sample 3
Locator:	P53VG4	P53VG5	P53C1
Sampled:	Aug 12, 96	Aug 12, 96	Aug 14, 96
Lab ID:	L9209-9	L9209-10	L9316-1
Matrix:	SALTWTRSED	SALTWTRSED	SALTWTRSED
% Solids:	75.9	61.1	77.7

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis			
2-Hexanone		<MDL,H	33	65.9	ug/Kg		<MDL	41	81.8	ug/Kg					
4-Methyl-2-Pentanone (MIBK)		<MDL,H	33	65.9	ug/Kg		<MDL	41	81.8	ug/Kg					
Acetone	61	<RDL,B,F	17	65.9	ug/Kg	69	<RDL,B	21	81.8	ug/Kg					
Acrolein		<MDL,X,F	33	65.9	ug/Kg		<MDL,X	41	81.8	ug/Kg					
Acrylonitrile		<MDL,H	33	65.9	ug/Kg		<MDL	41	81.8	ug/Kg					
Benzene		<MDL,H	6.6	13.2	ug/Kg		<MDL	8.2	16.4	ug/Kg					
Bromodichloromethane		<MDL,H	6.6	13.2	ug/Kg		<MDL	8.2	16.4	ug/Kg					
Bromoform		<MDL,H	6.6	13.2	ug/Kg		<MDL	8.2	16.4	ug/Kg					
Bromomethane		<MDL,H	6.6	13.2	ug/Kg		<MDL	8.2	16.4	ug/Kg					
Carbon Disulfide		<MDL,H	6.6	13.2	ug/Kg		<MDL	8.2	16.4	ug/Kg					
Carbon Tetrachloride		<MDL,H	6.6	13.2	ug/Kg		<MDL	8.2	16.4	ug/Kg					
Chlorobenzene		<MDL,H	6.6	13.2	ug/Kg		<MDL	8.2	16.4	ug/Kg					
Chlorodibromomethane		<MDL,H	6.6	13.2	ug/Kg		<MDL	8.2	16.4	ug/Kg					
Chloroethane		<MDL,H	6.6	13.2	ug/Kg		<MDL	8.2	16.4	ug/Kg					
Chloroform		<MDL,H	6.6	13.2	ug/Kg		<MDL	8.2	16.4	ug/Kg					
Chloromethane		<MDL,H	6.6	13.2	ug/Kg		<MDL	8.2	16.4	ug/Kg					
Chloromethane		<MDL,H	6.6	13.2	ug/Kg		<MDL	8.2	16.4	ug/Kg					
Cis-1,3-Dichloropropene		<MDL,H	6.6	13.2	ug/Kg		<MDL	8.2	16.4	ug/Kg					
Ethylbenzene		<MDL,H	6.6	13.2	ug/Kg		<MDL	8.2	16.4	ug/Kg					
Methylene Chloride		<MDL,H	6.6	65.9	ug/Kg		<MDL	8.2	81.8	ug/Kg					
Styrene		<MDL,H	6.6	13.2	ug/Kg		<MDL	8.2	16.4	ug/Kg					
Tetrachloroethylene		<MDL,H	6.6	13.2	ug/Kg		<MDL	8.2	16.4	ug/Kg					
Toluene		<MDL,H	6.6	13.2	ug/Kg		<MDL	8.2	16.4	ug/Kg					
Total Xylenes		<MDL,H	6.6	13.2	ug/Kg		<MDL	8.2	16.4	ug/Kg					
Trans-1,2-Dichloroethylene		<MDL,H	6.6	13.2	ug/Kg		<MDL	8.2	16.4	ug/Kg					
Trans-1,3-Dichloropropene		<MDL,H	6.6	13.2	ug/Kg		<MDL	8.2	16.4	ug/Kg					
Trichlorofluoromethane		<MDL,H	6.6	13.2	ug/Kg		<MDL	8.2	16.4	ug/Kg					
Vinyl Acetate		<MDL,X,F	33	65.9	ug/Kg		<MDL,X	41	81.8	ug/Kg					
Vinyl Chloride		<MDL,H	6.6	13.2	ug/Kg		<MDL	8.2	16.4	ug/Kg					
M.Code=SW-846 8270															
1,2-Diphenylhydrazine		<MDL	70	141	ug/Kg		<MDL	87	175	ug/Kg		<MDL	68	138	ug/Kg
2,4,5-Trichlorophenol		<MDL	140	281	ug/Kg		<MDL	180	349	ug/Kg		<MDL	140	274	ug/Kg
2,4,6-Trichlorophenol		<MDL	140	281	ug/Kg		<MDL	180	349	ug/Kg		<MDL	140	274	ug/Kg
2,4-Dichlorophenol		<MDL	36	70.2	ug/Kg		<MDL,G	44	87.2	ug/Kg		<MDL	35	68.6	ug/Kg
2,4-Dimethylphenol		<MDL	36	70.2	ug/Kg		<MDL,G	44	87.2	ug/Kg		<MDL	35	68.6	ug/Kg
2,4-Dinitrophenol		<MDL	70	141	ug/Kg		<MDL,G	87	175	ug/Kg		<MDL	68	138	ug/Kg
2,4-Dinitrotoluene		<MDL	14	28.1	ug/Kg		<MDL	18	34.9	ug/Kg		<MDL	14	27.4	ug/Kg
2,6-Dinitrotoluene		<MDL	14	28.1	ug/Kg		<MDL	18	34.9	ug/Kg		<MDL	14	27.4	ug/Kg
2-Chloronaphthalene		<MDL	21	35.2	ug/Kg		<MDL,G	26	43.7	ug/Kg		<MDL	21	34.4	ug/Kg
2-Chlorophenol		<MDL	70	141	ug/Kg		<MDL,G	87	175	ug/Kg		<MDL	68	138	ug/Kg

King County Environmental Lab Analytical Report

PROJECT: 423056

	Locator: P53VG4					Locator: P53VG5					Locator: P53C1				
	Sampled: Aug 12, 96					Sampled: Aug 12, 96					Sampled: Aug 14, 96				
	Lab ID: L9209-9					Lab ID: L9209-10					Lab ID: L9316-1				
	Matrix: SALTWTRSED					Matrix: SALTWTRSED					Matrix: SALTWTRSED				
	% Solids: 75.9					% Solids: 61.1					% Solids: 77.7				
Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis			
2-Methylnaphthalene		<MDL	57	105	ug/Kg		<MDL,G	70	131	ug/Kg		<MDL	55	103	ug/Kg
2-Methylphenol		<MDL	36	70.2	ug/Kg		<MDL,G	44	87.2	ug/Kg		<MDL	35	68.6	ug/Kg
2-Nitroaniline		<MDL	140	211	ug/Kg		<MDL	180	262	ug/Kg		<MDL	140	206	ug/Kg
2-Nitrophenol		<MDL	36	70.2	ug/Kg		<MDL,G	44	87.2	ug/Kg		<MDL	35	68.6	ug/Kg
3,3'-Dichlorobenzidine		<MDL,G	36	70.2	ug/Kg		<MDL,G	44	87.2	ug/Kg		<MDL,G	35	68.6	ug/Kg
3-Nitroaniline		<MDL,G	140	211	ug/Kg		<MDL,G	180	262	ug/Kg		<MDL	140	206	ug/Kg
4,6-Dinitro-O-Cresol		<MDL	70	141	ug/Kg		<MDL	87	175	ug/Kg		<MDL	68	138	ug/Kg
4-Bromophenyl Phenyl Ether		<MDL	14	21.1	ug/Kg		<MDL	18	26.2	ug/Kg		<MDL	14	20.6	ug/Kg
4-Chloro-3-Methylphenol		<MDL	70	141	ug/Kg		<MDL	87	175	ug/Kg		<MDL	68	138	ug/Kg
4-Chloroaniline		<MDL,G	70	141	ug/Kg		<MDL,G	87	175	ug/Kg		<MDL,G	68	138	ug/Kg
4-Chlorophenyl Phenyl Ether		<MDL	21	35.2	ug/Kg		<MDL	26	43.7	ug/Kg		<MDL	21	34.4	ug/Kg
4-Methylphenol	92.2		36	70.2	ug/Kg	1020	G	44	87.2	ug/Kg		<MDL	35	68.6	ug/Kg
4-Nitroaniline		<MDL	140	211	ug/Kg		<MDL	180	262	ug/Kg		<MDL	140	206	ug/Kg
4-Nitrophenol		<MDL	70	141	ug/Kg		<MDL	87	175	ug/Kg		<MDL	68	138	ug/Kg
Acenaphthene		<MDL	14	28.1	ug/Kg	159		18	34.9	ug/Kg		<MDL	14	27.4	ug/Kg
Acenaphthylene		<MDL	21	35.2	ug/Kg	64.3		26	43.7	ug/Kg		<MDL	21	34.4	ug/Kg
Aniline		<MDL,G	70	141	ug/Kg		<MDL,G	87	175	ug/Kg		<MDL,G	68	138	ug/Kg
Anthracene	54.2	G	21	35.2	ug/Kg	563	G	26	43.7	ug/Kg		<MDL,G	21	34.4	ug/Kg
Benzidine		<MDL,X	840	1690	ug/Kg		<MDL,X	1000	2090	ug/Kg		<MDL,X	820	1650	ug/Kg
Benzo(a)anthracene	138	G	21	35.2	ug/Kg	1320	G	26	43.7	ug/Kg		<MDL,G	21	34.4	ug/Kg
Benzo(a)pyrene	161	G	36	70.2	ug/Kg	1540	G	44	87.2	ug/Kg		<MDL,G	35	68.6	ug/Kg
Benzo(b)fluoranthene	216		57	105	ug/Kg	2110		70	131	ug/Kg		<MDL	55	103	ug/Kg
Benzo(g,h,i)perylene	81.9	G	36	70.2	ug/Kg	344	G	44	87.2	ug/Kg		<MDL,G	35	68.6	ug/Kg
Benzo(k)fluoranthene	100	<RDL,G	57	105	ug/Kg	987	G	70	131	ug/Kg		<MDL,G	55	103	ug/Kg
Benzoic Acid		<MDL	140	211	ug/Kg		<MDL,L	180	262	ug/Kg		<MDL	140	206	ug/Kg
Benzyl Alcohol		<MDL	36	70.2	ug/Kg		<MDL,G	44	87.2	ug/Kg		<MDL	35	68.6	ug/Kg
Benzyl Butyl Phthalate		<MDL	21	35.2	ug/Kg		<MDL	26	43.7	ug/Kg		<MDL	21	34.4	ug/Kg
Bis(2-Chloroethoxy)Methane		<MDL	36	70.2	ug/Kg		<MDL,G	44	87.2	ug/Kg		<MDL	35	68.6	ug/Kg
Bis(2-Chloroethyl)Ether		<MDL,G	21	35.2	ug/Kg		<MDL,G	26	43.7	ug/Kg		<MDL	21	34.4	ug/Kg
Bis(2-Chloroisopropyl)Ether		<MDL	70	141	ug/Kg		<MDL,G	87	175	ug/Kg		<MDL	68	138	ug/Kg
Bis(2-Ethylhexyl)Phthalate	73.8		21	35.2	ug/Kg	318		26	43.7	ug/Kg	35.1		21	34.4	ug/Kg
Carbazole		<MDL	36	70.2	ug/Kg	120		44	87.2	ug/Kg		<MDL	35	68.6	ug/Kg
Chrysene	219		21	35.2	ug/Kg	1910		26	43.7	ug/Kg		<MDL	21	34.4	ug/Kg
Coprostanol	140	<RDL	140	211	ug/Kg	460		180	262	ug/Kg		<MDL,E	140	206	ug/Kg
Di-N-Butyl Phthalate		<MDL	36	70.2	ug/Kg		<MDL	44	87.2	ug/Kg		<MDL	35	68.6	ug/Kg
Di-N-Octyl Phthalate		<MDL	21	35.2	ug/Kg		<MDL	26	43.7	ug/Kg		<MDL	21	34.4	ug/Kg
Dibenzo(a,h)anthracene		<MDL	57	105	ug/Kg	150		70	131	ug/Kg		<MDL	55	103	ug/Kg
Dibenzofuran		<MDL	36	70.2	ug/Kg	142		44	87.2	ug/Kg		<MDL	35	68.6	ug/Kg
Diethyl Phthalate		<MDL	36	70.2	ug/Kg		<MDL	44	87.2	ug/Kg		<MDL	35	68.6	ug/Kg
Dimethyl Phthalate		<MDL	14	21.1	ug/Kg		<MDL	18	26.2	ug/Kg		<MDL	14	20.6	ug/Kg

King County Environmental Lab Analytical Report

PROJECT: 423056

	Locator: P53VG4	Locator: P53VG5	Locator: P53C1
Sampled:	Aug 12, 96	Aug 12, 96	Aug 14, 96
Lab ID:	L9209-9	L9209-10	L9316-1
Matrix:	SALTWTRSED	SALTWTRSED	SALTWTRSED
% Solids:	75.9	61.1	77.7

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis			
Fluoranthene	187	G	21	42.2	ug/Kg	1750	G	26	52.4	ug/Kg	22	<RDL,G	21	41.2	ug/Kg
Fluorene		<MDL,G	21	35.2	ug/Kg	209	G	26	43.7	ug/Kg		<MDL,G	21	34.4	ug/Kg
Hexachlorobutadiene		<MDL	36	70.2	ug/Kg		<MDL,G	44	87.2	ug/Kg		<MDL,G	35	68.6	ug/Kg
Hexachlorocyclopentadiene		<MDL,G	36	70.2	ug/Kg		<MDL,G	44	87.2	ug/Kg		<MDL,G	35	68.6	ug/Kg
Hexachloroethane		<MDL,G	36	70.2	ug/Kg		<MDL,G	44	87.2	ug/Kg		<MDL,G	35	68.6	ug/Kg
Indeno(1,2,3-Cd)Pyrene	84.3	G	36	70.2	ug/Kg	543	G	44	87.2	ug/Kg		<MDL,G	35	68.6	ug/Kg
Isophorone		<MDL	36	70.2	ug/Kg		<MDL,G	44	87.2	ug/Kg		<MDL	35	68.6	ug/Kg
N-Nitrosodi-N-Propylamine		<MDL	36	70.2	ug/Kg		<MDL,G	44	87.2	ug/Kg		<MDL	35	68.6	ug/Kg
N-Nitrosodimethylamine		<MDL,G	140	211	ug/Kg		<MDL,G	180	262	ug/Kg		<MDL,G	140	206	ug/Kg
N-Nitrosodiphenylamine		<MDL	36	70.2	ug/Kg		<MDL	44	87.2	ug/Kg		<MDL	35	68.6	ug/Kg
Naphthalene		<MDL,G	57	105	ug/Kg	250	G	70	131	ug/Kg		<MDL,G	55	103	ug/Kg
Nitrobenzene		<MDL	36	70.2	ug/Kg		<MDL,G	44	87.2	ug/Kg		<MDL	35	68.6	ug/Kg
Pentachlorophenol		<MDL,G	36	70.2	ug/Kg		<MDL,E,G	44	87.2	ug/Kg		<MDL,G	35	68.6	ug/Kg
Phenanthrene	102	G	21	35.2	ug/Kg	789	G	26	43.7	ug/Kg		<MDL,G	21	34.4	ug/Kg
Phenol		<MDL	140	211	ug/Kg	640	G	180	262	ug/Kg		<MDL	140	206	ug/Kg
Pyrene	179	G	21	35.2	ug/Kg	3960	G	26	43.7	ug/Kg	31	<RDL,G	21	34.4	ug/Kg
M.Code=SW-846 8270 (SIM)															
1,2,4-Trichlorobenzene		<MDL,G	0.91	1.75	ug/Kg		<MDL,G	1.1	2.18	ug/Kg		<MDL,G	0.89	1.71	ug/Kg
1,2-Dichlorobenzene		<MDL,G	0.91	1.75	ug/Kg		<MDL,G	1.1	2.18	ug/Kg		<MDL,G	0.89	1.71	ug/Kg
1,3-Dichlorobenzene		<MDL,G	0.91	1.75	ug/Kg		<MDL,G	1.1	2.18	ug/Kg		<MDL,G	0.89	1.71	ug/Kg
1,4-Dichlorobenzene		<MDL,G	0.91	1.75	ug/Kg		<MDL,G	1.1	2.18	ug/Kg		<MDL,G	0.89	1.71	ug/Kg
Hexachlorobenzene		<MDL,G	0.91	1.75	ug/Kg		<MDL,G	1.1	2.18	ug/Kg		<MDL,G	0.89	1.71	ug/Kg

* indicates wet weight used for th

METALS

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
M.Code=METRO 16-01-001															
Mercury, Total, CVAA	0.05	<RDL	0.024	0.233	mg/Kg	0.334		0.033	0.327	mg/Kg		<MDL	0.024	0.247	mg/Kg
M.Code=METRO 16-02-004															
Aluminum, Total, ICP	10200	L	6.9	34.1	mg/Kg	13700	L	8.7	43	mg/Kg	10800	L	6.6	33.1	mg/Kg
Antimony, Total, ICP		<MDL,G	2.1	10.3	mg/Kg		<MDL,G	2.6	12.9	mg/Kg		<MDL,G	1.9	9.91	mg/Kg
Arsenic, Total, ICP	4	<RDL	3.4	17.1	mg/Kg	7.4	<RDL	4.3	21.4	mg/Kg	3.3	<RDL	3.3	16.5	mg/Kg
Barium, Total, ICP											39.5		0.066	0.331	mg/Kg
Beryllium, Total, ICP	0.16	<RDL	0.069	0.341	mg/Kg	0.21	<RDL	0.087	0.43	mg/Kg	0.24	<RDL	0.066	0.331	mg/Kg
Cadmium, Total, ICP		<MDL	0.21	1.03	mg/Kg	0.49	<RDL	0.26	1.29	mg/Kg		<MDL	0.19	0.991	mg/Kg
Calcium, Total, ICP	3600		3.4	17.1	mg/Kg	4890		4.3	21.4	mg/Kg	3940		3.3	16.5	mg/Kg
Chromium, Total, ICP	14.5		0.34	1.71	mg/Kg	23.2		0.43	2.14	mg/Kg	11.9		0.33	1.65	mg/Kg
Copper, Total, ICP	14.9		0.28	1.37	mg/Kg	45.5		0.34	1.72	mg/Kg	11.5		0.27	1.33	mg/Kg
Iron, Total, ICP	18600	G	3.4	17.1	mg/Kg	22700	G	4.3	21.4	mg/Kg	17400		3.3	16.5	mg/Kg
Lead, Total, ICP	9.6	<RDL	2.1	10.3	mg/Kg	52.9		2.6	12.9	mg/Kg	4.6	<RDL	1.9	9.91	mg/Kg
Magnesium, Total, ICP	4300		2.1	10.3	mg/Kg	5480		2.6	12.9	mg/Kg	3800		1.9	9.91	mg/Kg

King County Environmental Lab Analytical Report

PROJECT: 423056				
Locator:	P53VG4	P53VG5	P53C1
Sampled:	Aug 12, 96	Aug 12, 96	Aug 14, 96
Lab ID:	L9209-9	L9209-10	L9316-1
Matrix:	SALTWTRSED	SALTWTRSED	SALTWTRSED
% Solids:	75.9	61.1	77.7

Parameters	Value	Qual	MDL - Dry Weight Basis	RDL	Units	Value	Qual	MDL - Dry Weight Basis	RDL	Units	Value	Qual	MDL - Dry Weight Basis	RDL	Units
Molybdenum, Total, ICP		<MDL	1.3	6.84	mg/Kg		<MDL	1.8	8.59	mg/Kg		<MDL	1.3	6.6	mg/Kg
Nickel, Total, ICP	13.3		1.3	6.84	mg/Kg	20.1		1.8	8.59	mg/Kg	12		1.3	6.6	mg/Kg
Potassium, Total, ICP	1170		130	684	mg/Kg	1930		180	859	mg/Kg	969		130	660	mg/Kg
Selenium, Total, ICP		<MDL	3.4	17.1	mg/Kg		<MDL	4.3	21.4	mg/Kg		<MDL	3.3	16.5	mg/Kg
Silver, Total, ICP		<MDL	0.28	1.37	mg/Kg	0.7	<RDL	0.34	1.72	mg/Kg		<MDL	0.27	1.33	mg/Kg
Sodium, Total, ICP											3580		33	165	mg/Kg
Thallium, Total, ICP		<MDL	13	68.4	mg/Kg		<MDL	18	85.9	mg/Kg		<MDL	13	66	mg/Kg
Zinc, Total, ICP	48.7		0.34	1.71	mg/Kg	91.7		0.43	2.14	mg/Kg	45.2		0.33	1.65	mg/Kg
* indicates wet weight used for tl															
CONVENTIONALS															
M.Code=PSEP p9															
p+0.00 *	5.7		0.1		%	1.7		0.1		%	3.3		0.1		%
p+1.00 *	36.5		0.1		%	20.2		0.1		%	35		0.1		%
p+10.0 *		<MDL	0.1		%	1.2		0.1		%	0.3		0.1		%
p+10.0(more than) *	1.2		0.1		%	5.8		0.1		%	1.1		0.1		%
p+2.00 *	44.3		0.1		%	36.1		0.1		%	46.5		0.1		%
p+3.00 *	4		0.1		%	9.6		0.1		%	5.9		0.1		%
p+4.00 *	0.7		0.1		%	3		0.1		%	0.8		0.1		%
p+5.00 *	2.1		0.1		%	3.9		0.1		%	1.8		0.1		%
p+6.00 *	0.5		0.1		%	6.2		0.1		%		<MDL	0.1		%
p+7.00 *	0.9		0.1		%	3.7		0.1		%	1.4		0.1		%
p+8.00 *	2.1		0.1		%	5		0.1		%	2.1		0.1		%
p+9.00 *	0.3		0.1		%	2.5		0.1		%	0.7		0.1		%
p-1.00 *	1.4		0.1		%	0.6		0.1		%	0.6		0.1		%
p-2.00 *		<MDL	0.1		%		<MDL	0.1		%	0.1		0.1		%
p-2.00(less than) *	0.2		0.1		%	0.3		0.1		%	0.4		0.1		%
M.Code=SM5310-B															
Total Organic Carbon	2640		6.6	13.2	mg/Kg	25500		8.2	16.4	mg/Kg	3530		6.4	12.9	mg/Kg

* indicates wet weight used for this parameter

King County Environmental Lab Analytical Report

PROJECT: 423056	Locator:	P53C4	Locator:	P53C5
	Sampled:	Aug 14, 96	Sampled:	Aug 15, 96
	Lab ID:	L9316-2	Lab ID:	L9316-3
	Matrix:	SALTWTRSED	Matrix:	SALTWTRSED
	% Solids:	93.7	% Solids:	80.5

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis					- Dry Weight Basis			
ORGANICS										
M.Code=SW-846 8080										
4,4'-DDD		<MDL	1.4	2.85	ug/Kg		<MDL	1.6	3.32	ug/Kg
4,4'-DDE		<MDL	1.4	2.85	ug/Kg		<MDL	1.6	3.32	ug/Kg
4,4'-DDT		<MDL	1.4	2.85	ug/Kg		<MDL	1.6	3.32	ug/Kg
Aldrin		<MDL	1.4	2.85	ug/Kg		<MDL	1.6	3.32	ug/Kg
Alpha-BHC		<MDL	1.4	2.85	ug/Kg		<MDL	1.6	3.32	ug/Kg
Aroclor 1016		<MDL	14	28.5	ug/Kg		<MDL	16	33.2	ug/Kg
Aroclor 1221		<MDL	14	28.5	ug/Kg		<MDL	16	33.2	ug/Kg
Aroclor 1232		<MDL	14	28.5	ug/Kg		<MDL	16	33.2	ug/Kg
Aroclor 1242		<MDL	14	28.5	ug/Kg		<MDL	16	33.2	ug/Kg
Aroclor 1248		<MDL	14	28.5	ug/Kg		<MDL	16	33.2	ug/Kg
Aroclor 1254		<MDL	14	28.5	ug/Kg		<MDL	16	33.2	ug/Kg
Aroclor 1260		<MDL	14	28.5	ug/Kg		<MDL	16	33.2	ug/Kg
Beta-BHC		<MDL	1.4	2.85	ug/Kg		<MDL	1.6	3.32	ug/Kg
Chlordane		<MDL	7.2	14.2	ug/Kg		<MDL	8.3	16.5	ug/Kg
Delta-BHC		<MDL	1.4	2.85	ug/Kg		<MDL	1.6	3.32	ug/Kg
Dieldrin		<MDL	1.4	2.85	ug/Kg		<MDL	1.6	3.32	ug/Kg
Endosulfan I		<MDL	1.4	2.85	ug/Kg		<MDL	1.6	3.32	ug/Kg
Endosulfan II		<MDL	1.4	2.85	ug/Kg		<MDL	1.6	3.32	ug/Kg
Endosulfan Sulfate		<MDL	1.4	2.85	ug/Kg		<MDL	1.6	3.32	ug/Kg
Endrin		<MDL	1.4	2.85	ug/Kg		<MDL	1.6	3.32	ug/Kg
Endrin Aldehyde		<MDL	1.4	2.85	ug/Kg		<MDL	1.6	3.32	ug/Kg
Gamma-BHC (Lindane)		<MDL	1.4	2.85	ug/Kg		<MDL	1.6	3.32	ug/Kg
Heptachlor		<MDL	1.4	2.85	ug/Kg		<MDL	1.6	3.32	ug/Kg
Heptachlor Epoxide		<MDL	1.4	2.85	ug/Kg		<MDL	1.6	3.32	ug/Kg
Methoxychlor		<MDL	7.2	14.2	ug/Kg		<MDL	8.3	16.5	ug/Kg
Toxaphene		<MDL	14	28.5	ug/Kg		<MDL	16	33.2	ug/Kg
M.Code=SW-846 8260										
1,1,1-Trichloroethane										
1,1,2,2-Tetrachloroethane										
1,1,2-Trichloroethane										
1,1,2-Trichloroethylene										
1,1-Dichloroethane										
1,1-Dichloroethylene										
1,2-Dichloroethane										
1,2-Dichloropropane										
2-Butanone (MEK)										
2-Chloroethylvinyl ether										

King County Environmental Lab Analytical Report

PROJECT: 423056

	Locator: P53C4					Locator: P53C5				
	Sampled: Aug 14, 96					Sampled: Aug 15, 96				
	Lab ID: L9316-2					Lab ID: L9316-3				
	Matrix: SALTWTRSED					Matrix: SALTWTRSED				
	% Solids: 93.7					% Solids: 80.5				
Parameters	Value	Qual	MDL - Dry Weight Basis	RDL	Units	Value	Qual	MDL - Dry Weight Basis	RDL	Units
2-Hexanone										
4-Methyl-2-Pentanone (MIBK)										
Acetone										
Acrolein										
Acrylonitrile										
Benzene										
Bromodichloromethane										
Bromoform										
Bromomethane										
Carbon Disulfide										
Carbon Tetrachloride										
Chlorobenzene										
Chlorodibromomethane										
Chloroethane										
Chloroform										
Chloromethane										
Chloromethane										
Cis-1,3-Dichloropropene										
Ethylbenzene										
Methylene Chloride										
Styrene										
Tetrachloroethylene										
Toluene										
Total Xylenes										
Trans-1,2-Dichloroethylene										
Trans-1,3-Dichloropropene										
Trichlorofluoromethane										
Vinyl Acetate										
Vinyl Chloride										
M.Code=SW-846 8270										
1,2-Diphenylhydrazine		<MDL	57	114	ug/Kg		<MDL,G	66	133	ug/Kg
2,4,5-Trichlorophenol		<MDL	120	227	ug/Kg		<MDL,G	140	265	ug/Kg
2,4,6-Trichlorophenol		<MDL	120	227	ug/Kg		<MDL,G	140	265	ug/Kg
2,4-Dichlorophenol		<MDL	29	56.9	ug/Kg		<MDL,G	34	66.2	ug/Kg
2,4-Dimethylphenol		<MDL	29	56.9	ug/Kg		<MDL,G	34	66.2	ug/Kg
2,4-Dinitrophenol		<MDL	57	114	ug/Kg		<MDL,G	66	133	ug/Kg
2,4-Dinitrotoluene		<MDL	12	22.7	ug/Kg		<MDL,G	14	26.5	ug/Kg
2,6-Dinitrotoluene		<MDL	12	22.7	ug/Kg		<MDL,G	14	26.5	ug/Kg
2-Chloronaphthalene		<MDL	17	28.5	ug/Kg		<MDL,G	20	33.2	ug/Kg
2-Chlorophenol		<MDL	57	114	ug/Kg		<MDL,G	66	133	ug/Kg

King County Environmental Lab Analytical Report

PROJECT: 423056

	Locator: P53C4	Locator: P53C5
Sampled:	Aug 14, 96	Aug 15, 96
Lab ID:	L9316-2	L9316-3
Matrix:	SALTWTRSED	SALTWTRSED
% Solids:	93.7	80.5

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis					- Dry Weight Basis			
2-Methylnaphthalene		<MDL	46	85.4	ug/Kg		<MDL,G	53	99.4	ug/Kg
2-Methylphenol		<MDL	29	56.9	ug/Kg		<MDL,G	34	66.2	ug/Kg
2-Nitroaniline		<MDL	120	171	ug/Kg		<MDL,G	140	199	ug/Kg
2-Nitrophenol		<MDL	29	56.9	ug/Kg		<MDL,G	34	66.2	ug/Kg
3,3'-Dichlorobenzidine		<MDL,G	29	56.9	ug/Kg		<MDL,G	34	66.2	ug/Kg
3-Nitroaniline		<MDL	120	171	ug/Kg		<MDL,G	140	199	ug/Kg
4,6-Dinitro-O-Cresol		<MDL	57	114	ug/Kg		<MDL,G	66	133	ug/Kg
4-Bromophenyl Phenyl Ether		<MDL	12	17.1	ug/Kg		<MDL,G	14	19.9	ug/Kg
4-Chloro-3-Methylphenol		<MDL	57	114	ug/Kg		<MDL,G	66	133	ug/Kg
4-Chloroaniline		<MDL,G	57	114	ug/Kg		<MDL,G	66	133	ug/Kg
4-Chlorophenyl Phenyl Ether		<MDL	17	28.5	ug/Kg		<MDL,G	20	33.2	ug/Kg
4-Methylphenol		<MDL	29	56.9	ug/Kg		<MDL,G	34	66.2	ug/Kg
4-Nitroaniline		<MDL	120	171	ug/Kg		<MDL,G	140	199	ug/Kg
4-Nitrophenol		<MDL	57	114	ug/Kg		<MDL,G	66	133	ug/Kg
Acenaphthene		<MDL	12	22.7	ug/Kg		<MDL,G	14	26.5	ug/Kg
Acenaphthylene		<MDL	17	28.5	ug/Kg		<MDL,G	20	33.2	ug/Kg
Aniline		<MDL,G	57	114	ug/Kg		<MDL,G	66	133	ug/Kg
Anthracene		<MDL,G	17	28.5	ug/Kg		<MDL,G	20	33.2	ug/Kg
Benzidine		<MDL,X	680	1370	ug/Kg		<MDL,X,G	800	1590	ug/Kg
Benzo(a)anthracene		<MDL,G	17	28.5	ug/Kg		<MDL,G	20	33.2	ug/Kg
Benzo(a)pyrene		<MDL,G	29	56.9	ug/Kg		<MDL,G	34	66.2	ug/Kg
Benzo(b)fluoranthene		<MDL	46	85.4	ug/Kg		<MDL,G	53	99.4	ug/Kg
Benzo(g,h,i)perylene		<MDL,G	29	56.9	ug/Kg		<MDL,G	34	66.2	ug/Kg
Benzo(k)fluoranthene		<MDL,G	46	85.4	ug/Kg		<MDL,G	53	99.4	ug/Kg
Benzoic Acid		<MDL	120	171	ug/Kg		<MDL,G	140	199	ug/Kg
Benzyl Alcohol		<MDL	29	56.9	ug/Kg		<MDL,G	34	66.2	ug/Kg
Benzyl Butyl Phthalate		<MDL	17	28.5	ug/Kg		<MDL,G	20	33.2	ug/Kg
Bis(2-Chloroethoxy)Methane		<MDL	29	56.9	ug/Kg		<MDL,G	34	66.2	ug/Kg
Bis(2-Chloroethyl)Ether		<MDL	17	28.5	ug/Kg		<MDL,G	20	33.2	ug/Kg
Bis(2-Chloroisopropyl)Ether		<MDL	57	114	ug/Kg		<MDL,G	66	133	ug/Kg
Bis(2-Ethylhexyl)Phthalate		<MDL	17	28.5	ug/Kg		<MDL,G	20	33.2	ug/Kg
Carbazole		<MDL	29	56.9	ug/Kg		<MDL,G	34	66.2	ug/Kg
Chrysene		<MDL	17	28.5	ug/Kg		<MDL,G	20	33.2	ug/Kg
Coprostanol		<MDL,E	120	171	ug/Kg		<MDL,G,E	140	199	ug/Kg
Di-N-Butyl Phthalate		<MDL	29	56.9	ug/Kg		<MDL,G	34	66.2	ug/Kg
Di-N-Octyl Phthalate		<MDL	17	28.5	ug/Kg		<MDL,G	20	33.2	ug/Kg
Dibenzo(a,h)anthracene		<MDL	46	85.4	ug/Kg		<MDL,G	53	99.4	ug/Kg
Dibenzofuran		<MDL	29	56.9	ug/Kg		<MDL,G	34	66.2	ug/Kg
Diethyl Phthalate		<MDL	29	56.9	ug/Kg		<MDL,G	34	66.2	ug/Kg
Dimethyl Phthalate		<MDL	12	17.1	ug/Kg		<MDL,G	14	19.9	ug/Kg

King County Environmental Lab Analytical Report

PROJECT: 423056

	Locator: P53C4	Locator: P53C5
Sampled:	Aug 14, 96	Aug 15, 96
Lab ID:	L9316-2	L9316-3
Matrix:	SALTWTRSED	SALTWTRSED
% Solids:	93.7	80.5

Parameters	Value	Qual	MDL - Dry Weight Basis	RDL	Units	Value	Qual	MDL - Dry Weight Basis	RDL	Units
Fluoranthene		<MDL,G	17	34.2	ug/Kg		<MDL,G	20	39.8	ug/Kg
Fluorene		<MDL,G	17	28.5	ug/Kg		<MDL,G	20	33.2	ug/Kg
Hexachlorobutadiene		<MDL,G	29	56.9	ug/Kg		<MDL,G	34	66.2	ug/Kg
Hexachlorocyclopentadiene		<MDL,G	29	56.9	ug/Kg		<MDL,G	34	66.2	ug/Kg
Hexachloroethane		<MDL,G	29	56.9	ug/Kg		<MDL,G	34	66.2	ug/Kg
Indeno(1,2,3-Cd)Pyrene		<MDL,G	29	56.9	ug/Kg		<MDL,G	34	66.2	ug/Kg
Isophorone		<MDL	29	56.9	ug/Kg		<MDL,G	34	66.2	ug/Kg
N-Nitrosodi-N-Propylamine		<MDL	29	56.9	ug/Kg		<MDL,G	34	66.2	ug/Kg
N-Nitrosodimethylamine		<MDL,G	120	171	ug/Kg		<MDL,G	140	199	ug/Kg
N-Nitrosodiphenylamine		<MDL	29	56.9	ug/Kg		<MDL,G	34	66.2	ug/Kg
Naphthalene		<MDL,G	46	85.4	ug/Kg		<MDL,G	53	99.4	ug/Kg
Nitrobenzene		<MDL	29	56.9	ug/Kg		<MDL,G	34	66.2	ug/Kg
Pentachlorophenol		<MDL,G	29	56.9	ug/Kg		<MDL,G	34	66.2	ug/Kg
Phenanthrene		<MDL,G	17	28.5	ug/Kg		<MDL,G	20	33.2	ug/Kg
Phenol		<MDL	120	171	ug/Kg		<MDL,G	140	199	ug/Kg
Pyrene		<MDL,G	17	28.5	ug/Kg		<MDL,G	20	33.2	ug/Kg
M.Code=SW-846 8270 (SIM)										
1,2,4-Trichlorobenzene		<MDL,G	0.74	1.42	ug/Kg		<MDL,G	0.86	1.65	ug/Kg
1,2-Dichlorobenzene		<MDL,G	0.74	1.42	ug/Kg		<MDL,G	0.86	1.65	ug/Kg
1,3-Dichlorobenzene		<MDL,G	0.74	1.42	ug/Kg		<MDL,G	0.86	1.65	ug/Kg
1,4-Dichlorobenzene		<MDL,G	0.74	1.42	ug/Kg		<MDL,G	0.86	1.65	ug/Kg
Hexachlorobenzene		<MDL,G	0.74	1.42	ug/Kg		<MDL,G	0.86	1.65	ug/Kg

* indicates wet weight used for tł

METALS

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
M.Code=METRO 16-01-001										
Mercury, Total, CVAA		<MDL	0.02	0.199	mg/Kg		<MDL	0.025	0.243	mg/Kg
M.Code=METRO 16-02-004										
Aluminum, Total, ICP	9380	L	5.3	26.9	mg/Kg	9020	L	6.1	30.7	mg/Kg
Antimony, Total, ICP		<MDL,G	1.6	8.06	mg/Kg		<MDL,G	1.9	9.2	mg/Kg
Arsenic, Total, ICP	2.9	<RDL	2.7	13.4	mg/Kg	5.5	<RDL	3.1	15.3	mg/Kg
Barium, Total, ICP	32.3		0.053	0.269	mg/Kg	50.6		0.061	0.307	mg/Kg
Beryllium, Total, ICP	0.22	<RDL	0.053	0.269	mg/Kg	0.22	<RDL	0.061	0.307	mg/Kg
Cadmium, Total, ICP		<MDL	0.16	0.806	mg/Kg		<MDL	0.19	0.92	mg/Kg
Calcium, Total, ICP	3070		2.7	13.4	mg/Kg	2920		3.1	15.3	mg/Kg
Chromium, Total, ICP	11.8		0.27	1.34	mg/Kg	12.9		0.31	1.53	mg/Kg
Copper, Total, ICP	10.6		0.21	1.08	mg/Kg	10.5		0.25	1.23	mg/Kg
Iron, Total, ICP	16500		2.7	13.4	mg/Kg	18000		3.1	15.3	mg/Kg
Lead, Total, ICP	4.4	<RDL	1.6	8.06	mg/Kg	4.3	<RDL	1.9	9.2	mg/Kg
Magnesium, Total, ICP	3700		1.6	8.06	mg/Kg	3900		1.9	9.2	mg/Kg

King County Environmental Lab Analytical Report

PROJECT: 423056

	Locator: P53C4 Sampled: Aug 14, 96 Lab ID: L9316-2 Matrix: SALTWTRSED % Solids: 93.7					Locator: P53C5 Sampled: Aug 15, 96 Lab ID: L9316-3 Matrix: SALTWTRSED % Solids: 80.5				
Parameters	Value	Qual	MDL - Dry Weight Basis	RDL	Units	Value	Qual	MDL - Dry Weight Basis	RDL	Units
Molybdenum, Total, ICP		<MDL	1.1	5.38	mg/Kg		<MDL	1.2	6.14	mg/Kg
Nickel, Total, ICP	11.6		1.1	5.38	mg/Kg	11.2		1.2	6.14	mg/Kg
Potassium, Total, ICP	952		110	538	mg/Kg	984		120	614	mg/Kg
Selenium, Total, ICP		<MDL	2.7	13.4	mg/Kg		<MDL	3.1	15.3	mg/Kg
Silver, Total, ICP		<MDL	0.21	1.08	mg/Kg		<MDL	0.25	1.23	mg/Kg
Sodium, Total, ICP	1540		27	134	mg/Kg	3200		31	153	mg/Kg
Thallium, Total, ICP		<MDL	11	53.8	mg/Kg		<MDL	12	61.4	mg/Kg
Zinc, Total, ICP	47.4		0.27	1.34	mg/Kg	45.5		0.31	1.53	mg/Kg
* indicates wet weight used for tl										
CONVENTIONALS										
M.Code=PSEP p9										
p+0.00 *	5.2		0.1		%	5.5		0.1		%
p+1.00 *	36.8		0.1		%	38		0.1		%
p+10.0 *		<MDL	0.1		%		<MDL	0.1		%
p+10.0(more than) *		<MDL	0.1		%	3.1		0.1		%
p+2.00 *	48.3		0.1		%	46.6		0.1		%
p+3.00 *	4.5		0.1		%	3.5		0.1		%
p+4.00 *	0.3		0.1		%	0.4		0.1		%
p+5.00 *	0.3		0.1		%		<MDL	0.1		%
p+6.00 *		<MDL	0.1		%		<MDL	0.1		%
p+7.00 *	0.3		0.1		%		<MDL	0.1		%
p+8.00 *	2		0.1		%	0.5		0.1		%
p+9.00 *	0.3		0.1		%	0.1		0.1		%
p-1.00 *	1.3		0.1		%	1.1		0.1		%
p-2.00 *	0.1		0.1		%	0.1		0.1		%
p-2.00(less than) *	0.4		0.1		%	1.1		0.1		%
M.Code=SM5310-B										
Total Organic Carbon	1600		5.3	10.7	mg/Kg	2970		6.2	12.4	mg/Kg

* indicates wet weight used for this parameter

APPENDIX D

1994 CHEMISTRY DATA

TABLE OF CONTENTS

METRO Environmental Laboratory Quality Assurance Review

INTRODUCTION

This QA review accompanies data from samples submitted to the METRO Environmental Laboratory from the consultant Hart Crowser Inc. of Seattle Washington. This QA review is organized into four sections, as follows:

- General Comments
- Conventionals
- Metals
- Organics

An overview of the approach used for this QA review is detailed in the *General Comments* section which follows. Additional comments specific to each analysis are included in the appropriate section for that analysis.

This QA1 review has been conducted in accordance with guidelines established thorough the PSDDA program, primarily in the *Puget Sound Dredged Disposal Analysis Guidance Manual, Data Quality Evaluation for Proposed Dredged Material Disposal Projects*. Additionally, many of the approaches incorporated in this QA1 review have been established through collaboration between METRO and the Washington Department of Ecology Sediment Management Unit.

GENERAL COMMENTS

SCOPE OF SAMPLES SUBMITTED

This Quality Assurance Review is associated with Marine Sediment samples taken on 28 July and 29 July of 1994. These samples were taken in support of on-going studies conducted at Pier 53. Except where noted in the subcontracting sections of this QA review, all analyses have been conducted at the METRO Environmental Laboratory. The data are reported with associated data qualifiers and have undergone QA1 review, as summarized in this narrative report.

COMPLETENESS

Completeness has been evaluated for this data submission and QA review by considering the following criteria:

- Comparing available data with the planned project analytical scheme.
- Compliance with storage conditions, preservation requirements and hold times.
- A complete set of QC samples should be associated with each analysis.

Instances where these conditions are not met are noted in the appropriate section of this narrative.

METHODS

Methods are noted in the appropriate sections of this QA review.

TARGET LIST

The reported target list has been compared to the substances listed on the *Sediment Quality Standards-Chemical Criteria* to ensure that all applicable parameters have been analyzed, reported and included in this QA review.

DETECTION LIMITS

Achieved detection limits have been compared to the *Sediment Quality Standards-Chemical Criteria* to ensure that reported detection limits are sufficient to compare the reported data to the criteria values. This comparison is summarized in the appropriate sections of this report.

The METRO lab distinguishes between the Method Detection Limit (MDL) and the Reporting Detection Limit (RDL).

- The RDL is defined as the *minimum concentration of a constituent that can be reliably quantified.*
- The MDL is defined as *the minimum concentration of a constituent that can be detected.*

Some subcontractor data is available with an MDL only, in accordance with the subcontracting lab policies. All analytical data is reported with either a result or a detection limit.

HOLDING CONDITIONS AND TIMES

Holding conditions and times have been evaluated using guidelines established during the *Third Annual PSDDA Review Meeting.*

METHOD BLANK

Method blanks have been evaluated for the presence of positive results at or greater than the MDL. These instances and the qualification of the associated data are noted in the appropriate section.

STANDARD REFERENCE MATERIAL

Data have been qualified based on available SRM results. Instances of data reported without associated SRM analysis are noted in the narrative.

REPLICATES

Data have been qualified based on available replicate results. However, not all replicate data have been used as an indicator for data qualification. Only sets of replicate results which contain at least one result significantly greater than the MDL have been considered for data qualification. Where an RDL is present, only replicate data that contains at least one result greater than the RDL have been considered for data qualification. These guidelines have been used to account for the fact that precision obtained near the MDL is not representative of precision obtained throughout the entire analytical range.

MATRIX SPIKES

Matrix spikes have been used to qualify data for both organics and metals data. Matrix spikes are not required for conventionals parameters.

DATA QUALIFIERS

The data qualification system used for this data submission is listed in Table 2 of this QA review. These data qualifiers address situations which require qualification, according to QA1 guidance. The exact qualifiers used generally conform to QA1 guidance. METRO qualifiers indicating <MDL and <RDL have been used as replacements for the *T* and *U* specified under QA1 guidance.

UNITS AND SIGNIFICANT FIGURES

Data have been reported in accordance with lab policy at the time of data generation. When an RDL and MDL are reported, data have been reported to three significant figures above the RDL, and two significant figures equal to or below the RDL. Data with only an MDL have been reported to two significant figures.

All inorganic analytical results are reported in mg/Kg on a dry weight basis, whereas organic results are in ug/Kg on a dry weight basis.

Data is stored in wet weight basis on the data base and converted to dry weight basis during the reporting process. Should only one reported digit be available, rounding error can be significant. This rounding error can occur during the conversion from wet to dry weight.

SUBCONTRACTING

Analysis which have been subcontracted, and the issues associated with these subcontracted analyses are noted in this narrative. Note that the following parameter has always been submitted to a subcontractor for analysis:

- total organic carbon

CONVENTIONALS

COMPLETENESS

Results for all requested parameters are included in this report.

A total of 7 samples were analyzed for total solids (TOTS), particle size distribution (PSD) and total organic carbon (TOC). A complete set of QC samples are reported for all parameters.

Hold time exceedances occurred for some of the parameters and are discussed further in the hold time section.

SUBCONTRACTING

PSD was subcontracted to AmTest Inc. in Redmond, Washington.

METHODS

For TOC, PSEP (page 23) was used for preparation and SW 9060 was used for analysis. Please note that SM 5310-B is referenced for TOC analysis. The comprehensive report method code refers to the analytical method which is equivalent to the SW 9060 used to determine the TOC data. For Percent Solids, SM 2540 was used to perform the analysis. For PSD, PSEP (page 9) was used to perform the analysis. The optional peroxide digestion was not used, and particle size distribution was determined on the entire sample.

TARGET LIST

The reported phi size target list for particle size distribution corresponds to data obtained from the subcontracting laboratory.

DETECTION LIMITS

A positive result has been reported for all TOTS and TOC analyses. An MDL and RDL are reported for TOC. A positive result or MDL has been reported for all PSD phi sizes.

HOLDING CONDITIONS AND TIMES

All the analyses for PSD were completed within the recommended holding times for analysis. For PSD the recommended holding time is six months for refrigerated samples.

All the analyses for TOC and total solids were completed within 28 days of receipt. Twenty eight days is a commonly recognized hold time for these parameters. For this project, however, the recommended holding time for TOC and total solids analysis is 14 days for refrigerated samples. The analysis was not completed within the required 14 days. Note that these samples were received by the METRO lab well into the specified hold time.

METHOD BLANK

One unique method blank has been reported for TOC analysis. There is no indication of positive bias in the method blank results, and the data have not been qualified because of method blank contamination. Similarly for TOTS, one unique blank has been reported with no apparent positive bias.

STANDARD REFERENCE MATERIAL

One TOC SRM sample has been reported in association with the reported samples. The percent recovery was acceptable and well within the 80-120% range used to indicate data qualification.

REPLICATES

For TOC, one triplicate has been included in the data submission. The RSD was within acceptance windows. The TOC data have not been qualified based on the analytical results of sample replicates.

For TOTS, one triplicate sample has been included in the data submission. The RSD was well within the acceptance windows. Percent solids have not been qualified based on the analytical results of sample replicate or triplicates.

For PSD, one triplicate sample has been included in the data submission. The RSD for a number of phi sizes was well outside the acceptable window. Poor precision was observed throughout the range without a consistent pattern. All PSD data have been qualified with the data qualifier E.

UNITS AND SIGNIFICANT FIGURES

Data are reported in accordance with lab policy at the time of data generation.

TOC data are reported in ppm on a dry weight basis. Total Solids and PSD data are reported in percent.

METALS

COMPLETENESS

Data are reported for all parameters listed in Table 1. These data have been evaluated for completeness, and those comments are noted below.

All metal samples reported in this data submission have been analyzed in conjunction with a Standard Reference Material, Method Blank and Replicate. The sample selected for QC is a part of this data submission.

Sample storage conditions were not complaint for samples reported in this data submission. Further discussion will be addressed in the "hold time " section.

METHODS

The descriptive heading information "M.Code=" on the data report associates the elements in this data set with the specific method used for trace metals determination. The methods and their associated *M. CODE* used for the analysis of trace metals in this data set are listed in the table below .

Listing of Metals Methods

M.CODE	METHOD
PE	EPA Method 3050/6010
CV	EPA Method 7471

TARGET LIST

The reported target list contains all *Sediment Quality Standards-Chemical Criteria* metals for all samples. Additional metals have been reported as available.

DETECTION LIMITS

A positive result, MDL and RDL have been reported for all metals. All reported detection limits for metals analysis are below *Sediment Quality Standards-Chemical Criteria* for metals.

HOLDING CONDITIONS AND TIMES

Sample storage conditions have been evaluated using guidelines established during the *Third Annual PSDDA Review Meeting*. The criteria used to evaluate storage conditions for these analyses are listed in the table below.

PARAMETER	FROZEN HOLD TIME	REFRIGERATED HOLD TIME	COMMENT
metals	2 years	6 months	*psdda guidance*
mercury	28 days	not recommended	*none*

All metals samples reported in this data submission were placed into refrigeration after collection and had never been frozen. Refrigeration is a commonly approved storage technique for mercury but is not approved for this program. Sample preparation and analysis for Mercury was completed within 21 days after samples were collected.

METHOD BLANK

Method blank contamination was not factor affecting data quality. All method blank results were below the MDL.

Metals results are not corrected for the concentrations of metals determined in the method blanks.

STANDARD REFERENCE MATERIAL

The reference materials analyzed in association with reported METRO analytical results are listed below:

SRM	Comment
NR CC-PACS 1	does not contain silver

SRM Recovery of less than 80% has not been used as an indicator to qualify associated data. This is due to the fact that the digestion technique used for the reported samples is different from the one used to determine the SRM certified values.

SRM recovery of less than 80% and concurrent/compliant matrix spike recovery of greater than 75% was observed for the following elements: Cd, Cr, Ni. In accordance with qualification criteria outlined in this section and Table 2, associated data were not qualified.

SRM recovery of less than 50% was observed for Sb. Instances where the SRM recovery is below 50% are noted in the table below:

AFFECTED SAMPLES	SRM RECOVERY	MATRIX SPIKE RECOVERY
L4298-1 to L4298-7	Sb=39%	Sb=34%

REPLICATES

In general, reported RPD's for replicate samples included in this QA review are compliant and have not resulted in data qualification. Data associated with replicate RPD of greater than 20% have been qualified with the data qualifier "E".

MATRIX SPIKES

Note that matrix spike recoveries have also been included in the SRM recovery discussion.

Data associated with matrix spike recoveries which have not met the 75% to 125% criteria have been qualified with either the "G" or "L" flag, whichever is appropriate.

Matrix spike recoveries of note are listed in the Table below:

SAMPLES	COMMENT
L4298-1 to L4298-7	Mn=178% matrix spike, qualified with L Sb=34% matrix spike, qualified with G

UNITS AND SIGNIFICANT FIGURES

Data are reported in accordance with lab policy at the time of data generation. Metals sample results are reported in units of mg/Kg on a dry weight basis. Date are reported to three significant figures above the RDL and two significant figures when equal to or below the RDL.

Note that quality control samples such as spikes, duplicates and SRM material are reported in units of mg/L. This does not indicate that these quality control samples were performed on a water matrix. Rather, sufficient information was available in the reported format (mg/L) to calculate information such as percent recoveries and qualify the data as needed. Because sufficient information was available to qualify the data, the data has not been calculated on a soil basis. Based on method dilution factors, the reported data may be converted to a soil basis by multiplying by a factor of 50. This calculation assumes a typical sample size of 1 gram wet weight and a final volume of 50 mL.

ORGANICS

COMPLETENESS

Data are reported for all parameters listed in Table 1. These data have been evaluated for completeness, and those comments are noted below.

All samples are accompanied by a method blank and reported surrogate recoveries. All samples are accompanied by a matrix spike and matrix spike duplicate. Note that for BNA and pesticides the marine sediment sample selected for spiking is not a sample from this sample set. These MS/MSD have been spiked and analyzed for all target compounds for BNA and volatiles. The spike target list for the pesticides matrix spike includes nearly all target compounds. The non spike list for pesticides is indicated in the QC summary. Replicate and SRM samples have not been analyzed with this data submission. Note that the matrix spike duplicate recoveries provide useful information regarding replication of results.

All samples were analyzed within hold time.

METHODS

Analyses were performed in accordance with EPA methods SW-846, -8270, -8080, -8260 for BNA, PEST/PCB, and VOA, respectively.

TARGET LIST

The BNA target list includes all *Sediment Quality Standards-Chemical Criteria* compounds with the exception of benzo(j)fluoranthene. Note that all three of the benzo-fluoranthene isomers elute in the same region of the chromatogram. The organics section has verified that the analytical conditions used are sufficient to calculate a total benzo-fluoranthene result using the *b* and *k* isomers reported.

Because there are no *Sediment Quality Standards-Chemical Criteria* for pesticides and volatiles, these target lists have been compared to the PSDDA Chemicals of Concern list.

The reported pesticides target list complies with the PSDDA pesticides of concern. It should be noted that DDT, DDE, and DDD have been reported as p,p' isomers. The reported PCB data includes Aroclors 1016, 1221, 1232, 1242, 1248, 1254, and 1260.

The reported volatile organics target list includes all of the PSDDA volatile compounds of concern.

DETECTION LIMITS

A positive result, MDL, and RDL have been reported for all organics parameters. In general, reported detection limits for organics analysis are below *Sediment Quality Standards-Chemical Criteria* for organics. Note that TOC normalized detection limits for chlorinated benzenes generally exceed SQS criteria. Additionally, the detection limit for 2,4-dimethyl phenol exceeds the SQS criteria.

HOLDING CONDITIONS AND TIMES

Sample storage conditions have been evaluated using guidelines established during the *Third Annual PSDDA Review Meeting*. The criteria used to evaluate storage conditions for these analyses are listed in the table below.

PARAMETER	FROZEN HOLD TIME	REFRIGERATED HOLD TIME	COMMENT
volatiles	NA	14 days	*none*
BNA	1 year	14 days	*40 days to analyze*
pesticides/PCB	1 year	14 days	*40 days to analyze*

All samples were analyzed within hold time.

METHOD BLANK

No contaminants were detected in any PEST/PCB method blanks. Where contaminants were detected in method blanks the associated data have been qualified with "B".

Significant method blank contamination issues are noted in the table below:

SAMPLES	Comment
L4298-1 through L4298-7	Bis(2-ethylhexyl)phthalate and Di-N-butylphthalate >MDL, samples qualified with B
L4298-1, L4298-3, L4298-4, L4298-5, L4298-7	Methylene chloride, Chloroform, Acetone, 1,1,2,2-Tetrachloroethane >MDL, samples qualified with B
L4298-2, L4298-6	Methylene chloride , chloroform, acetone> MDL, samples qualified with B

STANDARD REFERENCE MATERIAL

No SRM was extracted with this data set.

REPLICATES

Sample replicates were not analyzed for organics parameters for this data submission. Matrix spike replicates were analyzed and are reported with this data submission. Matrix spike and matrix spike replicate recoveries and RPD of those recoveries were calculated and this data is included in this QA review. Data have not been qualified due to MS/MSD RPD.

MATRIX SPIKES

Data requiring qualification due to non-compliant matrix spike recovery are summarized in the tables below:

Summary of VOA Matrix Spike Recoveries Outside Acceptance Limits

SITUATION	COMPOUNDS	SAMPLES AFFECTED
matrix spike recoveries >150%, compounds qualified with L	Acetone, MEK,	L4298-1 through L4298-7
matrix spike recoveries <50%, compound qualified with G	Vinyl acetate	L4298-1 through L4298-7
matrix spike recoveries <10%, compounds qualified with X	Acrolein	L4298-1 through L4298-7

Summary of BNA Matrix Spike Recoveries Outside Acceptance Limits

SITUATION	COMPOUNDS	SAMPLES AFFECTED
matrix spike recoveries <50%, compounds qualified with G	Hexachloroethane, Benzo(g,h,i)perylene, 4-Chloroaniline, 4-Nitroaniline	L4298-1 through L4298-7
matrix spike recoveries >150%, compounds qualified with L	2,4,6-trichlorophenol, 4-Nitrophenol, 1,2-Diphenylhydrazine, Carbazole	L4298-1 through L4298-7
matrix spike recoveries <10%, compounds qualified with X	Hexachlorocyclopentadiene, Benzidine, 3,3'-Dichlorobenzidine Aniline	L4298-1 through L4298-7

Summary of Pest/PCB Matrix Spike Recoveries Outside Acceptance Limits

SITUATION	COMPOUNDS	SAMPLES AFFECTED
matrix spike recoveries >150%, compounds qualified with L	Aroclor 1260	L4298-1 through L4298-7

Note that the high aroclor 1260 recovery appears to be due, at least in part, to poor sample homogeneity.

UNITS AND SIGNIFICANT FIGURES

Data are reported in accordance with lab policy at the time of data generation. Organics results are reported in ug/Kg on a dry weight basis. Results above the RDL are reported to three significant figures. Results equal to or below the RDL are reported to two significant figures.

Note that quality control samples such as spikes, duplicates and SRM material are reported in units of mg/L. This does not indicate that these quality control samples were performed on a water matrix. Rather, sufficient information was available in the reported format (mg/L) to calculate information such as percent recoveries and qualify the data as needed.

SURROGATES

Surrogate recoveries for all parameters and samples analyzed were within QC limits with the exception of the following:

Summary of Non Compliant Surrogate Recoveries

SITUATION	COMPOUNDS	SAMPLE AFFECTED
BNA Surrogate recoveries >150%	2,4,6, tribromophenol	L4298-1 through L4298-7

The above instances do not meet criteria for qualification as detailed in Table 2. Only when all surrogates for a fraction are non compliant are criteria met for data qualification.

Table 1 page 1 of 1

Sample Inventory for Pier 53/Hart Crowser 1994
Project A44703

STATION	SAMPLE DEPTH IN CM.	SAMPLE DATE	LATITUDE	LONGITUDE	SAMPLE NUMBER	BNA	VOA	PEST/PCB	METAL	PERCENT SOLIDS	TOC	PSD
P53VG1	0-10 cm	940729	47 36' 14"	122 20' 24"	4298-1	X	X	X	X	X	X	X
P53VG3	0-10 cm	940728	47 36' 17"	122 20' 25"	4298-2	X	X	X	X	X	X	X
P53VG5	0-10 cm	940729	47 36' 14"	122 20' 21"	4298-3	X	X	X	X	X	X	X
P53VG6	0-10 cm	940729	47 36' 15"	122 20'22"	4298-4	X	X	X	X	X	X	X
P53VG8	0-10 cm	940729	47 36' 12"	122 20' 23"	4298-5	X	X	X	X	X	X	X
P53VG10	0-10 cm	940729	47 36' 13"	122 20' 19"	4298-6	X	X	X	X	X	X	X
P53VG11	0-10 cm	940729	47 36' 13"	122 20' 20"	4298-7	X	X	X	X	X	X	X

Table 2. Summary of Data Qualifiers Used

Condition to Qualify	SEDQUAL Qualifier	Organics QC Limits	Metals QC Limits	Conventionals QC Limits	METRO Equivalent Qualifier
very low matrix spike recovery	X	< 10 %	< 10 %	NA	X
low matrix spike recovery	G	< 50%	< 75%	NA	G
high matrix spike recovery	L	> 150%	>125%	NA	L
low SRM recovery	G	SRM not available	NA	< 80%*	G
high SRM recovery	L	SRM not available	>120%	>120%*	L
high duplicate RPD	E	>100 %	>20%	> 20 %	E, estimated
high triplicate RSD	E	> 100%	NA	> 20 %	E, estimated
less than the reporting detection limit	T	NA	NA	NA	< RDL
less than the method detection limit	U	NA	NA	NA	< MDL
contamination reported in blank	B	> MDL	> MDL	> MDL	B
very biased data, based on surrogate recoveries	X	all fraction surrogates are <10%	NA	NA	X
biased data, based on surrogate recoveries	E	all fraction surrogates are < 50% or >150%	NA	NA	E, estimated
estimate based on presumptive evidence	N	NA	NA	NA	J# used to indicate the presence of TIC's
rejected, unusable for all purposes	R	NA	NA	NA	R

* Note that PSDDA guidance uses a 95% confidence window for this parameter/qualification.

METRO Environmental Lab Analytical Report

PROJECT: A44703

	P53VG1	P53VG3	P53VG5
Locator:	P53VG1	P53VG3	P53VG5
Sampled:	Jul 29, 94	Jul 28, 94	Jul 29, 94
Lab ID:	L4298-1	L4298-2	L4298-3
Matrix:	SALTWTRSED	SALTWTRSED	SALTWTRSED
% Solids:	80.7	61.7	62.5

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis			
ORGANICS															
M.Code=SW-846 8080															
4,4'-DDD		<MDL	1.6	3.31	ug/Kg		<MDL	2.1	4.33	ug/Kg	11.1		2.1	4.27	ug/Kg
4,4'-DDE		<MDL	1.6	3.31	ug/Kg		<MDL	2.1	4.33	ug/Kg	5.18		2.1	4.27	ug/Kg
4,4'-DDT		<MDL	1.6	3.31	ug/Kg		<MDL	2.1	4.33	ug/Kg	288		2.1	4.27	ug/Kg
Aldrin		<MDL	1.6	3.31	ug/Kg		<MDL	2.1	4.33	ug/Kg		<MDL	2.1	4.27	ug/Kg
Alpha-BHC		<MDL	1.6	3.31	ug/Kg		<MDL	2.1	4.33	ug/Kg		<MDL	2.1	4.27	ug/Kg
Aroclor 1016		<MDL	16	33.1	ug/Kg		<MDL	21	43.3	ug/Kg		<MDL	21	42.7	ug/Kg
Aroclor 1221		<MDL	16	33.1	ug/Kg		<MDL	21	43.3	ug/Kg		<MDL	21	42.7	ug/Kg
Aroclor 1232		<MDL	16	33.1	ug/Kg		<MDL	21	43.3	ug/Kg		<MDL	21	42.7	ug/Kg
Aroclor 1242		<MDL	16	33.1	ug/Kg		<MDL	21	43.3	ug/Kg		<MDL	21	42.7	ug/Kg
Aroclor 1248		<MDL	16	33.1	ug/Kg		<MDL	21	43.3	ug/Kg		<MDL	21	42.7	ug/Kg
Aroclor 1254		<MDL	16	33.1	ug/Kg		<MDL	21	43.3	ug/Kg	37	<RDL	21	42.7	ug/Kg
Aroclor 1260		<MDL,L	16	33.1	ug/Kg	29	<RDL,L	21	43.3	ug/Kg	43.4	L	21	42.7	ug/Kg
Beta-BHC		<MDL	1.6	3.31	ug/Kg		<MDL	2.1	4.33	ug/Kg		<MDL	2.1	4.27	ug/Kg
Chlordane		<MDL	9.9	16.5	ug/Kg		<MDL	13	21.6	ug/Kg		<MDL	13	21.3	ug/Kg
Delta-BHC		<MDL	1.6	3.31	ug/Kg		<MDL	2.1	4.33	ug/Kg		<MDL	2.1	4.27	ug/Kg
Dieldrin		<MDL	1.6	3.31	ug/Kg		<MDL	2.1	4.33	ug/Kg		<MDL	2.1	4.27	ug/Kg
Endosulfan I		<MDL	1.6	3.31	ug/Kg		<MDL	2.1	4.33	ug/Kg		<MDL	2.1	4.27	ug/Kg
Endosulfan II		<MDL	1.6	3.31	ug/Kg		<MDL	2.1	4.33	ug/Kg		<MDL	2.1	4.27	ug/Kg
Endosulfan Sulfate		<MDL	1.6	3.31	ug/Kg		<MDL	2.1	4.33	ug/Kg		<MDL	2.1	4.27	ug/Kg
Endrin		<MDL	1.6	3.31	ug/Kg		<MDL	2.1	4.33	ug/Kg		<MDL	2.1	4.27	ug/Kg
Endrin Aldehyde		<MDL	1.6	3.31	ug/Kg		<MDL	2.1	4.33	ug/Kg		<MDL	2.1	4.27	ug/Kg
Gamma-BHC (Lindane)		<MDL	1.6	3.31	ug/Kg		<MDL	2.1	4.33	ug/Kg		<MDL	2.1	4.27	ug/Kg
Heptachlor		<MDL	1.6	3.31	ug/Kg		<MDL	2.1	4.33	ug/Kg		<MDL	2.1	4.27	ug/Kg
Heptachlor Epoxide		<MDL	1.6	3.31	ug/Kg		<MDL	2.1	4.33	ug/Kg		<MDL	2.1	4.27	ug/Kg
Methoxychlor		<MDL	9.9	16.5	ug/Kg		<MDL	13	21.6	ug/Kg		<MDL	13	21.3	ug/Kg
Toxaphene		<MDL	16	33.1	ug/Kg		<MDL	21	43.3	ug/Kg		<MDL	21	42.7	ug/Kg
M.Code=SW-846 8260															
1,1,1-Trichloroethane		<MDL	6.2	12.4	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	8	16	ug/Kg
1,1,2,2-Tetrachloroethane		<MDL,B	6.2	12.4	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL,B	8	16	ug/Kg
1,1,2-Trichloroethane		<MDL	6.2	12.4	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	8	16	ug/Kg
1,1,2-Trichloroethylene		<MDL	6.2	12.4	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	8	16	ug/Kg
1,1-Dichloroethane		<MDL	6.2	12.4	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	8	16	ug/Kg
1,1-Dichloroethylene		<MDL	6.2	12.4	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	8	16	ug/Kg
1,2-Dichloroethane		<MDL	6.2	12.4	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	8	16	ug/Kg
1,2-Dichloropropane		<MDL	6.2	12.4	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	8	16	ug/Kg
2-Butanone (MEK)		<MDL,L	31	62	ug/Kg		<MDL,L	41	81	ug/Kg	45	<RDL,L	40	80	ug/Kg
2-Chloroethylvinyl ether		<MDL	6.2	12.4	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	8	16	ug/Kg
2-Hexanone		<MDL	31	62	ug/Kg		<MDL	41	81	ug/Kg		<MDL	40	80	ug/Kg
4-Methyl-2-Pentanone (MIBK)		<MDL	31	62	ug/Kg		<MDL	41	81	ug/Kg		<MDL	40	80	ug/Kg
Acetone	78.4	B,L	31	62	ug/Kg	79	<RDL,B,L	41	81	ug/Kg	174	B,L	40	80	ug/Kg
Acrolein		<MDL,X	31	62	ug/Kg		<MDL,X	41	81	ug/Kg		<MDL,X	40	80	ug/Kg
Acrylonitrile		<MDL	31	62	ug/Kg		<MDL	41	81	ug/Kg		<MDL	40	80	ug/Kg

METRO Environmental Lab Analytical Report

PROJECT: A44703

	Locator: P53VG1	Locator: P53VG3	Locator: P53VG5
	Sampled: Jul 29, 94	Sampled: Jul 28, 94	Sampled: Jul 29, 94
	Lab ID: L4298-1	Lab ID: L4298-2	Lab ID: L4298-3
	Matrix: SALTWTRSED	Matrix: SALTWTRSED	Matrix: SALTWTRSED
	% Solids: 80.7	% Solids: 61.7	% Solids: 62.5

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis			
Benzene		<MDL	6.2	12.4	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	8	16	ug/Kg
Bromodichloromethane		<MDL	6.2	12.4	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	8	16	ug/Kg
Bromoform		<MDL	6.2	12.4	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	8	16	ug/Kg
Bromomethane		<MDL	6.2	12.4	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	8	16	ug/Kg
Carbon Disulfide		<MDL	6.2	12.4	ug/Kg		<MDL	8.1	16.2	ug/Kg	9.8	<RDL	8	16	ug/Kg
Carbon Tetrachloride		<MDL	6.2	12.4	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	8	16	ug/Kg
Chlorobenzene		<MDL	6.2	12.4	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	8	16	ug/Kg
Chlorodibromomethane		<MDL	6.2	12.4	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	8	16	ug/Kg
Chloroethane		<MDL	6.2	12.4	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	8	16	ug/Kg
Chloroform	13.3	B	6.2	12.4	ug/Kg		<MDL,B	8.1	16.2	ug/Kg	25.8	B	8	16	ug/Kg
Chloromethane		<MDL	6.2	12.4	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	8	16	ug/Kg
Chloromethane		<MDL	6.2	12.4	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	8	16	ug/Kg
cis-1,3-Dichloropropene		<MDL	6.2	12.4	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	8	16	ug/Kg
Ethylbenzene		<MDL	6.2	12.4	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	8	16	ug/Kg
Methylene Chloride	56	<RDL,B	31	62	ug/Kg	84.1	B	41	81	ug/Kg	99.4	B	40	80	ug/Kg
Styrene		<MDL	6.2	12.4	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	8	16	ug/Kg
Tetrachloroethylene		<MDL	6.2	12.4	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	8	16	ug/Kg
Toluene		<MDL	6.2	12.4	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	8	16	ug/Kg
Total Xylenes		<MDL	6.2	12.4	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	8	16	ug/Kg
Trans-1,2-Dichloroethylene		<MDL	6.2	12.4	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	8	16	ug/Kg
Trans-1,3-Dichloropropene		<MDL	6.2	12.4	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	8	16	ug/Kg
Trichlorofluoromethane		<MDL	6.2	12.4	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	8	16	ug/Kg
Vinyl Acetate		<MDL,G	31	62	ug/Kg		<MDL,G	41	81	ug/Kg		<MDL,G	40	80	ug/Kg
Vinyl Chloride		<MDL	6.2	12.4	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	8	16	ug/Kg
M.Code=SW-846 8270															
1,2,4-Trichlorobenzene		<MDL	20	33.1	ug/Kg		<MDL	26	43.3	ug/Kg		<MDL	26	42.7	ug/Kg
1,2-Dichlorobenzene		<MDL	20	33.1	ug/Kg		<MDL	26	43.3	ug/Kg		<MDL	26	42.7	ug/Kg
1,2-Diphenylhydrazine		<MDL,L	66	133	ug/Kg		<MDL,L	86	173	ug/Kg		<MDL,L	85	171	ug/Kg
1,3-Dichlorobenzene		<MDL	20	33.1	ug/Kg		<MDL	26	43.3	ug/Kg		<MDL	26	42.7	ug/Kg
1,4-Dichlorobenzene		<MDL	20	33.1	ug/Kg		<MDL	26	43.3	ug/Kg		<MDL	26	42.7	ug/Kg
2,4,5-Trichlorophenol		<MDL	140	264	ug/Kg		<MDL	180	345	ug/Kg		<MDL	180	341	ug/Kg
2,4,6-Trichlorophenol		<MDL,L	140	264	ug/Kg		<MDL,L	180	345	ug/Kg		<MDL,L	180	341	ug/Kg
2,4-Dichlorophenol		<MDL	33	66	ug/Kg		<MDL	44	86.4	ug/Kg		<MDL	43	85.3	ug/Kg
2,4-Dimethylphenol		<MDL	33	66	ug/Kg		<MDL	44	86.4	ug/Kg		<MDL	43	85.3	ug/Kg
2,4-Dinitrophenol		<MDL	66	133	ug/Kg		<MDL	86	173	ug/Kg		<MDL	85	171	ug/Kg
2,4-Dinitrotoluene		<MDL	14	26.4	ug/Kg		<MDL	18	34.5	ug/Kg		<MDL	18	34.1	ug/Kg
2,6-Dinitrotoluene		<MDL	14	26.4	ug/Kg		<MDL	18	34.5	ug/Kg		<MDL	18	34.1	ug/Kg
2-Chloronaphthalene		<MDL	20	33.1	ug/Kg		<MDL	26	43.3	ug/Kg		<MDL	26	42.7	ug/Kg
2-Chlorophenol		<MDL	66	133	ug/Kg		<MDL	86	173	ug/Kg		<MDL	85	171	ug/Kg
2-Methylnaphthalene		<MDL	53	99.1	ug/Kg		<MDL	70	130	ug/Kg	129		69	128	ug/Kg
2-Methylphenol		<MDL	33	66	ug/Kg		<MDL	44	86.4	ug/Kg		<MDL	43	85.3	ug/Kg
2-Nitroaniline		<MDL	140	198	ug/Kg		<MDL	180	259	ug/Kg		<MDL	180	256	ug/Kg
2-Nitrophenol		<MDL	33	66	ug/Kg		<MDL	44	86.4	ug/Kg		<MDL	43	85.3	ug/Kg
3,3'-Dichlorobenzidine		<MDL,X	33	66	ug/Kg		<MDL,X	44	86.4	ug/Kg		<MDL,X	43	85.3	ug/Kg
3-Nitroaniline		<MDL	140	198	ug/Kg		<MDL	180	259	ug/Kg		<MDL	180	256	ug/Kg

METRO Environmental Lab Analytical Report

PROJECT: A44703

	Locator: P53VG1					Locator: P53VG3					Locator: P53VG5				
	Sampled: Jul 29, 94					Sampled: Jul 28, 94					Sampled: Jul 29, 94				
	Lab ID: L4298-1					Lab ID: L4298-2					Lab ID: L4298-3				
	Matrix: SALTWTRSED					Matrix: SALTWTRSED					Matrix: SALTWTRSED				
	% Solids: 80.7					% Solids: 61.7					% Solids: 62.5				
Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis			
4,6-Dinitro-O-Cresol		<MDL	66	133	ug/Kg		<MDL	86	173	ug/Kg		<MDL	85	171	ug/Kg
4-Bromophenyl Phenyl Ether		<MDL	14	19.8	ug/Kg		<MDL	18	25.9	ug/Kg		<MDL	18	25.6	ug/Kg
4-Chloro-3-Methylphenol		<MDL	66	133	ug/Kg		<MDL	86	173	ug/Kg		<MDL	85	171	ug/Kg
4-Chloroaniline		<MDL,G	66	133	ug/Kg		<MDL,G	86	173	ug/Kg		<MDL,G	85	171	ug/Kg
4-Chlorophenyl Phenyl Ether		<MDL	20	33.1	ug/Kg		<MDL	26	43.3	ug/Kg		<MDL	26	42.7	ug/Kg
4-Methylphenol		<MDL	33	66	ug/Kg		<MDL	44	86.4	ug/Kg		<MDL	43	85.3	ug/Kg
4-Nitroaniline		<MDL,G	140	198	ug/Kg		<MDL,G	180	259	ug/Kg		<MDL,G	180	256	ug/Kg
4-Nitrophenol		<MDL,L	66	133	ug/Kg		<MDL,L	86	173	ug/Kg		<MDL,L	85	171	ug/Kg
Acenaphthene		<MDL	14	26.4	ug/Kg	50.6		18	34.5	ug/Kg	323		18	34.1	ug/Kg
Acenaphthylene		<MDL	20	33.1	ug/Kg	44.7		26	43.3	ug/Kg	163		26	42.7	ug/Kg
Aniline		<MDL,X	66	133	ug/Kg		<MDL,X	86	173	ug/Kg		<MDL,X	85	171	ug/Kg
Anthracene		<MDL	20	33.1	ug/Kg	365		26	43.3	ug/Kg	1480		26	42.7	ug/Kg
Benzidine		<MDL,X	790	1590	ug/Kg		<MDL,X	1000	2070	ug/Kg		<MDL,X	1000	2050	ug/Kg
Benzo(a)anthracene	25	<RDL	20	33.1	ug/Kg	744		26	43.3	ug/Kg	4620		26	42.7	ug/Kg
Benzo(a)pyrene		<MDL	33	66	ug/Kg	630		44	86.4	ug/Kg	2160		43	85.3	ug/Kg
Benzo(b)fluoranthene		<MDL	53	99.1	ug/Kg	1010		70	130	ug/Kg	3580		69	128	ug/Kg
Benzo(g,h,i)perylene	57	<RDL,G	33	66	ug/Kg	288	G	44	86.4	ug/Kg	346	G	43	85.3	ug/Kg
Benzo(k)fluoranthene		<MDL	53	99.1	ug/Kg	329		70	130	ug/Kg	1200		69	128	ug/Kg
Benzoic Acid		<MDL	140	198	ug/Kg	230	<RDL	180	259	ug/Kg	294		180	256	ug/Kg
Benzyl Alcohol		<MDL	33	66	ug/Kg		<MDL	44	86.4	ug/Kg		<MDL	43	85.3	ug/Kg
Benzyl Butyl Phthalate		<MDL	20	33.1	ug/Kg		<MDL	26	43.3	ug/Kg		<MDL	26	42.7	ug/Kg
Bis(2-Chloroethoxy)Methane		<MDL	33	66	ug/Kg		<MDL	44	86.4	ug/Kg		<MDL	43	85.3	ug/Kg
Bis(2-Chloroethyl)Ether		<MDL	20	33.1	ug/Kg		<MDL	26	43.3	ug/Kg		<MDL	26	42.7	ug/Kg
Bis(2-Chloroisopropyl)Ether		<MDL	66	133	ug/Kg		<MDL	86	173	ug/Kg		<MDL	85	171	ug/Kg
Bis(2-Ethylhexyl)Phthalate	51.7	B	20	33.1	ug/Kg	222	B	26	43.3	ug/Kg	317	B	26	42.7	ug/Kg
Carbazole		<MDL,L	33	66	ug/Kg	147	L	44	86.4	ug/Kg	549	L	43	85.3	ug/Kg
Chrysene	37.5		20	33.1	ug/Kg	1060		26	43.3	ug/Kg	3660		26	42.7	ug/Kg
Coprostanol		<MDL	140	198	ug/Kg	502		180	259	ug/Kg	862		180	256	ug/Kg
Di-N-Butyl Phthalate	74.2	B	33	66	ug/Kg	191	B	44	86.4	ug/Kg	173	B	43	85.3	ug/Kg
Di-N-Octyl Phthalate		<MDL	20	33.1	ug/Kg		<MDL	26	43.3	ug/Kg		<MDL	26	42.7	ug/Kg
Dibenzo(a,h)anthracene		<MDL	53	99.1	ug/Kg	110	<RDL	70	130	ug/Kg	192		69	128	ug/Kg
Dibenzofuran		<MDL	33	66	ug/Kg		<MDL	44	86.4	ug/Kg	318		43	85.3	ug/Kg
Diethyl Phthalate		<MDL	33	66	ug/Kg		<MDL	44	86.4	ug/Kg		<MDL	43	85.3	ug/Kg
Dimethyl Phthalate		<MDL	14	19.8	ug/Kg		<MDL	18	25.9	ug/Kg		<MDL	18	25.6	ug/Kg
Fluoranthene	62.6		20	39.7	ug/Kg	1410		26	51.9	ug/Kg	16600		26	51.2	ug/Kg
Fluorene		<MDL	20	33.1	ug/Kg	92.5		26	43.3	ug/Kg	571		26	42.7	ug/Kg
Hexachlorobenzene		<MDL	20	33.1	ug/Kg		<MDL	26	43.3	ug/Kg		<MDL	26	42.7	ug/Kg
Hexachlorobutadiene		<MDL	33	66	ug/Kg		<MDL	44	86.4	ug/Kg		<MDL	43	85.3	ug/Kg
Hexachlorocyclopentadiene		<MDL,X	33	66	ug/Kg		<MDL,X	44	86.4	ug/Kg		<MDL,X	43	85.3	ug/Kg
Hexachloroethane		<MDL,G	33	66	ug/Kg		<MDL,G	44	86.4	ug/Kg		<MDL,G	43	85.3	ug/Kg
Indeno(1,2,3-Cd)Pyrene		<MDL	33	66	ug/Kg	387		44	86.4	ug/Kg	634		43	85.3	ug/Kg
Isophorone		<MDL	33	66	ug/Kg		<MDL	44	86.4	ug/Kg		<MDL	43	85.3	ug/Kg
N-Nitrosodi-N-Propylamine		<MDL	33	66	ug/Kg		<MDL	44	86.4	ug/Kg		<MDL	43	85.3	ug/Kg
N-Nitrosodimethylamine		<MDL	140	198	ug/Kg		<MDL	180	259	ug/Kg		<MDL	180	256	ug/Kg
N-Nitrosodiphenylamine		<MDL	33	66	ug/Kg		<MDL	44	86.4	ug/Kg		<MDL	43	85.3	ug/Kg

METRO Environmental Lab Analytical Report

PROJECT: A44703

	P53VG1	P53VG3	P53VG5
Locator:	P53VG1	P53VG3	P53VG5
Sampled:	Jul 29, 94	Jul 28, 94	Jul 29, 94
Lab ID:	L4298-1	L4298-2	L4298-3
Matrix:	SALTWTRSED	SALTWTRSED	SALTWTRSED
% Solids:	80.7	61.7	62.5

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis			
Naphthalene		<MDL	53	99.1	ug/Kg		<MDL	70	130	ug/Kg	517		69	128	ug/Kg
Nitrobenzene		<MDL	33	66	ug/Kg		<MDL	44	86.4	ug/Kg		<MDL	43	85.3	ug/Kg
Pentachlorophenol		<MDL	33	66	ug/Kg		<MDL	44	86.4	ug/Kg		<MDL	43	85.3	ug/Kg
Phenanthrene		<MDL	20	33.1	ug/Kg	512		26	43.3	ug/Kg	1890		26	42.7	ug/Kg
Phenol		<MDL	140	198	ug/Kg		<MDL	180	259	ug/Kg		<MDL	180	256	ug/Kg
Pyrene	38		20	33.1	ug/Kg	956		26	43.3	ug/Kg	7580		26	42.7	ug/Kg
METALS															
M.Code=METRO 16-01-005															
Mercury, Total, CVAA	0.047	<RDL	0.025	0.247	mg/Kg	0.13	<RDL	0.032	0.327	mg/Kg	0.418		0.032	0.312	mg/Kg
M.Code=METRO 16-02-004															
Aluminum, Total, ICP	9640		12	61.5	mg/Kg	13500		16	81	mg/Kg	12300		16	79.4	mg/Kg
Antimony, Total, ICP		<MDL,G	3.7	18.5	mg/Kg		<MDL,G	4.9	24.3	mg/Kg		<MDL,G	4.8	23.8	mg/Kg
Arsenic, Total, ICP	14	<RDL	6.2	30.7	mg/Kg	14	<RDL	8.1	40.5	mg/Kg	16	<RDL	8	39.7	mg/Kg
Barium, Total, ICP	46	E	0.12	0.615	mg/Kg	42.6	E	0.16	0.81	mg/Kg	48.8	E	0.16	0.794	mg/Kg
Beryllium, Total, ICP	0.25	<RDL	0.12	0.615	mg/Kg	0.34	<RDL	0.16	0.81	mg/Kg	0.3	<RDL	0.16	0.794	mg/Kg
Cadmium, Total, ICP		<MDL	0.37	1.85	mg/Kg		<MDL	0.49	2.43	mg/Kg	0.56	<RDL	0.48	2.38	mg/Kg
Calcium, Total, ICP	3400		6.2	30.7	mg/Kg	4730		8.1	40.5	mg/Kg	4300		8	39.7	mg/Kg
Chromium, Total, ICP	13		0.62	3.07	mg/Kg	23.5		0.81	4.05	mg/Kg	23.4		0.8	3.97	mg/Kg
Copper, Total, ICP	12.3		0.5	2.45	mg/Kg	29.8		0.65	3.24	mg/Kg	39.7		0.64	3.17	mg/Kg
Iron, Total, ICP	20000		6.2	30.7	mg/Kg	22500		8.1	40.5	mg/Kg	21900		8	39.7	mg/Kg
Lead, Total, ICP	6.9	<RDL	3.7	18.5	mg/Kg	27.9		4.9	24.3	mg/Kg	44.5		4.8	23.8	mg/Kg
Magnesium, Total, ICP	4050	E	3.7	18.5	mg/Kg	5610	E	4.9	24.3	mg/Kg	5100	E	4.8	23.8	mg/Kg
Manganese, Total, ICP	201	L	0.25	1.23	mg/Kg	222	L	0.32	1.62	mg/Kg	221	L	0.32	1.59	mg/Kg
Molybdenum, Total, ICP		<MDL	2.5	12.3	mg/Kg		<MDL	3.2	16.2	mg/Kg		<MDL	3.2	15.9	mg/Kg
Nickel, Total, ICP	12.3		2.5	12.3	mg/Kg	17.5		3.2	16.2	mg/Kg	17.1		3.2	15.9	mg/Kg
Selenium, Total, ICP		<MDL	6.2	30.7	mg/Kg		<MDL	8.1	40.5	mg/Kg		<MDL	8	39.7	mg/Kg
Silver, Total, ICP		<MDL	0.5	2.45	mg/Kg		<MDL	0.65	3.24	mg/Kg	0.75	<RDL	0.64	3.17	mg/Kg
Sodium, Total, ICP	3140		62	307	mg/Kg	7120		81	405	mg/Kg	7120		80	397	mg/Kg
Thallium, Total, ICP		<MDL	25	123	mg/Kg		<MDL	32	162	mg/Kg		<MDL	32	159	mg/Kg
Zinc, Total, ICP	47.5		0.62	3.07	mg/Kg	72		0.81	4.05	mg/Kg	86.7		0.8	3.97	mg/Kg
CONVENTIONALS															
M.Code=SM5310-B															
Total Organic Carbon	3070		6.2	12.4	mg/Kg	17000		8.1	16.2	mg/Kg	15100		8	16	mg/Kg
M.Code=(No Method Code)															
p-2.25	0.5	E	0.1		%	0.9	E	0.1		%		<MDL,E	0.1		%
p-2.00		<MDL,E	0.1		%	0.2	E	0.1		%		<MDL,E	0.1		%
p-1.00	3.8	E	0.1		%	0.5	E	0.1		%	0.5	E	0.1		%
p+0.00	13	E	0.1		%	1.4	E	0.1		%	1.4	E	0.1		%
p+1.00	42	E	0.1		%	14	E	0.1		%	21	E	0.1		%
p+2.00	35	E	0.1		%	46	E	0.1		%	42	E	0.1		%
p+3.00	3.3	E	0.1		%	15	E	0.1		%	9.8	E	0.1		%
p+4.00	0.2	E	0.1		%	3.6	E	0.1		%	3.4	E	0.1		%
p+5.00	1.4	E	0.1		%	4	E	0.1		%	4.2	E	0.1		%

METRO Environmental Lab Analytical Report

PROJECT: A44703

	Locator: P53VG1					Locator: P53VG3					Locator: P53VG5				
	Sampled: Jul 29, 94					Sampled: Jul 28, 94					Sampled: Jul 29, 94				
	Lab ID: L4298-1					Lab ID: L4298-2					Lab ID: L4298-3				
	Matrix: SALTWTRSED					Matrix: SALTWTRSED					Matrix: SALTWTRSED				
	% Solids: 80.7					% Solids: 61.7					% Solids: 62.5				
Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis			
p+6.00		<MDL,E	0.1		%	2.8	E	0.1		%	3.5	E	0.1		%
p+7.00		<MDL,E	0.1		%	3.3	E	0.1		%	4.8	E	0.1		%
p+8.00	0.5	E	0.1		%	3.7	E	0.1		%	4.2	E	0.1		%
p+9.00	0.1	E	0.1		%	1.1	E	0.1		%	1.1	E	0.1		%
p+10.0		<MDL,E	0.1		%	0.4	E	0.1		%	0.4	E	0.1		%
p+11.0	0.6	E	0.1		%	3.8	E	0.1		%	3.9	E	0.1		%

METRO Environmental Lab Analytical Report

PROJECT: A44703

Locator: P53VG6
Sampled: Jul 29, 94
Lab ID: L4298-4
Matrix: SALTWTRSED
% Solids: 55.5

Parameters	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis			
ORGANICS					
M.Code=SW-846 8080					
4,4'-DDD	4.3	<RDL	2.3	4.81	ug/Kg
4,4'-DDE	2.5	<RDL	2.3	4.81	ug/Kg
4,4'-DDT		<MDL	2.3	4.81	ug/Kg
Aldrin		<MDL	2.3	4.81	ug/Kg
Alpha-BHC		<MDL	2.3	4.81	ug/Kg
Aroclor 1016		<MDL	23	48.1	ug/Kg
Aroclor 1221		<MDL	23	48.1	ug/Kg
Aroclor 1232		<MDL	23	48.1	ug/Kg
Aroclor 1242		<MDL	23	48.1	ug/Kg
Aroclor 1248		<MDL	23	48.1	ug/Kg
Aroclor 1254	40	<RDL	23	48.1	ug/Kg
Aroclor 1260	49.7	L	23	48.1	ug/Kg
Beta-BHC		<MDL	2.3	4.81	ug/Kg
Chlordane		<MDL	14	24	ug/Kg
Delta-BHC		<MDL	2.3	4.81	ug/Kg
Dieldrin		<MDL	2.3	4.81	ug/Kg
Endosulfan I		<MDL	2.3	4.81	ug/Kg
Endosulfan II		<MDL	2.3	4.81	ug/Kg
Endosulfan Sulfate		<MDL	2.3	4.81	ug/Kg
Endrin		<MDL	2.3	4.81	ug/Kg
Endrin Aldehyde		<MDL	2.3	4.81	ug/Kg
Gamma-BHC (Lindane)		<MDL	2.3	4.81	ug/Kg
Heptachlor		<MDL	2.3	4.81	ug/Kg
Heptachlor Epoxide		<MDL	2.3	4.81	ug/Kg
Methoxychlor		<MDL	14	24	ug/Kg
Toxaphene		<MDL	23	48.1	ug/Kg
M.Code=SW-846 8260					
1,1,1-Trichloroethane		<MDL	9	18	ug/Kg
1,1,2,2-Tetrachloroethane		<MDL,B	9	18	ug/Kg
1,1,2-Trichloroethane		<MDL	9	18	ug/Kg
1,1,2-Trichloroethylene		<MDL	9	18	ug/Kg
1,1-Dichloroethane		<MDL	9	18	ug/Kg
1,1-Dichloroethylene		<MDL	9	18	ug/Kg
1,2-Dichloroethane		<MDL	9	18	ug/Kg
1,2-Dichloropropane		<MDL	9	18	ug/Kg
2-Butanone (MEK)	58	<RDL,L	45	90.1	ug/Kg
2-Chloroethylvinyl ether		<MDL	9	18	ug/Kg
2-Hexanone		<MDL	45	90.1	ug/Kg
4-Methyl-2-Pentanone (MIBK)		<MDL	45	90.1	ug/Kg
Acetone	254	B,L	45	90.1	ug/Kg
Acrolein		<MDL,X	45	90.1	ug/Kg
Acrylonitrile		<MDL	45	90.1	ug/Kg

METRO Environmental Lab Analytical Report

PROJECT: A44703

Locator: P53VG6
Sampled: Jul 29, 94
Lab ID: L4298-4
Matrix: SALTWTRSED
% Solids: 55.5

Parameters	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis			
Benzene		<MDL	9	18	ug/Kg
Bromodichloromethane		<MDL	9	18	ug/Kg
Bromoform		<MDL	9	18	ug/Kg
Bromomethane		<MDL	9	18	ug/Kg
Carbon Disulfide	9.7	<RDL	9	18	ug/Kg
Carbon Tetrachloride		<MDL	9	18	ug/Kg
Chlorobenzene		<MDL	9	18	ug/Kg
Chlorodibromomethane		<MDL	9	18	ug/Kg
Chloroethane		<MDL	9	18	ug/Kg
Chloroform	35.5	B	9	18	ug/Kg
Chloromethane		<MDL	9	18	ug/Kg
Chloromethane		<MDL	9	18	ug/Kg
cis-1,3-Dichloropropene		<MDL	9	18	ug/Kg
Ethylbenzene		<MDL	9	18	ug/Kg
Methylene Chloride	88	<RDL,B	45	90.1	ug/Kg
Styrene		<MDL	9	18	ug/Kg
Tetrachloroethylene		<MDL	9	18	ug/Kg
Toluene		<MDL	9	18	ug/Kg
Total Xylenes		<MDL	9	18	ug/Kg
Trans-1,2-Dichloroethylene		<MDL	9	18	ug/Kg
Trans-1,3-Dichloropropene		<MDL	9	18	ug/Kg
Trichlorofluoromethane		<MDL	9	18	ug/Kg
Vinyl Acetate		<MDL,G	45	90.1	ug/Kg
Vinyl Chloride		<MDL	9	18	ug/Kg
M.Code=SW-846 8270					
1,2,4-Trichlorobenzene		<MDL	29	48.1	ug/Kg
1,2-Dichlorobenzene		<MDL	29	48.1	ug/Kg
1,2-Diphenylhydrazine		<MDL,L	95	193	ug/Kg
1,3-Dichlorobenzene		<MDL	29	48.1	ug/Kg
1,4-Dichlorobenzene		<MDL	29	48.1	ug/Kg
2,4,5-Trichlorophenol		<MDL	200	384	ug/Kg
2,4,6-Trichlorophenol		<MDL,L	200	384	ug/Kg
2,4-Dichlorophenol		<MDL	49	96	ug/Kg
2,4-Dimethylphenol		<MDL	49	96	ug/Kg
2,4-Dinitrophenol		<MDL	95	193	ug/Kg
2,4-Dinitrotoluene		<MDL	20	38.4	ug/Kg
2,6-Dinitrotoluene		<MDL	20	38.4	ug/Kg
2-Chloronaphthalene		<MDL	29	48.1	ug/Kg
2-Chlorophenol		<MDL	95	193	ug/Kg
2-Methylnaphthalene		<MDL	77	144	ug/Kg
2-Methylphenol		<MDL	49	96	ug/Kg
2-Nitroaniline		<MDL	200	288	ug/Kg
2-Nitrophenol		<MDL	49	96	ug/Kg
3,3'-Dichlorobenzidine		<MDL,X	49	96	ug/Kg
3-Nitroaniline		<MDL	200	288	ug/Kg

METRO Environmental Lab Analytical Report

PROJECT: A44703

Locator: P53VG6
Sampled: Jul 29, 94
Lab ID: L4298-4
Matrix: SALTWTRSED
% Solids: 55.5

Parameters	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis			
4,6-Dinitro-O-Cresol		<MDL	95	193	ug/Kg
4-Bromophenyl Phenyl Ether		<MDL	20	28.8	ug/Kg
4-Chloro-3-Methylphenol		<MDL	95	193	ug/Kg
4-Chloroaniline		<MDL,G	95	193	ug/Kg
4-Chlorophenyl Phenyl Ether		<MDL	29	48.1	ug/Kg
4-Methylphenol		<MDL	49	96	ug/Kg
4-Nitroaniline		<MDL,G	200	288	ug/Kg
4-Nitrophenol		<MDL,L	95	193	ug/Kg
Acenaphthene	153		20	38.4	ug/Kg
Acenaphthylene	129		29	48.1	ug/Kg
Aniline		<MDL,X	95	193	ug/Kg
Anthracene	791		29	48.1	ug/Kg
Benzidine		<MDL,X	1200	2310	ug/Kg
Benzo(a)anthracene	2320		29	48.1	ug/Kg
Benzo(a)pyrene	1510		49	96	ug/Kg
Benzo(b)fluoranthene	2450		77	144	ug/Kg
Benzo(g,h,i)perylene	330	G	49	96	ug/Kg
Benzo(k)fluoranthene	915		77	144	ug/Kg
Benzoic Acid	308		200	288	ug/Kg
Benzyl Alcohol		<MDL	49	96	ug/Kg
Benzyl Butyl Phthalate		<MDL	29	48.1	ug/Kg
Bis(2-Chloroethoxy)Methane		<MDL	49	96	ug/Kg
Bis(2-Chloroethyl)Ether		<MDL	29	48.1	ug/Kg
Bis(2-Chloroisopropyl)Ether		<MDL	95	193	ug/Kg
Bis(2-Ethylhexyl)Phthalate	541	B	29	48.1	ug/Kg
Carbazole	308	L	49	96	ug/Kg
Chrysene	2410		29	48.1	ug/Kg
Coprostanol	759		200	288	ug/Kg
Di-N-Butyl Phthalate	162	B	49	96	ug/Kg
Di-N-Octyl Phthalate		<MDL	29	48.1	ug/Kg
Dibenzo(a,h)anthracene	140	<RDL	77	144	ug/Kg
Dibenzofuran	152		49	96	ug/Kg
Diethyl Phthalate		<MDL	49	96	ug/Kg
Dimethyl Phthalate		<MDL	20	28.8	ug/Kg
Fluoranthene	4810		29	57.7	ug/Kg
Fluorene	285		29	48.1	ug/Kg
Hexachlorobenzene		<MDL	29	48.1	ug/Kg
Hexachlorobutadiene		<MDL	49	96	ug/Kg
Hexachlorocyclopentadiene		<MDL,X	49	96	ug/Kg
Hexachloroethane		<MDL,G	49	96	ug/Kg
Indeno(1,2,3-Cd)Pyrene	533		49	96	ug/Kg
Isophorone		<MDL	49	96	ug/Kg
N-Nitrosodi-N-Propylamine		<MDL	49	96	ug/Kg
N-Nitrosodimethylamine		<MDL	200	288	ug/Kg
N-Nitrosodiphenylamine	49	<RDL	49	96	ug/Kg

METRO Environmental Lab Analytical Report

PROJECT: A44703

Locator:	P53VG6
Sampled:	Jul 29, 94
Lab ID:	L4298-4
Matrix:	SALTWTRSED
% Solids:	55.5

Parameters	Value	Qual	MDL	RDL	Units
			- Dry Weight Basis		
Naphthalene	240		77	144	ug/Kg
Nitrobenzene		<MDL	49	96	ug/Kg
Pentachlorophenol		<MDL	49	96	ug/Kg
Phenanthrene	1050		29	48.1	ug/Kg
Phenol		<MDL	200	283	ug/Kg
Pyrene	2900		29	48.1	ug/Kg
METALS					
M.Code=METRO 16-01-005					
Mercury, Total, CVAA	0.42		0.036	0.359	mg/Kg
M.Code=METRO 16-02-004					
Aluminum, Total, ICP	15200		18	89.2	mg/Kg
Antimony, Total, ICP		<MDL,G	5.4	26.7	mg/Kg
Arsenic, Total, ICP	16	<RDL	8.8	44.5	mg/Kg
Barium, Total, ICP	66.3	E	0.18	0.892	mg/Kg
Beryllium, Total, ICP	0.36	<RDL	0.18	0.892	mg/Kg
Cadmium, Total, ICP	0.61	<RDL	0.54	2.67	mg/Kg
Calcium, Total, ICP	5100		8.8	44.5	mg/Kg
Chromium, Total, ICP	26.7		0.88	4.45	mg/Kg
Copper, Total, ICP	46.8		0.72	3.57	mg/Kg
Iron, Total, ICP	25000		8.8	44.5	mg/Kg
Lead, Total, ICP	49.7		5.4	26.7	mg/Kg
Magnesium, Total, ICP	6250	E	5.4	26.7	mg/Kg
Manganese, Total, ICP	240	L	0.36	1.78	mg/Kg
Molybdenum, Total, ICP		<MDL	3.6	17.8	mg/Kg
Nickel, Total, ICP	21.4		3.6	17.8	mg/Kg
Selenium, Total, ICP		<MDL	8.8	44.5	mg/Kg
Silver, Total, ICP	0.77	<RDL	0.72	3.57	mg/Kg
Sodium, Total, ICP	9260		88	445	mg/Kg
Thallium, Total, ICP		<MDL	36	178	mg/Kg
Zinc, Total, ICP	97.7		0.88	4.45	mg/Kg
CONVENTIONALS					
M.Code=SM5310-B					
Total Organic Carbon	19100		9	18	mg/Kg
M.Code=(No Method Code)					
p-2.25	1.1	E	0.1		%
p-2.00		<MDL,E	0.1		%
p-1.00	0.5	E	0.1		%
p+0.00	1.6	E	0.1		%
p+1.00	11	E	0.1		%
p+2.00	30	E	0.1		%
p+3.00	16	E	0.1		%
p+4.00	5.8	E	0.1		%
p+5.00	7.9	E	0.1		%

METRO Environmental Lab Analytical Report

PROJECT: A44703

Locator: P53VG6
Sampled: Jul 29, 94
Lab ID: L4298-4
Matrix: SALTWTRSED
% Solids: 55.5

Parameters	Value	Qual	MDL	RDL	Units
			- Dry Weight Basis		
p+6.00	7	E	0.1		%
p+7.00	7.8	E	0.1		%
p+8.00	4.3	E	0.1		%
p+9.00	1.1	E	0.1		%
p+10.0	0.4	E	0.1		%
p+11.0	5.1	E	0.1		%

METRO Environmental Lab Analytical Report

PROJECT: A44703

	Sample 1	Sample 2	Sample 3
Locator:	P53VG8	P53VG10	P53VG11
Sampled:	Jul 29, 94	Jul 29, 94	Jul 29, 94
Lab ID:	L4298-5	L4298-6	L4298-7
Matrix:	SALTWTRSED	SALTWTRSED	SALTWTRSED
% Solids:	81.1	61.9	66.1

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis			
ORGANICS															
M.Code=SW-846 8080															
4,4'-DDD		<MDL	1.6	3.29	ug/Kg	5.01		2.1	4.31	ug/Kg	34.8		2	4.04	ug/Kg
4,4'-DDE		<MDL	1.6	3.29	ug/Kg		<MDL	2.1	4.31	ug/Kg	9.82		2	4.04	ug/Kg
4,4'-DDT		<MDL	1.6	3.29	ug/Kg		<MDL	2.1	4.31	ug/Kg		<MDL	2	4.04	ug/Kg
Aldrin		<MDL	1.6	3.29	ug/Kg		<MDL	2.1	4.31	ug/Kg		<MDL	2	4.04	ug/Kg
Alpha-BHC		<MDL	1.6	3.29	ug/Kg		<MDL	2.1	4.31	ug/Kg		<MDL	2	4.04	ug/Kg
Aroclor 1016		<MDL	16	32.9	ug/Kg		<MDL	21	43.1	ug/Kg		<MDL	20	40.4	ug/Kg
Aroclor 1221		<MDL	16	32.9	ug/Kg		<MDL	21	43.1	ug/Kg		<MDL	20	40.4	ug/Kg
Aroclor 1232		<MDL	16	32.9	ug/Kg		<MDL	21	43.1	ug/Kg		<MDL	20	40.4	ug/Kg
Aroclor 1242		<MDL	16	32.9	ug/Kg		<MDL	21	43.1	ug/Kg		<MDL	20	40.4	ug/Kg
Aroclor 1248		<MDL	16	32.9	ug/Kg		<MDL	21	43.1	ug/Kg	27	<RDL	20	40.4	ug/Kg
Aroclor 1254		<MDL	16	32.9	ug/Kg		<MDL	21	43.1	ug/Kg	60.7		20	40.4	ug/Kg
Aroclor 1260		<MDL,L	16	32.9	ug/Kg		<MDL,L	21	43.1	ug/Kg	64.4	L	20	40.4	ug/Kg
Beta-BHC		<MDL	1.6	3.29	ug/Kg		<MDL	2.1	4.31	ug/Kg		<MDL	2	4.04	ug/Kg
Chlordane		<MDL	9.9	16.4	ug/Kg		<MDL	13	21.5	ug/Kg		<MDL	12	20.1	ug/Kg
Delta-BHC		<MDL	1.6	3.29	ug/Kg		<MDL	2.1	4.31	ug/Kg		<MDL	2	4.04	ug/Kg
Dieldrin		<MDL	1.6	3.29	ug/Kg		<MDL	2.1	4.31	ug/Kg		<MDL	2	4.04	ug/Kg
Endosulfan I		<MDL	1.6	3.29	ug/Kg		<MDL	2.1	4.31	ug/Kg		<MDL	2	4.04	ug/Kg
Endosulfan II		<MDL	1.6	3.29	ug/Kg		<MDL	2.1	4.31	ug/Kg		<MDL	2	4.04	ug/Kg
Endosulfan Sulfate		<MDL	1.6	3.29	ug/Kg		<MDL	2.1	4.31	ug/Kg		<MDL	2	4.04	ug/Kg
Endrin		<MDL	1.6	3.29	ug/Kg		<MDL	2.1	4.31	ug/Kg		<MDL	2	4.04	ug/Kg
Endrin Aldehyde		<MDL	1.6	3.29	ug/Kg		<MDL	2.1	4.31	ug/Kg		<MDL	2	4.04	ug/Kg
Gamma-BHC (Lindane)		<MDL	1.6	3.29	ug/Kg		<MDL	2.1	4.31	ug/Kg		<MDL	2	4.04	ug/Kg
Heptachlor		<MDL	1.6	3.29	ug/Kg		<MDL	2.1	4.31	ug/Kg		<MDL	2	4.04	ug/Kg
Heptachlor Epoxide		<MDL	1.6	3.29	ug/Kg		<MDL	2.1	4.31	ug/Kg		<MDL	2	4.04	ug/Kg
Methoxychlor		<MDL	9.9	16.4	ug/Kg		<MDL	13	21.5	ug/Kg		<MDL	12	20.1	ug/Kg
Toxaphene		<MDL	16	32.9	ug/Kg		<MDL	21	43.1	ug/Kg		<MDL	20	40.4	ug/Kg
M.Code=SW-846 8260															
1,1,1-Trichloroethane		<MDL	6.2	12.3	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	7.6	15.1	ug/Kg
1,1,2,2-Tetrachloroethane		<MDL,B	6.2	12.3	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL,B	7.6	15.1	ug/Kg
1,1,2-Trichloroethane		<MDL	6.2	12.3	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	7.6	15.1	ug/Kg
1,1,2-Trichloroethylene		<MDL	6.2	12.3	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	7.6	15.1	ug/Kg
1,1-Dichloroethane		<MDL	6.2	12.3	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	7.6	15.1	ug/Kg
1,1-Dichloroethylene		<MDL	6.2	12.3	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	7.6	15.1	ug/Kg
1,2-Dichloroethane		<MDL	6.2	12.3	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	7.6	15.1	ug/Kg
1,2-Dichloropropane		<MDL	6.2	12.3	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	7.6	15.1	ug/Kg
2-Butanone (MEK)		<MDL,L	31	61.7	ug/Kg		<MDL,L	40	80.8	ug/Kg		<MDL,L	38	75.6	ug/Kg
2-Chloroethylvinyl ether		<MDL	6.2	12.3	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	7.6	15.1	ug/Kg
2-Hexanone		<MDL	31	61.7	ug/Kg		<MDL	40	80.8	ug/Kg		<MDL	38	75.6	ug/Kg
4-Methyl-2-Pentanone (MIBK)		<MDL	31	61.7	ug/Kg		<MDL	40	80.8	ug/Kg		<MDL	38	75.6	ug/Kg
Acetone	90.6	B,L	31	61.7	ug/Kg	174	B,L	40	80.8	ug/Kg	146	B,L	38	75.6	ug/Kg
Acrolein		<MDL,X	31	61.7	ug/Kg		<MDL,X	40	80.8	ug/Kg		<MDL,X	38	75.6	ug/Kg
Acrylonitrile		<MDL	31	61.7	ug/Kg		<MDL	40	80.8	ug/Kg		<MDL	38	75.6	ug/Kg

METRO Environmental Lab Analytical Report

PROJECT: A44703

	P53VG8	P53VG10	P53VG11
Locator:	P53VG8	P53VG10	P53VG11
Sampled:	Jul 29, 94	Jul 29, 94	Jul 29, 94
Lab ID:	L4298-5	L4298-6	L4298-7
Matrix:	SALTWTRSED	SALTWTRSED	SALTWTRSED
% Solids:	81.1	61.9	66.1

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis			
Benzene		<MDL	6.2	12.3	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	7.6	15.1	ug/Kg
Bromodichloromethane		<MDL	6.2	12.3	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	7.6	15.1	ug/Kg
Bromoform		<MDL	6.2	12.3	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	7.6	15.1	ug/Kg
Bromomethane		<MDL	6.2	12.3	ug/Kg	14	<RDL	8.1	16.2	ug/Kg		<MDL	7.6	15.1	ug/Kg
Carbon Disulfide		<MDL	6.2	12.3	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	7.6	15.1	ug/Kg
Carbon Tetrachloride		<MDL	6.2	12.3	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	7.6	15.1	ug/Kg
Chlorobenzene		<MDL	6.2	12.3	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	7.6	15.1	ug/Kg
Chlorodibromomethane		<MDL	6.2	12.3	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	7.6	15.1	ug/Kg
Chloroethane		<MDL	6.2	12.3	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	7.6	15.1	ug/Kg
Chloroform	6.3	<RDL,B	6.2	12.3	ug/Kg		<MDL	8.1	16.2	ug/Kg	8.5	<RDL,B	7.6	15.1	ug/Kg
Chloromethane		<MDL	6.2	12.3	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	7.6	15.1	ug/Kg
Chloromethane		<MDL	6.2	12.3	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	7.6	15.1	ug/Kg
cis-1,3-Dichloropropene		<MDL	6.2	12.3	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	7.6	15.1	ug/Kg
Ethylbenzene		<MDL	6.2	12.3	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	7.6	15.1	ug/Kg
Methylene Chloride	104	B	31	61.7	ug/Kg	824	B	40	80.8	ug/Kg	134	B	38	75.6	ug/Kg
Styrene		<MDL	6.2	12.3	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	7.6	15.1	ug/Kg
Tetrachloroethylene		<MDL	6.2	12.3	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	7.6	15.1	ug/Kg
Toluene		<MDL	6.2	12.3	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	7.6	15.1	ug/Kg
Total Xylenes		<MDL	6.2	12.3	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	7.6	15.1	ug/Kg
Trans-1,2-Dichloroethylene		<MDL	6.2	12.3	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	7.6	15.1	ug/Kg
Trans-1,3-Dichloropropene		<MDL	6.2	12.3	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	7.6	15.1	ug/Kg
Trichlorofluoromethane		<MDL	6.2	12.3	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	7.6	15.1	ug/Kg
Vinyl Acetate		<MDL,G	31	61.7	ug/Kg		<MDL,G	40	80.8	ug/Kg		<MDL,G	38	75.6	ug/Kg
Vinyl Chloride		<MDL	6.2	12.3	ug/Kg		<MDL	8.1	16.2	ug/Kg		<MDL	7.6	15.1	ug/Kg
M.Code=SW-846 8270															
1,2,4-Trichlorobenzene		<MDL	20	32.9	ug/Kg		<MDL	26	43.1	ug/Kg		<MDL	24	40.4	ug/Kg
1,2-Dichlorobenzene .		<MDL	20	32.9	ug/Kg		<MDL	26	43.1	ug/Kg		<MDL	24	40.4	ug/Kg
1,2-Diphenylhydrazine		<MDL,L	65	132	ug/Kg		<MDL,L	86	173	ug/Kg		<MDL,L	80	162	ug/Kg
1,3-Dichlorobenzene		<MDL	20	32.9	ug/Kg		<MDL	26	43.1	ug/Kg		<MDL	24	40.4	ug/Kg
1,4-Dichlorobenzene		<MDL	20	32.9	ug/Kg		<MDL	26	43.1	ug/Kg		<MDL	24	40.4	ug/Kg
2,4,5-Trichlorophenol		<MDL	140	263	ug/Kg		<MDL	180	344	ug/Kg		<MDL	170	322	ug/Kg
2,4,6-Trichlorophenol		<MDL,L	140	263	ug/Kg		<MDL,L	180	344	ug/Kg		<MDL,L	170	322	ug/Kg
2,4-Dichlorophenol		<MDL	33	65.7	ug/Kg		<MDL	44	86.1	ug/Kg		<MDL	41	80.6	ug/Kg
2,4-Dimethylphenol		<MDL	33	65.7	ug/Kg		<MDL	44	86.1	ug/Kg	59	<RDL	41	80.6	ug/Kg
2,4-Dinitrophenol		<MDL	65	132	ug/Kg		<MDL	86	173	ug/Kg		<MDL	80	162	ug/Kg
2,4-Dinitrotoluene		<MDL	14	26.3	ug/Kg		<MDL	18	34.4	ug/Kg		<MDL	17	32.2	ug/Kg
2,6-Dinitrotoluene		<MDL	14	26.3	ug/Kg		<MDL	18	34.4	ug/Kg		<MDL	17	32.2	ug/Kg
2-Chloronaphthalene		<MDL	20	32.9	ug/Kg		<MDL	26	43.1	ug/Kg		<MDL	24	40.4	ug/Kg
2-Chlorophenol		<MDL	65	132	ug/Kg		<MDL	86	173	ug/Kg		<MDL	80	162	ug/Kg
2-Methylnaphthalene		<MDL	53	98.6	ug/Kg	170		69	129	ug/Kg	290		65	121	ug/Kg
2-Methylphenol		<MDL	33	65.7	ug/Kg		<MDL	44	86.1	ug/Kg		<MDL	41	80.6	ug/Kg
2-Nitroaniline		<MDL	140	197	ug/Kg		<MDL	180	258	ug/Kg		<MDL	170	242	ug/Kg
2-Nitrophenol		<MDL	33	65.7	ug/Kg		<MDL	44	86.1	ug/Kg		<MDL	41	80.6	ug/Kg
3,3'-Dichlorobenzidine		<MDL,X	33	65.7	ug/Kg		<MDL,X	44	86.1	ug/Kg		<MDL,X	41	80.6	ug/Kg
3-Nitroaniline		<MDL	140	197	ug/Kg		<MDL	180	258	ug/Kg		<MDL	170	242	ug/Kg

METRO Environmental Lab Analytical Report

PROJECT: A44703

	P53VG8	P53VG10	P53VG11
Locator:	P53VG8	P53VG10	P53VG11
Sampled:	Jul 29, 94	Jul 29, 94	Jul 29, 94
Lab ID:	L4298-5	L4298-6	L4298-7
Matrix:	SALTWTRSED	SALTWTRSED	SALTWTRSED
% Solids:	81.1	61.9	66.1

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis			
4,6-Dinitro-O-Cresol		<MDL	65	132	ug/Kg		<MDL	86	173	ug/Kg		<MDL	80	162	ug/Kg
4-Bromophenyl Phenyl Ether		<MDL	14	19.7	ug/Kg		<MDL	18	25.8	ug/Kg		<MDL	17	24.2	ug/Kg
4-Chloro-3-Methylphenol		<MDL	65	132	ug/Kg		<MDL	86	173	ug/Kg		<MDL	80	162	ug/Kg
4-Chloroaniline		<MDL,G	65	132	ug/Kg		<MDL,G	86	173	ug/Kg		<MDL,G	80	162	ug/Kg
4-Chlorophenyl Phenyl Ether		<MDL	20	32.9	ug/Kg		<MDL	26	43.1	ug/Kg		<MDL	24	40.4	ug/Kg
4-Methylphenol		<MDL	33	65.7	ug/Kg	97.4		44	86.1	ug/Kg		<MDL	41	80.6	ug/Kg
4-Nitroaniline		<MDL,G	140	197	ug/Kg		<MDL,G	180	258	ug/Kg		<MDL,G	170	242	ug/Kg
4-Nitrophenol		<MDL,L	65	132	ug/Kg		<MDL,L	86	173	ug/Kg		<MDL,L	80	162	ug/Kg
Acenaphthene		<MDL	14	26.3	ug/Kg	425		18	34.4	ug/Kg	5610		17	32.2	ug/Kg
Acenaphthylene		<MDL	20	32.9	ug/Kg	267		26	43.1	ug/Kg	327		24	40.4	ug/Kg
Aniline		<MDL,X	65	132	ug/Kg		<MDL,X	86	173	ug/Kg		<MDL,X	80	162	ug/Kg
Anthracene	52.7		20	32.9	ug/Kg	1070		26	43.1	ug/Kg	2250		24	40.4	ug/Kg
Benzidine		<MDL,X	790	1580	ug/Kg		<MDL,X	1000	2070	ug/Kg		<MDL,X	970	1940	ug/Kg
Benzo(a)anthracene	91.4		20	32.9	ug/Kg	2700		26	43.1	ug/Kg	6900		24	40.4	ug/Kg
Benzo(a)pyrene	66		33	65.7	ug/Kg	1760		44	86.1	ug/Kg	3000		41	80.6	ug/Kg
Benzo(b)fluoranthene	114		53	98.6	ug/Kg	3780		69	129	ug/Kg	6020		65	121	ug/Kg
Benzo(g,h,i)perylene		<MDL,G	33	65.7	ug/Kg	481	G	44	86.1	ug/Kg	526	G	41	80.6	ug/Kg
Benzo(k)fluoranthene		<MDL	53	98.6	ug/Kg	1600		69	129	ug/Kg	2010		65	121	ug/Kg
Benzoic Acid		<MDL	140	197	ug/Kg	363		180	258	ug/Kg	313		170	242	ug/Kg
Benzyl Alcohol		<MDL	33	65.7	ug/Kg		<MDL	44	86.1	ug/Kg		<MDL	41	80.6	ug/Kg
Benzyl Butyl Phthalate		<MDL	20	32.9	ug/Kg		<MDL	26	43.1	ug/Kg		<MDL	24	40.4	ug/Kg
Bis(2-Chloroethoxy)Methane		<MDL	33	65.7	ug/Kg		<MDL	44	86.1	ug/Kg		<MDL	41	80.6	ug/Kg
Bis(2-Chloroethyl)Ether		<MDL	20	32.9	ug/Kg		<MDL	26	43.1	ug/Kg		<MDL	24	40.4	ug/Kg
Bis(2-Chloroisopropyl)Ether		<MDL	65	132	ug/Kg		<MDL	86	173	ug/Kg		<MDL	80	162	ug/Kg
Bis(2-Ethylhexyl)Phthalate	49	B	20	32.9	ug/Kg		<MDL,B	26	43.1	ug/Kg	236	B	24	40.4	ug/Kg
Carbazole		<MDL,L	33	65.7	ug/Kg	743	L	44	86.1	ug/Kg	1770	L	41	80.6	ug/Kg
Chrysene	152		20	32.9	ug/Kg	3020		26	43.1	ug/Kg	5230		24	40.4	ug/Kg
Coprostanol		<MDL	140	197	ug/Kg		<MDL	180	258	ug/Kg		<MDL	170	242	ug/Kg
Di-N-Butyl Phthalate	87.7	B	33	65.7	ug/Kg	131	B	44	86.1	ug/Kg	90.2	B	41	80.6	ug/Kg
Di-N-Octyl Phthalate		<MDL	20	32.9	ug/Kg		<MDL	26	43.1	ug/Kg		<MDL	24	40.4	ug/Kg
Dibenzo(a,h)anthracene		<MDL	53	98.6	ug/Kg	334		69	129	ug/Kg	245		65	121	ug/Kg
Dibenzofuran		<MDL	33	65.7	ug/Kg	333		44	86.1	ug/Kg	1600		41	80.6	ug/Kg
Diethyl Phthalate		<MDL	33	65.7	ug/Kg		<MDL	44	86.1	ug/Kg		<MDL	41	80.6	ug/Kg
Dimethyl Phthalate		<MDL	14	19.7	ug/Kg		<MDL	18	25.8	ug/Kg		<MDL	17	24.2	ug/Kg
Fluoranthene	208		20	39.5	ug/Kg	4750		26	51.7	ug/Kg	23600		24	48.4	ug/Kg
Fluorene		<MDL	20	32.9	ug/Kg	512		26	43.1	ug/Kg	1980		24	40.4	ug/Kg
Hexachlorobenzene		<MDL	20	32.9	ug/Kg		<MDL	26	43.1	ug/Kg		<MDL	24	40.4	ug/Kg
Hexachlorobutadiene		<MDL	33	65.7	ug/Kg		<MDL	44	86.1	ug/Kg		<MDL	41	80.6	ug/Kg
Hexachlorocyclopentadiene		<MDL,X	33	65.7	ug/Kg		<MDL,X	44	86.1	ug/Kg		<MDL,X	41	80.6	ug/Kg
Hexachloroethane		<MDL,G	33	65.7	ug/Kg		<MDL,G	44	86.1	ug/Kg		<MDL,G	41	80.6	ug/Kg
Indeno(1,2,3-Cd)Pyrene	43	<RDL	33	65.7	ug/Kg	761		44	86.1	ug/Kg	809		41	80.6	ug/Kg
Isophorone		<MDL	33	65.7	ug/Kg		<MDL	44	86.1	ug/Kg		<MDL	41	80.6	ug/Kg
N-Nitrosodi-N-Propylamine		<MDL	33	65.7	ug/Kg		<MDL	44	86.1	ug/Kg		<MDL	41	80.6	ug/Kg
N-Nitrosodimethylamine		<MDL	140	197	ug/Kg		<MDL	180	258	ug/Kg		<MDL	170	242	ug/Kg
N-Nitrosodiphenylamine		<MDL	33	65.7	ug/Kg		<MDL	44	86.1	ug/Kg		<MDL	41	80.6	ug/Kg

METRO Environmental Lab Analytical Report

PROJECT: A44703

	P53VG8	P53VG10	P53VG11
Locator:	P53VG8	P53VG10	P53VG11
Sampled:	Jul 29, 94	Jul 29, 94	Jul 29, 94
Lab ID:	L4298-5	L4298-6	L4298-7
Matrix:	SALTWTRSED	SALTWTRSED	SALTWTRSED
% Solids:	81.1	61.9	66.1

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis			
Naphthalene		<MDL	53	98.6	ug/Kg	187		69	129	ug/Kg	2130		65	121	ug/Kg
Nitrobenzene		<MDL	33	65.7	ug/Kg		<MDL	44	86.1	ug/Kg		<MDL	41	80.6	ug/Kg
Pentachlorophenol		<MDL	33	65.7	ug/Kg		<MDL	44	86.1	ug/Kg		<MDL	41	80.6	ug/Kg
Phenanthrene	78.1		20	32.9	ug/Kg	2460		26	43.1	ug/Kg	9590		24	40.4	ug/Kg
Phenol		<MDL	140	197	ug/Kg		<MDL	180	258	ug/Kg		<MDL	170	242	ug/Kg
Pyrene	97.4		20	32.9	ug/Kg	11600		26	43.1	ug/Kg	29300		24	40.4	ug/Kg
METALS															
M.Code=METRO 16-01-005															
Mercury, Total, CVAA	0.031	<RDL	0.025	0.248	mg/Kg	1.66		0.032	0.318	mg/Kg	0.935		0.03	0.303	mg/Kg
M.Code=METRO 16-02-004															
Aluminum, Total, ICP	10700		12	60.9	mg/Kg	12600		16	80.3	mg/Kg	11600		15	75.2	mg/Kg
Antimony, Total, ICP		<MDL,G	3.7	18.2	mg/Kg		<MDL,G	4.8	24.1	mg/Kg		<MDL,G	4.5	22.5	mg/Kg
Arsenic, Total, ICP	11	<RDL	6	30.5	mg/Kg	15	<RDL	8.1	40.1	mg/Kg	17	<RDL	7.6	37.7	mg/Kg
Barium, Total, ICP	20.6	E	0.12	0.609	mg/Kg	620	E	0.16	0.803	mg/Kg	72.5	E	0.15	0.752	mg/Kg
Beryllium, Total, ICP	0.22	<RDL	0.12	0.609	mg/Kg	0.34	<RDL	0.16	0.803	mg/Kg	0.27	<RDL	0.15	0.752	mg/Kg
Cadmium, Total, ICP		<MDL	0.37	1.82	mg/Kg	1.5	<RDL	0.48	2.41	mg/Kg	1.3	<RDL	0.45	2.25	mg/Kg
Calcium, Total, ICP	4560		6	30.5	mg/Kg	7770		8.1	40.1	mg/Kg	31000		7.6	37.7	mg/Kg
Chromium, Total, ICP	19.6		0.6	3.05	mg/Kg	60.9		0.81	4.01	mg/Kg	37.5		0.76	3.77	mg/Kg
Copper, Total, ICP	18.2		0.49	2.44	mg/Kg	111		0.65	3.21	mg/Kg	55.7		0.61	3.01	mg/Kg
Iron, Total, ICP	14200		6	30.5	mg/Kg	19900		8.1	40.1	mg/Kg	18500		7.6	37.7	mg/Kg
Lead, Total, ICP	5.9	<RDL	3.7	18.2	mg/Kg	394		4.8	24.1	mg/Kg	121		4.5	22.5	mg/Kg
Magnesium, Total, ICP	4280	E	3.7	18.2	mg/Kg	6560	E	4.8	24.1	mg/Kg	6200	E	4.5	22.5	mg/Kg
Manganese, Total, ICP	173	L	0.25	1.22	mg/Kg	221	L	0.32	1.6	mg/Kg	228	L	0.3	1.5	mg/Kg
Molybdenum, Total, ICP		<MDL	2.5	12.2	mg/Kg	6.5	<RDL	3.2	16	mg/Kg	3.6	<RDL	3	15	mg/Kg
Nickel, Total, ICP	19.1		2.5	12.2	mg/Kg	36.8		3.2	16	mg/Kg	36.5		3	15	mg/Kg
Selenium, Total, ICP		<MDL	6	30.5	mg/Kg		<MDL	8.1	40.1	mg/Kg		<MDL	7.6	37.7	mg/Kg
Silver, Total, ICP		<MDL	0.49	2.44	mg/Kg	5.19		0.65	3.21	mg/Kg	3.49		0.61	3.01	mg/Kg
Sodium, Total, ICP	3880		60	305	mg/Kg	8510		81	401	mg/Kg	5850		76	377	mg/Kg
Thallium, Total, ICP		<MDL	25	122	mg/Kg		<MDL	32	160	mg/Kg		<MDL	30	150	mg/Kg
Zinc, Total, ICP	30.6		0.6	3.05	mg/Kg	208		0.81	4.01	mg/Kg	132		0.76	3.77	mg/Kg
CONVENTIONALS															
M.Code=SM5310-B															
Total Organic Carbon	4020		6.2	12.3	mg/Kg	41500		8.1	16.2	mg/Kg	16500		7.6	15.1	mg/Kg
M.Code=(No Method Code)															
p-2.25	15	E	0.1		%	27	E	0.1		%	1.9	E	0.1		%
p-2.00	3.6	E	0.1		%	4.2	E	0.1		%	0.3	E	0.1		%
p-1.00	11	E	0.1		%	17	E	0.1		%	3.9	E	0.1		%
p+0.00	9.6	E	0.1		%	8	E	0.1		%	5.8	E	0.1		%
p+1.00	13	E	0.1		%	7.5	E	0.1		%	26	E	0.1		%
p+2.00	15	E	0.1		%	7.2	E	0.1		%	31	E	0.1		%
p+3.00	4.4	E	0.1		%	5.9	E	0.1		%	9.7	E	0.1		%
p+4.00	1.6	E	0.1		%	4.7	E	0.1		%	2.5	E	0.1		%
p+5.00	5.6	E	0.1		%	1.3	E	0.1		%	5.5	E	0.1		%

METRO Environmental Lab Analytical Report

PROJECT: A44703

Locator: P53VG8
Sampled: Jul 29, 94
Lab ID: L4298-5
Matrix: SALTWTRSED
% Solids: 81.1

Parameters	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis			
p+6.00	5.3	E	0.1		%
p+7.00	6	E	0.1		%
p+8.00	3.7	E	0.1		%
p+9.00	1.4	E	0.1		%
p+10.0	0.6	E	0.1		%
p+11.0	4.8	E	0.1		%

Locator: P53VG10
Sampled: Jul 29, 94
Lab ID: L4298-6
Matrix: SALTWTRSED
% Solids: 61.9

Parameters	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis			
p+6.00	4.1	E	0.1		%
p+7.00	3.9	E	0.1		%
p+8.00	3.3	E	0.1		%
p+9.00	1.1	E	0.1		%
p+10.0	0.4	E	0.1		%
p+11.0	3.9	E	0.1		%

Locator: P53VG11
Sampled: Jul 29, 94
Lab ID: L4298-7
Matrix: SALTWTRSED
% Solids: 66.1

Parameters	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis			
p+6.00	4.2	E	0.1		%
p+7.00	3.3	E	0.1		%
p+8.00	2.4	E	0.1		%
p+9.00	0.4	E	0.1		%
p+10.0		<MDL,E	0.1		%
p+11.0	3.6	E	0.1		%

APPENDIX E
BENTHIC TAXONOMY DATA

PIER 53-55 CAP						
METRO - SEATTLE						
INVERTEBRATE SPECIES DATA						
By Marine Taxonomic Services, Ltd.						
December, 1996						
TAXON	NODOC CODE	VG1-1	VG1-2	VG1-3	VG1-4	VG1-5
Amage anops	5001670101		1			
Ampharete labrops	5001670215	9	1	5	5	1
Ampharete sp. Indet.	5001670200					
Ampharete cf. crassiseta						
Ampharetidae sp. Indet.	5001670000			1		
Amphicties mucronata	5001670306		1			
Anobothrus gracilis	5001670701					
Aphelochaeta monilaris	5001500301	2	1	1	3	
Aphelochaeta sp. Indet.						
Aphelochaeta sp. N-1		4	2		1	1
Aphrodita sp. Juv.	5001010100					
Aricidea ramosa	5001410706				2	
Aricidea wassi	5001410206					
Armandia brevis	5001580202					1
Ascleriocheilus beringainus	5001570201					
Barantolla nr. americana	5001600601					
Capitella capitata 'hyperspecies'	5001600101					
Capitellidae sp. Indet.	5001600000					
Caulleriella pacifica		4	3	2	2	1
Chaetozone acuta						
Chaetozone nr. setosa	5001500401	7	5	4	2	2
Chaetozone sp. Indet.	5001500400					
Cirratulidae sp. Indet.	5001500000	1	3	1	2	1
Cirratulidae sp. Juv.	5001500000					
Cirratulus robustus	5001500102					
'Clymenura' gracilis	5001631203	3				
Cossura pygodactyla	5001520106				2	
Demonax sp. Indet.	5001702800					
Diopatra ornata	5001290202		1	3		2
Dipolydora cardalia	5001430431				1	1
Dipolydora caulleryi	5001430404			1		
Dipolydora socialis	5001430402					
Dorvillea annulata	5001360502					
Dorvillea pseudorubrovittata	5001360101				1	
Dorvillidae sp. Indet.	5001360000					
Drilonereis longa	5001330103				1	
Ehlersia heterochaeta	5001232201			1		
Ehlersia hyperioni	5001230321	2	1			
Ehlersia sp. Indet.	5001232200					
Eteone sp. Indet.	5001130200					
Euchone incolor	5001700204	2				
Euclymeninae sp. Indet.		1	1	1		
Eulalia californiensis		2	1	1	6	1
Eumida longicornuta		1	4	1	1	5

PIER 53-55 CAP						
METRO - SEATTLE						
INVERTEBRATE SPECIES DATA						
By Marine Taxonomic Services, Ltd.						
December, 1996						
TAXON	NODOC CODE	VG1-1	VG1-2	VG1-3	VG1-4	VG1-5
Exogone lourei	5001230703					
Exogone sp. Juv.	5001230700	1				
Gattyana ciliata	5001020602					
Gattyana cirrosa	5001020603	4	4	9	2	4
Glycera americana	5001270104	1				
Glycera nana		4	7	7	1	1
Glycera sp. Indet.	5001270100				1	
Glycera sp. Juv.	5001270100					
Glycinde armigera	5001280103	4	4	2	1	1
Glycinde polygnatha	5001280105					
Glycinde sp. Juv.	5001280100					
Goniada maculata	5001280202	2	2		1	1
Harmothoe imbricata	5001020806					
Hesionidae sp. Indet.	5001210000					
Heteromastus filobranchus	5001600203					
Isocirrus longiceps	5001632001					
Laonice cirrata	5001430201	2	6	2		1
Laonice pugettensis	5001430204					
Leitoscoloplos pugettensis	5001401601		2			
Levinsenia gracilis	5001410801	1		1	2	
Lumbrineridae sp. Indet.	5001310000	39	55	46	42	17
Lumbrineris californiensis	5001310132	4	7	9	23	11
Lumbrineris limicola	5001310128					
Magelona longicornis	5001440105	1		2		1
Maldanidae sp. Indet.	5001630000					
Mediomastus sp. Indet.	5001600400		2		1	
Mesochaetopterus taylori	5001490401		1			1
Microphthalmus sczelkowii	5001210201					1
Micropodarke dubia	5001210801		1			
Neosabellaria cementarium	5001650201		1			1
Nephtys caeca	5001250103			1		
Nephtys cornuta	5001250104	1	5	3	4	1
Nephtys ferruginea	5001250111	9	8	7	1	3
Nephtys nr. ciliata	5001250102					
Nephtys sp. Indet.	5001250100					1
Nephtys sp. Juv.	5001250100				1	
Nereidae sp. Indet.	5001240000					
Nereis procera	5001240404	2	2		1	2
Nereis sp. Juv.	5001240400					
Notomastus latericius	5001600306					
Notomastus sp. Indet.	5001600300					
Notomastus tenuis	5001600302	1	3	1	2	3
Odontosyllis phosphorea	5001231303	5		2		
Oligochaeta sp. Indet.						

PIER 53-55 CAP						
METRO - SEATTLE						
INVERTEBRATE SPECIES DATA						
By Marine Taxonomic Services, Ltd.						
December, 1996						
TAXON	NODOC CODE	VG1-1	VG1-2	VG1-3	VG1-4	VG1-5
Onuphidae sp. Indet.	5001290000					
Onuphis elegans	5001290111					
Onuphis iridescens	5001290103					
Onuphis sp. Juv.	5001290100					
Ophelina acuminata	5001580607	1				
Orbiniidae sp. Indet.	5001400000					
Paleonotus bellis	5001080101					
Paranaitis polynoides	5001130803					
Parandalia fauveli	5001220802		2	1	1	4
Paraprionospio pinnata	5001431701	3	3		4	1
Parougia caeca						
Pectinaria californiensis	5001660304					
Pectinaria granulata	5001660303	5	1	1	2	1
Pectinaria sp. Indet.	5001660300					
Pholoe glabra	5001060102					
Pholoe minuta	5001060101					
Pholoides aspera	5001040202	9	2	6	8	8
Phyllochaetopterus prolifica	5001490202	1				
Phyllodoce groenlandica	5001130102	1	1	2		
Phyllodoce hartmanae	5001131402		1			
Phyllodoce sp. Indet.	5001131400					
Phyllodoce sp. Juv.	5001131400					
Phyllodocidae sp. Juv.	5001130000					
Phylo felix	5001400401					
Pilargis maculata	5001220303				2	
Pionosyllis sp. Indet.	5001230200					
Pista bansei						
Pista elongata	5001680703	1				
Pista sp. Indet.	5001680700				1	
Platynereis bicanaliculata	5001240501					
Podarkeopsis glabrus	5001211903	1			2	
Polycirrus californicus	5001680810	1				
Polycirrus sp. Indet.	5001680800					
Polycirrus sp. complex	.					
Polydora limicola	5001430415			1		
Polydora sp. Indet.	5001430400				1	
Polynoidae sp. Indet.	5001020000	1	3	1	4	
Prionospio jubata		83	58	59	51	61
Prionospio lighti	5001430521					
Prionospio multibranchiata	5001433601					
Prionospio sp. Indet.	5001430500					
Prionospio sp. Juv.	5001430500	1				
Proclea graffi	5001681702		1			
Protodorvillea gracilis	5001360201	1		1		

PIER 53-55 CAP						
METRO - SEATTLE						
INVERTEBRATE SPECIES DATA						
By Marine Taxonomic Services, Ltd.						
December, 1996						
TAXON	NODOC CODE	VG1-1	VG1-2	VG1-3	VG1-4	VG1-5
Rhodine bitorquata	5001631001					
Scoletoma luti	5001310109	5	17	10	11	5
Scoloplos armiger	5001400301					
Sigalion spinosa						
Sphaerodoropsis sphaerulifer	5001260202	1	4	2	2	1
Sphaerosyllis californiensis	5001230808					
Sphaerosyllis ranunculus						
Sphaerosyllis sp. Indet.	5001230800					
Spio cirrifera	5001430703					
Spio sp. Indet.	5001430700					
Spiochaetopterus costarum	5001490302	27	46	30	9	18
Spionidae sp. Juv.	5001430000					
Spiophanes berkeleyorum	5001431004	6		1	1	1
Sthenalais fusca	5001060306	1		1		
Streblosoma bairdi	5001682502					
Syllidae sp. Indet.	5001230000					1
Syllis sp. Indet.	5001230300	1	1			
Tenonia priops	5001022302					
Terebellidae sp. Juv.	5001680000					
Terebellides californica	5001690103					
Terebellides sp. Indet.	5001690100					
Travisia forbesii	5001580402					1
Travisia sp. Juv.	5001580400					
Trochochaeta multisetosa	5001450203	1	1	1	2	
Typosyllis harti	5001230510	1	1	3	2	4
MOLLUSCA						
Acila castrensis	5502020101					
Adontorhina cyclia	5515020102				1	
Aeolidiidae sp. Indet.	5142030000					
Alvania compacta	5103200106		1			
Articulata sp. Juv.		1				
Astarte elliptica	5515190114					
Astyris gausapata		2	1			
Axinopsida serricata	5515020201	164	174	150	126	187
Balcis sp. Indet.	5103530600					
Bivalvia sp. Juv.	5500000000					
Cardiidae sp. Juv.	5515220000					
Cardiomya pectinata	5520100101		2			
Chaetoderma sp. Indet.	5402010100				2	
Clinocardium blandum						
Clinocardium nuttalli	5515220102					
Clinocardium sp. Juv.	5515220100					
Compsomyax subdiaphana	5515470301	1			1	

PIER 53-55 CAP						
METRO - SEATTLE						
INVERTEBRATE SPECIES DATA						
By Marine Taxonomic Services, Ltd.						
December, 1996						
TAXON	NODOC CODE	VG1-1	VG1-2	VG1-3	VG1-4	VG1-5
Crepipatella lingulata	5103640301					
Cryptonatica affinis	5103760201					
Cylichna attonsa	5110040214					
Gastropoda sp. Indet.	5100000000					
Gastropteron pacificum	5110070101			1		
Hiatella arctica	5517060201					
Kurtzia arteaga	5106024101		1			
Lacuna vincta	5103090305					
Lirobittium sp. Indet.						
Lottia pelta						
Lottia sp. Juv.						
Lucinoma annulatum	5515010201					1
Lyonsia californica	5520050202	12	1	2		6
Macoma calcarea	5515310101				1	
Macoma carlottensis	5515310112	1	8		1	7
Macoma elimata	5515310102	7	3	4	4	1
Macoma inquinata	5515310115					
Macoma obliqua	5515310106	2				1
Macoma sp. Juv.	5515310100	20	7	3	4	7
Macoma yoldiformis	5515310111		1			
Margarites pupillus	5102100308					
Megacrenella columbiana	5507010301	6	4	2	1	4
Melanochlamys diomedea	5110060101					
Modiolus sp. Juv.	5507010600					1
Mysella tumida	5515100102					
Mytilidae sp. Juv.	5507010000					
Mytilus edulis sp. complex	5507010100					
Nassarius mendicus	5101080101					
Nemocardium centrifilosum	5515220301	1		2		1
Nucula tenuis	5502020201		1		2	1
Nuculana minuta	5502040202					
Nudibranchia sp. Juv.	5127000000	1		1	1	
Odostomia sp. Indet.	5108010100					
Olivella baetica	5105100102					
Onchidoris bilamellata	5131050507					
Pandora filosa	5520020102	1				
Pandora sp. Juv.	5520020100	2	1			
Panomya ampla	5517060303					
Parvilucina tenuisculpta	5515010101	13	28	37	24	43
Pododesmus macroschisma	5509090101					
Protothaca staminea	5515470701					
Psephidia lordi	5515470501	3	2	1		
Rictaxis punctocaelatus	5110010401					
Saxidomus giganteus	5515470201					

PIER 53-55 CAP						
METRO - SEATTLE						
INVERTEBRATE SPECIES DATA						
By Marine Taxonomic Services, Ltd.						
December, 1996						
TAXON	NODOC CODE	VG1-1	VG1-2	VG1-3	VG1-4	VG1-5
Solen sicarius	5515290201					
Tellina modesta	5515310204					
Tellina nuculoides	5515310202					
Teredinidae sp. Indet.	5518020000					
Thracia cf. challisiana	5520080207					
Thracia sp. Juv.	5520080200					
Thracia trapezoides	5520080203					
Thyasira gouldi	5515020325		2	1	2	2
Turbonilla sp. Indet.	5108010200	1	2			
CRUSTACEA						
Ampelisca careyi	6169020135					
Ampelisca cristata	6169020112					
Ampelisca hancocki	6169020113					
Ampelisca lobata	6169020134					1
Aoroides exilis	6169060106					
Aoroides inermis	6169060104		1			1
Aoroides intermedia	6169060107					
Aruga oculata						
Balanomorpha sp. Indet.	6134000000					
Balanus glandula	6134020107					
Bopyroides hippolytes	6165040401		2			
Brachyura sp. Indet.	6184000000					
Byblis millsi	6169020209	9	2	3	1	
Byblis sp. Indet.	6169020200					
Cancer gracilis	6188030105	3	2			2
Cancer productus	6188030101					
Caprella laeviuscula	6171010710					
Caprella mendax	6171010719					
Chthamalus dalli	6134010101					
Corophium crassicorne	6169150203					
Crangon alaskensis	6179221003	2	1			1
Crangon sp. Indet.	6179220100					
Crangonidae sp. Indet.	6179220000					
Cyclopoida sp. Indet.	6120000000					1
Deflexilodes aenigmaticus		2		1	1	2
Desdimelita californica	6169211005					
Diastylis santamariensis						
Eobrolgus chumashi	6169421902					
Euaulus pusiolus	6179160408					
Eudorella pacifica	6154040202	7	3	3	3	3
Euphilomedes carcharodonta	6111070301	332	143	194	114	221
Euphilomedes producta	6111070303	7	5	8	5	11
Exosphaeroma inornata	6161020402					

PIER 53-55 CAP						
METRO - SEATTLE						
INVERTEBRATE SPECIES DATA						
By Marine Taxonomic Services, Ltd.						
December, 1996						
TAXON	NODOC CODE	VG1-1	VG1-2	VG1-3	VG1-4	VG1-5
Gammaridea sp. Indet.	6169210000		1			
Gammaropsis thompsoni	6169260401					
Haliophasma geminatum	6160011601					
Harpacticoida sp. Indet.	6119000000					
Hemigrapsus oregonensis	6189070102					
Heterophoxus conlanae			1	3	4	4
Hippolytidae sp. Indet.	6179160000					
Hippomedon coecus	6169341411		1			3
Leptochelia dubia	6157020103			2		
Leptognathia gracilis	6157090102					
Mayerella banksia	6171010301					
Melphisana "bola"	6169350201					
Munnogonium tillerae	6163120303					
Mysidae sp. Indet.	6153010000					
Nebalia "pugettensis"	6145010102					
Neotrypaea sp. Indet.				1		
Nymphon pixellae	6001010107		1			
Opisa tridentata	6169342802					
Orchomene pacificus	6169342903					
Orchomene pinguis	6169342904					
Pachynus barnardi	6169343101					
Pagurus dalli	6183060223	1				
Pagurus granosimanus	6183060211					
Pagurus sp. Indet.	6183060200					
Parametaphoxus quaylei			1	2	5	8
Parasterope barnesi	6111030503	1	5	2	1	4
Peramphithoe tea						
Photis brevipes	6169260201					
Phoxichelidium femoratum	6001060102					1
Pinnixa schmitti	6189060404			3		
Pinnixa sp. Indet.	6189060400					1
Pinnotheridae sp. Indet.	6189060000					
Pleusymtes sp A						
Protomedeia prudens	6169260312					
Protomedeia sp. Indet.	6169260300					
Rhepoxynius abronius	6169421504					
Rutiderma lomae	6111060103				1	
Solidobalanus hesperius	6134050201	1				
Spirontocaris snyderi	6179160204		1			
Spirontocaris sp. Indet.	6179160200	1				
Synchelidium pectinatum				1	1	
Synchelidium rectipalmum	6169371403					
Synchelidium variabilum						
Westwoodilla caecula	6169371502		2	4	1	2

PIER 53-55 CAP						
METRO - SEATTLE						
INVERTEBRATE SPECIES DATA						
By Marine Taxonomic Services, Ltd.						
December, 1996						
TAXON	NODOC CODE	VG1-1	VG1-2	VG1-3	VG1-4	VG1-5
MISCELLANEOUS						
Amphiodia periercta	8129030107					
Amphiodia sp. Indet.	8129030100					
Amphipholis sp. Indet.	8129030900					1
Amphipholis squamata	8129030202					
Amphiuridae sp. Indet.	8129030000					
Anthozoa sp. Indet.	3740000000					
Chironomidae sp. Juv.	6505080000					
Crossaster papposus	8113010103					
Cucumaria piperata	8172060111					
Ephemeroptera sp. Juv.						
Golfingia sp. Indet.	7200020100	4	5	3	5	5
Golfingia sp. Juv.	7200020100					
Holothuroidea sp. Indet.	8170000000	1				
Nematoda sp. Indet.	4700000000					
Nemertinea sp. Indet.	4300000000	3	5	4	7	1
Nynantheae sp. Indet.		1		1	2	1
Ophiura lutkeni	8127010607			1	2	
Ophiura sarsi	8127010610					
Ophiura sp. Indet.	8127010600			1		
Pentamera sp. Indet.	8172060300					
Phoronis sp. Indet.	7700010200					
Platyhelminthes sp. Indet.	3900000000				1	
Spinulosida sp. Indet.	8112000000			1		1
Strongylocentrotus sp. Juv.	8149030200					
Tunicate sp. Indet.				1		

PIER 53-55 CAP
METRO - SEATTLE
INVERTEBRATE SPECIES DATA
By Marine Taxonomic Services, Ltd.
December, 1996

TAXON	NODOC CODE	VG2-1	VG2-2	VG2-3	VG2-4	VG2-5
Amage anops	5001670101					
Ampharete labrops	5001670215					
Ampharete sp. Indet.	5001670200					
Ampharete cf. crassiseta						
Ampharetidae sp. Indet.	5001670000	2			1	
Amphicties mucronata	5001670306					
Anobothrus gracilis	5001670701	8	2	1	1	
Aphelochaeta monilaris	5001500301		2		1	1
Aphelochaeta sp. Indet.		2	2	1	1	2
Aphelochaeta sp. N-1			3			2
Aphrodita sp. Juv.	5001010100					
Aricidea ramosa	5001410706					
Aricidea wassi	5001410206					
Armandia brevis	5001580202					1
Ascleriocheilus beringainus	5001570201					
Barantolla nr. americana	5001600601					
Capitella capitata 'hyperspecies'	5001600101					
Capitellidae sp. Indet.	5001600000					
Caullerlella pacifica						
Chaetozone acuta						
Chaetozone nr. setosa	5001500401	5	1	2	4	6
Chaetozone sp. Indet.	5001500400					
Cirratulidae sp. Indet.	5001500000					
Cirratulidae sp. Juv.	5001500000	1	1			
Cirratulus robustus	5001500102					
'Clymenura' gracilis	5001631203	1		2		
Cossura pygodactyla	5001520106		1			3
Demonax sp. Indet.	5001702800					
Diopatra ornata	5001290202	4	2	1	4	1
Dipolydora cardalia	5001430431					
Dipolydora caulleryi	5001430404					
Dipolydora socialis	5001430402					
Dorvillea annulata	5001360502					
Dorvillea pseudorubrovittata	5001360101					
Dorvillidae sp. Indet.	5001360000		1			
Drilonereis longa	5001330103					1
Ehlersia heterochaeta	5001232201	1	4			
Ehlersia hyperioni	5001230321	1	4			
Ehlersia sp. Indet.	5001232200					
Eteone sp. Indet.	5001130200			1		
Euchone incolor	5001700204	1				
Euclymeninae sp. Indet.						
Eulalia californiensis			2			
Eumida longicornuta			3	1	1	2

PIER 53-55 CAP						
METRO - SEATTLE						
INVERTEBRATE SPECIES DATA						
By Marine Taxonomic Services, Ltd.						
December, 1996						
TAXON	NODOC CODE	VG2-1	VG2-2	VG2-3	VG2-4	VG2-5
Exogone lourei	5001230703	1	1	1		
Exogone sp. Juv.	5001230700					
Gattyana ciliata	5001020602					
Gattyana cirrosa	5001020603				1	
Glycera americana	5001270104					
Glycera nana		1			2	1
Glycera sp. Indet.	5001270100		1			
Glycera sp. Juv.	5001270100					
Glycinde armigera	5001280103	1				
Glycinde polygnatha	5001280105					
Glycinde sp. Juv.	5001280100					
Goniada maculata	5001280202	1	1			1
Harmothoe imbricata	5001020806					
Hesionidae sp. Indet.	5001210000					
Heteromastus filobranchus	5001600203				1	
Isocirrus longiceps	5001632001					
Laonice cirrata	5001430201		2			
Laonice pugettensis	5001430204					
Leitoscoloplos pugettensis	5001401601			4		
Levinsenia gracilis	5001410801	2				4
Lumbrineridae sp. Indet.	5001310000	20	31	7	16	10
Lumbrineris californiensis	5001310132		1			2
Lumbrineris limicola	5001310128					
Magelona longicornis	5001440105					
Maldanidae sp. Indet.	5001630000	1		2	1	1
Mediomastus sp. Indet.	5001600400	1	1	1		
Mesochaetopterus taylori	5001490401					
Microphthalmus sczelkowii	5001210201					
Micropodarke dubia	5001210801					
Neosabellaria cementarium	5001650201					
Nephtys caeca	5001250103					
Nephtys cornuta	5001250104	6	9	1	6	11
Nephtys ferruginea	5001250111	4	2	3	6	5
Nephtys nr. ciliata	5001250102					
Nephtys sp. Indet.	5001250100					
Nephtys sp. Juv.	5001250100		1			
Nereidae sp. Indet.	5001240000					
Nereis procera	5001240404	2	1	2	1	
Nereis sp. Juv.	5001240400					1
Notomastus latericius	5001600306					
Notomastus sp. Indet.	5001600300					
Notomastus tenuis	5001600302	1	3	2	4	3
Odontosyllis phosphorea	5001231303					
Oligochaeta sp. Indet.						

PIER 53-55 CAP						
METRO - SEATTLE						
INVERTEBRATE SPECIES DATA						
By Marine Taxonomic Services, Ltd.						
December, 1996						
TAXON	NODOC CODE	VG2-1	VG2-2	VG2-3	VG2-4	VG2-5
Onuphidae sp. Indet.	5001290000					
Onuphis elegans	5001290111					
Onuphis iridescens	5001290103					
Onuphis sp. Juv.	5001290100					
Ophelina acuminata	5001580607	1		1		2
Orbiniidae sp. Indet.	5001400000		1			
Paleonotus bellis	5001080101					1
Paranaitis polynoides	5001130803		1			
Parandalia fauveli	5001220802			1		1
Paraprionospio pinnata	5001431701	1	2	1	2	2
Parougia caeca						
Pectinaria californiensis	5001660304					
Pectinaria granulata	5001660303		1			
Pectinaria sp. Indet.	5001660300					
Pholoe glabra	5001060102					
Pholoe minuta	5001060101					
Pholoides aspera	5001040202					1
Phyllochaetopterus prolifica	5001490202					
Phyllodoce groenlandica	5001130102	2			1	1
Phyllodoce hartmanae	5001131402					
Phyllodoce sp. Indet.	5001131400	1	1			
Phyllodoce sp. Juv.	5001131400					
Phyllodocidae sp. Juv.	5001130000					
Phylo felix	5001400401					
Pilargis maculata	5001220303					
Pionosyllis sp. Indet.	5001230200					
Pista bansei						
Pista elongata	5001680703					
Pista sp. Indet.	5001680700					
Platynereis bicanaliculata	5001240501					
Podarkeopsis glabrus	5001211903					
Polycirrus californicus	5001680810				1	
Polycirrus sp. Indet.	5001680800					
Polycirrus sp. complex						
Polydora limicola	5001430415					1
Polydora sp. Indet.	5001430400					
Polynoidae sp. Indet.	5001020000		1			2
Prionospio jubata		34	35	19	34	43
Prionospio lighti	5001430521	1				
Prionospio multibranchiata	5001433601					
Prionospio sp. Indet.	5001430500					
Prionospio sp. Juv.	5001430500					
Proclea graffi	5001681702	1				
Protodorvillea gracilis	5001360201	2	2			

PIER 53-55 CAP						
METRO - SEATTLE						
INVERTEBRATE SPECIES DATA						
By Marine Taxonomic Services, Ltd.						
December, 1996						
TAXON	NODOC CODE	VG2-1	VG2-2	VG2-3	VG2-4	VG2-5
Rhodine bitorquata	5001631001	1				
Scoletoma luti	5001310109	6	7	6	6	16
Scoloplos armiger	5001400301					
Sigalion spinosa						
Sphaerodoropsis sphaerulifer	5001260202	5	4	1	4	3
Sphaerosyllis californiensis	5001230808					
Sphaerosyllis ranunculus		2				
Sphaerosyllis sp. Indet.	5001230800					
Spio cirrifera	5001430703		1			
Spio sp. Indet.	5001430700					
Spiochaetopterus costarum	5001490302	7	20		4	10
Spionidae sp. Juv.	5001430000					
Spiophanes berkeleyorum	5001431004	1				3
Sthenalais fusca	5001060306	1				1
Streblosoma bairdi	5001682502	1				
Syllidae sp. Indet.	5001230000					
Syllis sp. Indet.	5001230300			1		
Tenonia priops	5001022302					
Terebellidae sp. Juv.	5001680000					
Terebellides californica	5001690103	1				
Terebellides sp. Indet.	5001690100					
Travisia forbesii	5001580402					
Travisia sp. Juv.	5001580400					
Trochochaeta multisetosa	5001450203	1	1			2
Typosyllis harti	5001230510	2	3	1	2	2
MOLLUSCA						
Acila castrensis	5502020101					
Adontorhina cyclia	5515020102	2				
Aeolidiidae sp. Indet.	5142030000					
Alvania compacta	5103200106					
Articulata sp. Juv.						
Astarte elliptica	5515190114					
Astyris gausapata			1	13	5	2
Axinopsida serricata	5515020201	335	127	201	191	176
Balcis sp. Indet.	5103530600					
Bivalvia sp. Juv.	5500000000	1	2			1
Cardiidae sp. Juv.	5515220000					
Cardiomya pectinata	5520100101					
Chaetoderma sp. Indet.	5402010100	1				2
Clinocardium blandum						
Clinocardium nuttalli	5515220102					
Clinocardium sp. Juv.	5515220100					
Compsomyax subdiaphana	5515470301				1	1

PIER 53-55 CAP						
METRO - SEATTLE						
INVERTEBRATE SPECIES DATA						
By Marine Taxonomic Services, Ltd.						
December, 1996						
TAXON	NODOC CODE	VG2-1	VG2-2	VG2-3	VG2-4	VG2-5
Crepipatella lingulata	5103640301					
Cryptonatica affinis	5103760201					
Cylichna attonsa	5110040214					
Gastropoda sp. Indet.	5100000000					
Gastropteron pacificum	5110070101			1	1	5
Hiatella arctica	5517060201		1			
Kurtzia arteaga	5106024101					
Lacuna vincta	5103090305					
Lirobittium sp. Indet.						
Lottia pelta						
Lottia sp. Juv.						
Lucinoma annulatum	5515010201	2	2			1
Lyonsia californica	5520050202	4		1	1	2
Macoma calcarea	5515310101					
Macoma carlottensis	5515310112	8	2	18	11	6
Macoma elimata	5515310102			2		2
Macoma inquinata	5515310115					
Macoma obliqua	5515310106					
Macoma sp. Juv.	5515310100	22	14	14	2	4
Macoma yoldiformis	5515310111		1		1	
Margarites pupillus	5102100308					
Megacrenella columbiana	5507010301	5	5		3	1
Melanochlamys diomedea	5110060101					
Modiolus sp. Juv.	5507010600	1				
Mysella tumida	5515100102	1		3	1	1
Mytilidae sp. Juv.	5507010000					
Mytilus edulis sp. complex	5507010100					
Nassarius mendicus	5101080101					
Nemocardium centrifilosum	5515220301		1	1		1
Nucula tenuis	5502020201	1	4		1	
Nuculana minuta	5502040202					
Nudibranchia sp. Juv.	5127000000					
Odostomia sp. Indet.	5108010100					1
Olivella baetica	5105100102					
Onchidoris bilamellata	5131050507					
Pandora filosa	5520020102					
Pandora sp. Juv.	5520020100	1	1			
Panomya ampla	5517060303					
Parvilucina tenuisculpta	5515010101	38	23	23	25	23
Pododesmus macroschisma	5509090101					
Protothaca staminea	5515470701					
Psephidia lordi	5515470501					
Rictaxis punctocaelatus	5110010401					
Saxidomus giganteus	5515470201					

PIER 53-55 CAP						
METRO - SEATTLE						
INVERTEBRATE SPECIES DATA						
By Marine Taxonomic Services, Ltd.						
December, 1996						
TAXON	NODOC CODE	VG2-1	VG2-2	VG2-3	VG2-4	VG2-5
Solen sicarius	5515290201					
Tellina modesta	5515310204					
Tellina nuculoides	5515310202					
Teredinidae sp. Indet.	5518020000					
Thracia cf. challisiana	5520080207					
Thracia sp. Juv.	5520080200					
Thracia trapezoides	5520080203					1
Thyasira gouldi	5515020325		1	1		3
Turbonilla sp. Indet.	5108010200					
CRUSTACEA						
Ampelisca careyi	6169020135					
Ampelisca cristata	6169020112					
Ampelisca hancocki	6169020113					1
Ampelisca lobata	6169020134					
Aoroides exilis	6169060106					
Aoroides inermis	6169060104	2				
Aoroides intermedia	6169060107					
Aruga oculata						
Balanomorpha sp. Indet.	6134000000					
Balanus glandula	6134020107					
Bopyroides hippolytes	6165040401					
Brachyura sp. Indet.	6184000000					
Byblis millsi	6169020209	1				
Byblis sp. Indet.	6169020200					
Cancer gracilis	6188030105			2	1	1
Cancer productus	6188030101					
Caprella laeviuscula	6171010710					
Caprella mendax	6171010719					
Chthamalus dalli	6134010101					
Corophium crassicorne	6169150203					
Crangon alaskensis	6179221003				3	1
Crangon sp. Indet.	6179220100					
Crangonidae sp. Indet.	6179220000					
Cyclopoida sp. Indet.	6120000000					
Deflexilodes aenigmaticus						1
Desdimelita californica	6169211005					
Diastylis santamariensis						
Eobrolgus chumashi	6169421902					
Euaulus pusiolus	6179160408					
Eudorella pacifica	6154040202	10	5	5	5	5
Euphilomedes carcharodonta	6111070301	76	75	64	72	50
Euphilomedes producta	6111070303	5	5		4	2
Exosphaeroma inornata	6161020402					

PIER 53-55 CAP						
METRO - SEATTLE						
INVERTEBRATE SPECIES DATA						
By Marine Taxonomic Services, Ltd.						
December, 1996						
TAXON	NODOC CODE	VG2-1	VG2-2	VG2-3	VG2-4	VG2-5
Gammaridea sp. Indet.	6169210000					
Gammaropsis thompsoni	6169260401					
Haliophasma geminatum	6160011601					
Harpacticoida sp. Indet.	6119000000					
Hemigrapsus oregonensis	6189070102					
Heterophoxus conlanae		3		1	2	8
Hippolytidae sp. Indet.	6179160000					
Hippomedon coecus	6169341411				2	
Leptochelia dubia	6157020103		1	2		
Leptognathia gracilis	6157090102					
Mayerella banksia	6171010301					
Melphisana "bola"	6169350201					
Munnogonium tillerae	6163120303					
Mysidae sp. Indet.	6153010000		2			
Nebalia "pugettensis"	6145010102					
Neotrypaea sp. Indet.		2			1	
Nymphon pixellae	6001010107				1	
Opisa tridentata	6169342802					
Orchomene pacificus	6169342903					
Orchomene pinguis	6169342904					
Pachynus barnardi	6169343101					
Pagurus dalli	6183060223					
Pagurus granosimanus	6183060211					
Pagurus sp. Indet.	6183060200					
Parametaphoxus quaylei		4	3		2	1
Parasterope barnesi	6111030503	1			1	1
Peramphithoe tea						
Photis brevipes	6169260201					
Phoxichelidium femoratum	6001060102					
Pinnixa schmitti	6189060404					
Pinnixa sp. Indet.	6189060400		1	1		2
Pinnotheridae sp. Indet.	6189060000					
Pleusymtes sp A						
Protomedeia prudens	6169260312					
Protomedeia sp. Indet.	6169260300					
Rhepoxynius abronius	6169421504					
Rutiderma lomae	6111060103		1			
Solidobalanus hesperius	6134050201	1				2
Spirontocaris snyderi	6179160204					
Spirontocaris sp. Indet.	6179160200					
Synchelidium pectinatum						
Synchelidium rectipalmum	6169371403					
Synchelidium variabilum						
Westwoodilla caecula	6169371502					

PIER 53-55 CAP						
METRO - SEATTLE						
INVERTEBRATE SPECIES DATA						
By Marine Taxonomic Services, Ltd.						
December, 1996						
TAXON	NODOC CODE	VG2-1	VG2-2	VG2-3	VG2-4	VG2-5
MISCELLANEOUS						
Amphiodia periercta	8129030107					
Amphiodia sp. Indet.	8129030100					
Amphipholis sp. Indet.	8129030900					
Amphipholis squamata	8129030202					
Amphiuridae sp. Indet.	8129030000					
Anthozoa sp. Indet.	3740000000					
Chironomidae sp. Juv.	6505080000					
Crossaster papposus	8113010103					
Cucumaria piperata	8172060111					
Ephemeroptera sp. Juv.			2			
Golfingia sp. Indet.	7200020100			3	3	
Golfingia sp. Juv.	7200020100					
Holothuroidea sp. Indet.	8170000000					
Nematoda sp. Indet.	4700000000					
Nemertinea sp. Indet.	4300000000	3	6		3	2
Nynantheae sp. Indet.		3	2			
Ophiura lutkeni	8127010607		5			
Ophiura sarsi	8127010610					
Ophiura sp. Indet.	8127010600					2
Pentamera sp. Indet.	8172060300					
Phoronis sp. Indet.	7700010200					
Platyhelminthes sp. Indet.	3900000000		1			
Spinulosida sp. Indet.	8112000000					
Strongylocentrotus sp. Juv.	8149030200					
Tunicate sp. Indet.					1	

PIER 53-55 CAP						
METRO - SEATTLE						
INVERTEBRATE SPECIES DATA						
By Marine Taxonomic Services, Ltd.						
December, 1996						
TAXON	NODOC CODE	VG3-1	VG3-2	VG3-3	VG3-4	VG3-5
Amage anops	5001670101					
Ampharete labrops	5001670215	1	5	5	3	5
Ampharete sp. Indet.	5001670200					
Ampharete cf. crassiseta						
Ampharetidae sp. Indet.	5001670000					
Amphicties mucronata	5001670306					
Anobothrus gracilis	5001670701		1	1		
Aphelochaeta monilaris	5001500301		3	1	7	4
Aphelochaeta sp. Indet.				1	1	1
Aphelochaeta sp. N-1		1		5	13	1
Aphrodita sp. Juv.	5001010100					
Aricidea ramosa	5001410706					
Aricidea wassi	5001410206			1	1	
Armandia brevis	5001580202					
Ascleriocheilus beringainus	5001570201			1		
Barantolla nr. americana	5001600601		1			
Capitella capitata 'hyperspecies'	5001600101					
Capitellidae sp. Indet.	5001600000	1			2	
Caulleriella pacifica			1	1	1	
Chaetozone acuta						
Chaetozone nr. setosa	5001500401	1	2	5	2	2
Chaetozone sp. Indet.	5001500400					
Cirratulidae sp. Indet.	5001500000					
Cirratulidae sp. Juv.	5001500000					
Cirratulus robustus	5001500102					
'Clymenura' gracilis	5001631203					
Cossura pygodactyla	5001520106	2		2	4	
Demonax sp. Indet.	5001702800					
Diopatra ornata	5001290202	1	3	2	6	1
Dipolydora cardalia	5001430431					
Dipolydora caulleryi	5001430404					1
Dipolydora socialis	5001430402					
Dorvillea annulata	5001360502					
Dorvillea pseudorubrovittata	5001360101			4	2	1
Dorvillidae sp. Indet.	5001360000					
Drilonereis longa	5001330103					
Ehlersia heterochaeta	5001232201					
Ehlersia hyperioni	5001230321					
Ehlersia sp. Indet.	5001232200	7	4	2	2	2
Eteone sp. Indet.	5001130200		1		1	
Euchone incolor	5001700204					
Euclymeninae sp. Indet.						
Eulalia californiensis			2	1	2	1
Eumida longicornuta		1		3	1	

PIER 53-55 CAP						
METRO - SEATTLE						
INVERTEBRATE SPECIES DATA						
By Marine Taxonomic Services, Ltd.						
December, 1996						
TAXON	NODOC CODE	VG3-1	VG3-2	VG3-3	VG3-4	VG3-5
Exogone lourei	5001230703					
Exogone sp. Juv.	5001230700					
Gattyana ciliata	5001020602					
Gattyana cirrosa	5001020603	1	1	2		
Glycera americana	5001270104		1			
Glycera nana		1	5	3	4	
Glycera sp. Indet.	5001270100					
Glycera sp. Juv.	5001270100					
Glycinde armigera	5001280103			1		
Glycinde polygnatha	5001280105	3	2	1	3	
Glycinde sp. Juv.	5001280100				2	
Goniada maculata	5001280202	2	1			
Harmothoe imbricata	5001020806					
Hesionidae sp. Indet.	5001210000	1		1	3	
Heteromastus filobranchus	5001600203					
Isocirrus longiceps	5001632001					
Laonice cirrata	5001430201	1	3	1	2	1
Laonice pugettensis	5001430204			1		
Leitoscoloplos pugettensis	5001401601		1	1		1
Levinsenia gracilis	5001410801			2		1
Lumbrineridae sp. Indet.	5001310000	18	21	40	33	30
Lumbrineris californiensis	5001310132	5	12	33	14	4
Lumbrineris limicola	5001310128					
Magelona longicornis	5001440105				1	
Maldanidae sp. Indet.	5001630000	1		2		1
Mediomastus sp. Indet.	5001600400			2	2	1
Mesochaetopterus taylori	5001490401					
Microphthalmus sczelkowii	5001210201					
Micropodarke dubia	5001210801					
Neosabellaria cementarium	5001650201					
Nephtys caeca	5001250103					
Nephtys cornuta	5001250104	4	4	6	25	6
Nephtys ferruginea	5001250111	4	9	10	18	6
Nephtys nr. ciliata	5001250102					
Nephtys sp. Indet.	5001250100					
Nephtys sp. Juv.	5001250100	1				
Nereidae sp. Indet.	5001240000					
Nereis procera	5001240404	3	3	4	2	3
Nereis sp. Juv.	5001240400					
Notomastus latericius	5001600306					
Notomastus sp. Indet.	5001600300					
Notomastus tenuis	5001600302	1	10	10	7	4
Odontosyllis phosphorea	5001231303			1		
Oligochaeta sp. Indet.						

PIER 53-55 CAP						
METRO - SEATTLE						
INVERTEBRATE SPECIES DATA						
By Marine Taxonomic Services, Ltd.						
December, 1996						
TAXON	NODOC CODE	VG3-1	VG3-2	VG3-3	VG3-4	VG3-5
Onuphidae sp. Indet.	5001290000	1				
Onuphis elegans	5001290111					
Onuphis iridescens	5001290103					
Onuphis sp. Juv.	5001290100					
Ophelina acuminata	5001580607	1		2		
Orbiniidae sp. Indet.	5001400000					1
Paleonotus bellis	5001080101					
Paranaitis polynoides	5001130803					
Parandalia fauveli	5001220802	1		2	1	5
Paraprionospio pinnata	5001431701	1	1	4	11	2
Parougia caeca				3		
Pectinaria californiensis	5001660304			1	1	
Pectinaria granulata	5001660303					
Pectinaria sp. Indet.	5001660300					
Pholoe glabra	5001060102	1				
Pholoe minuta	5001060101					
Pholoides aspera	5001040202		1	3	2	
Phyllochaetopterus prolifica	5001490202					
Phyllodoce groenlandica	5001130102	1	2	1	1	1
Phyllodoce hartmanae	5001131402					
Phyllodoce sp. Indet.	5001131400					
Phyllodoce sp. Juv.	5001131400					
Phyllodocidae sp. Juv.	5001130000					
Phylo felix	5001400401		1	1	1	
Pilargis maculata	5001220303				1	1
Pionosyllis sp. Indet.	5001230200					
Pista bansei						
Pista elongata	5001680703				1	
Pista sp. Indet.	5001680700					
Platynereis bicanaliculata	5001240501					
Podarkeopsis glabrus	5001211903		1			
Polycirrus californicus	5001680810					
Polycirrus sp. Indet.	5001680800					
Polycirrus sp. complex						
Polydora limicola	5001430415					1
Polydora sp. Indet.	5001430400					
Polynoidae sp. Indet.	5001020000	1	1	2		1
Prionospio jubata		26	57	65	97	36
Prionospio lighti	5001430521					
Prionospio multibranchiata	5001433601				2	
Prionospio sp. Indet.	5001430500					
Prionospio sp. Juv.	5001430500					
Proclea graffi	5001681702					
Protodorvillea gracilis	5001360201					

PIER 53-55 CAP						
METRO - SEATTLE						
INVERTEBRATE SPECIES DATA						
By Marine Taxonomic Services, Ltd.						
December, 1996						
TAXON	NODOC CODE	VG3-1	VG3-2	VG3-3	VG3-4	VG3-5
Rhodine bitorquata	5001631001					
Scoletoma luti	5001310109	8	10	12	46	6
Scoloplos armiger	5001400301					
Sigalion spinosa						
Sphaerodoropsis sphaerulifer	5001260202	3	8	4	9	2
Sphaerosyllis californiensis	5001230808					
Sphaerosyllis ranunculus						
Sphaerosyllis sp. Indet.	5001230800					
Spio cirrifera	5001430703				1	
Spio sp. Indet.	5001430700					
Spiochaetopterus costarum	5001490302	1	15	12	1	12
Spionidae sp. Juv.	5001430000					2
Spiophanes berkeleyorum	5001431004	1	1	1	5	
Sthenalais fusca	5001060306					
Streblosoma bairdi	5001682502					
Syllidae sp. Indet.	5001230000					
Syllis sp. Indet.	5001230300					
Tenonia priops	5001022302		1			1
Terebellidae sp. Juv.	5001680000					
Terebellides californica	5001690103		1			
Terebellides sp. Indet.	5001690100					
Travisia forbesii	5001580402					
Travisia sp. Juv.	5001580400					
Trochochaeta multisetosa	5001450203	2	3	2	2	1
Typosyllis harti	5001230510				1	1
MOLLUSCA						
Acila castrensis	5502020101					
Adontorhina cyclia	5515020102					
Aeolidiidae sp. Indet.	5142030000					
Alvania compacta	5103200106					
Articulata sp. Juv.						
Astarte elliptica	5515190114					
Astyris gausapata			12	7	10	1
Axinopsida serricata	5515020201	214	368	266	273	251
Balcis sp. Indet.	5103530600					
Bivalvia sp. Juv.	5500000000					3
Cardiidae sp. Juv.	5515220000					
Cardiomya pectinata	5520100101					
Chaetoderma sp. Indet.	5402010100		1	2		
Clinocardium blandum						
Clinocardium nuttalli	5515220102					
Clinocardium sp. Juv.	5515220100					
Compsomyax subdiaphana	5515470301					1

PIER 53-55 CAP						
METRO - SEATTLE						
INVERTEBRATE SPECIES DATA						
By Marine Taxonomic Services, Ltd.						
December, 1996						
TAXON	NODOC CODE	VG3-1	VG3-2	VG3-3	VG3-4	VG3-5
Crepipatella lingulata	5103640301					
Cryptonatica affinis	5103760201					
Cylichna attonsa	5110040214					
Gastropoda sp. Indet.	5100000000					
Gastropteron pacificum	5110070101	1	2	2		
Hiatella arctica	5517060201					
Kurtzia arteaga	5106024101					
Lacuna vincta	5103090305					
Lirobittium sp. Indet.						
Lottia pelta						
Lottia sp. Juv.						
Lucinoma annulatum	5515010201	2		1		
Lyonsia californica	5520050202	3		1	1	
Macoma calcarea	5515310101		1		1	1
Macoma carlottensis	5515310112	1	2	5	14	
Macoma elimata	5515310102		1	4		1
Macoma inquinata	5515310115					
Macoma obliqua	5515310106	1				
Macoma sp. Juv.	5515310100	1	8	3	1	15
Macoma yoldiformis	5515310111			1		
Margarites pupillus	5102100308					
Megacrenella columbiana	5507010301	1			1	6
Melanochlamys diomedea	5110060101					
Modiolus sp. Juv.	5507010600					1
Mysella tumida	5515100102					1
Mytilidae sp. Juv.	5507010000					
Mytilus edulis sp. complex	5507010100					
Nassarius mendicus	5101080101					
Nemocardium centrifilosum	5515220301	1	1	3	2	
Nucula tenuis	5502020201		2	2	2	5
Nuculana minuta	5502040202			1		1
Nudibranchia sp. Juv.	5127000000					
Odostomia sp. Indet.	5108010100					
Olivella baetica	5105100102					
Onchidoris bilamellata	5131050507					
Pandora filosa	5520020102	1				1
Pandora sp. Juv.	5520020100					
Panomya ampla	5517060303					
Parvilucina tenuisculpta	5515010101	29	51	42	39	57
Pododesmus macroschisma	5509090101					
Protothaca staminea	5515470701					
Psephidia lordi	5515470501					
Rictaxis punctocaelatus	5110010401					
Saxidomus giganteus	5515470201		1			

PIER 53-55 CAP						
METRO - SEATTLE						
INVERTEBRATE SPECIES DATA						
By Marine Taxonomic Services, Ltd.						
December, 1996						
TAXON	NODOC CODE	VG3-1	VG3-2	VG3-3	VG3-4	VG3-5
Solen sicarius	5515290201					
Tellina modesta	5515310204					
Tellina nuculoides	5515310202					
Teredinidae sp. Indet.	5518020000					
Thracia cf. challisiana	5520080207					
Thracia sp. Juv.	5520080200					
Thracia trapezoides	5520080203	1				
Thyasira gouldi	5515020325	3	4	1	3	
Turbonilla sp. Indet.	5108010200					
CRUSTACEA						
Ampelisca careyi	6169020135			1		
Ampelisca cristata	6169020112					
Ampelisca hancocki	6169020113					
Ampelisca lobata	6169020134					
Aoroides exilis	6169060106					
Aoroides inermis	6169060104		1	2		
Aoroides intermedia	6169060107					
Aruga oculata						
Balanomorpha sp. Indet.	6134000000					
Balanus glandula	6134020107					
Bopyroides hippolytes	6165040401					
Brachyura sp. Indet.	6184000000					
Byblis millsi	6169020209		1	1	1	3
Byblis sp. Indet.	6169020200					
Cancer gracilis	6188030105	1	4	2	2	1
Cancer productus	6188030101					
Caprella laeviuscula	6171010710					
Caprella mendax	6171010719					
Chthamalus dalli	6134010101					
Corophium crassicorne	6169150203					
Crangon alaskensis	6179221003		1		6	3
Crangon sp. Indet.	6179220100				1	
Crangonidae sp. Indet.	6179220000					
Cyclopoida sp. Indet.	6120000000					
Deflexilodes aenigmaticus						
Desdimelita californica	6169211005					
Diastylis santamariensis					1	
Eobrolgus chumashi	6169421902					
Euaulus pusiolus	6179160408					
Eudorella pacifica	6154040202	3	7	16	11	12
Euphilomedes carcharodonta	6111070301	88	152	140	154	97
Euphilomedes producta	6111070303	4	11	5	6	4
Exosphaeroma inornata	6161020402					

PIER 53-55 CAP						
METRO - SEATTLE						
INVERTEBRATE SPECIES DATA						
By Marine Taxonomic Services, Ltd.						
December, 1996						
TAXON	NODOC CODE	VG3-1	VG3-2	VG3-3	VG3-4	VG3-5
Gammaridea sp. Indet.	6169210000					
Gammaropsis thompsoni	6169260401					
Haliophasma geminatum	6160011601					
Harpacticoida sp. Indet.	6119000000					
Hemigrapsus oregonensis	6189070102					
Heterophoxus conlanae		1		1	4	1
Hippolytidae sp. Indet.	6179160000			2		
Hippomedon coecus	6169341411		1			3
Leptochelia dubia	6157020103					1
Leptognathia gracilis	6157090102					
Mayerella banksia	6171010301					
Melphisana "bola"	6169350201					
Munnogonium tillerae	6163120303					
Mysidae sp. Indet.	6153010000					
Nebalia "pugettensis"	6145010102					
Neotrypaea sp. Indet.						
Nymphon pixellae	6001010107					
Opisa tridentata	6169342802					
Orchomene pacificus	6169342903					
Orchomene pinguis	6169342904					
Pachynus barnardi	6169343101					
Pagurus dalli	6183060223					
Pagurus granosimanus	6183060211					
Pagurus sp. Indet.	6183060200					
Parametaphoxus quaylei		4		1	4	1
Parasterope barnesi	6111030503	1	8		3	5
Peramphithoe tea				2		
Photis brevipes	6169260201					
Phoxichelidium femoratum	6001060102					
Pinnixa schmitti	6189060404	3				
Pinnixa sp. Indet.	6189060400		1			1
Pinnotheridae sp. Indet.	6189060000					
Pleusymtes sp A						
Protomedeia prudens	6169260312					
Protomedeia sp. Indet.	6169260300					
Rhepoxynius abronius	6169421504					
Rutiderma lomae	6111060103					
Solidobalanus hesperius	6134050201		1		2	
Spirontocaris snyderi	6179160204	1		1		
Spirontocaris sp. Indet.	6179160200					
Synchelidium pectinatum				2		
Synchelidium rectipalmum	6169371403					
Synchelidium variabilum						
Westwoodilla caecula	6169371502		2	2	1	

PIER 53-55 CAP						
METRO - SEATTLE						
INVERTEBRATE SPECIES DATA						
By Marine Taxonomic Services, Ltd.						
December, 1996						
TAXON	NODOC CODE	VG3-1	VG3-2	VG3-3	VG3-4	VG3-5
MISCELLANEOUS						
Amphiodia periercta	8129030107					
Amphiodia sp. Indet.	8129030100					
Amphipholis sp. Indet.	8129030900					
Amphipholis squamata	8129030202					
Amphiuridae sp. Indet.	8129030000					1
Anthozoa sp. Indet.	3740000000					
Chironomidae sp. Juv.	6505080000					
Crossaster papposus	8113010103					
Cucumaria piperata	8172060111					
Ephemeroptera sp. Juv.						
Golfingia sp. Indet.	7200020100	2	1	2	1	
Golfingia sp. Juv.	7200020100					
Holothuroidea sp. Indet.	8170000000					
Nematoda sp. Indet.	4700000000					
Nemertinea sp. Indet.	4300000000	2	3	6	4	1
Nynantheae sp. Indet.		2		3	1	2
Ophiura lutkeni	8127010607			8	1	
Ophiura sarsi	8127010610					
Ophiura sp. Indet.	8127010600		1			
Pentamera sp. Indet.	8172060300					
Phoronis sp. Indet.	7700010200					
Platyhelminthes sp. Indet.	3900000000					2
Spinulosida sp. Indet.	8112000000					1
Strongylocentrotus sp. Juv.	8149030200					
Tunicate sp. Indet.						

PIER 53-55 CAP						
METRO - SEATTLE						
INVERTEBRATE SPECIES DATA						
By Marine Taxonomic Services, Ltd.						
December, 1996						
TAXON	NODOC CODE	VG4-1	VG4-2	VG4-3	VG4-4	VG4-5
Amage anops	5001670101					
Ampharete labrops	5001670215		3	3	1	
Ampharete sp. Indet.	5001670200					
Ampharete cf. crassiseta						
Ampharetidae sp. Indet.	5001670000	2	2		1	
Amphicties mucronata	5001670306					
Anobothrus gracilis	5001670701	5		3		
Aphelochaeta monilaris	5001500301					1
Aphelochaeta sp. Indet.						
Aphelochaeta sp. N-1		2	3	2	3	3
Aphrodita sp. Juv.	5001010100				1	
Aricidea ramosa	5001410706					
Aricidea wassi	5001410206				1	
Armandia brevis	5001580202					
Ascleriocheilus beringainus	5001570201					
Barantolla nr. americana	5001600601				2	1
Capitella capitata 'hyperspecies'	5001600101					
Capitellidae sp. Indet.	5001600000		1			
Caulleriella pacifica						
Chaetozone acuta						
Chaetozone nr. setosa	5001500401	2	1	1	1	2
Chaetozone sp. Indet.	5001500400					
Cirratulidae sp. Indet.	5001500000	1				
Cirratulidae sp. Juv.	5001500000					
Cirratulus robustus	5001500102					
'Clymenura' gracilis	5001631203	2		2	1	1
Cossura pygodactyla	5001520106		1			
Demonax sp. Indet.	5001702800					
Diopatra ornata	5001290202	5	6	9	3	3
Dipolydora cardalia	5001430431			1		
Dipolydora caulleryi	5001430404					
Dipolydora socialis	5001430402					
Dorvillea annulata	5001360502			1		
Dorvillea pseudorubrovittata	5001360101	1				
Dorvillidae sp. Indet.	5001360000					
Drilonereis longa	5001330103					
Ehlersia heterochaeta	5001232201	3	2	2	1	2
Ehlersia hyperioni	5001230321		1	2	1	1
Ehlersia sp. Indet.	5001232200					
Eteone sp. Indet.	5001130200				1	
Euchone incolor	5001700204			1		
Euclymeninae sp. Indet.						
Eulalia californiensis		1	1		1	
Eumida longicornuta			3		1	3

PIER 53-55 CAP						
METRO - SEATTLE						
INVERTEBRATE SPECIES DATA						
By Marine Taxonomic Services, Ltd.						
December, 1996						
TAXON	NODOC CODE	VG4-1	VG4-2	VG4-3	VG4-4	VG4-5
Exogone lourei	5001230703					
Exogone sp. Juv.	5001230700					
Gattyana ciliata	5001020602					
Gattyana cirrosa	5001020603	1	1	3	3	7
Glycera americana	5001270104			1		
Glycera nana		1	6	4	14	6
Glycera sp. Indet.	5001270100					
Glycera sp. Juv.	5001270100					
Glycinde armigera	5001280103	2	1	1	2	1
Glycinde polygnatha	5001280105					
Glycinde sp. Juv.	5001280100					
Goniada maculata	5001280202	2	3	1	4	2
Harmothoe imbricata	5001020806				1	
Hesionidae sp. Indet.	5001210000					
Heteromastus filobranchus	5001600203		1			
Isocirrus longiceps	5001632001					
Laonice cirrata	5001430201	3		1		
Laonice pugettensis	5001430204					
Leitoscoloplos pugettensis	5001401601		5	1	1	3
Levinsenia gracilis	5001410801			1		1
Lumbrineridae sp. Indet.	5001310000	27	30	29	27	29
Lumbrineris californiensis	5001310132			3		
Lumbrineris limicola	5001310128					
Magelona longicornis	5001440105		1			
Maldanidae sp. Indet.	5001630000				2	
Mediomastus sp. Indet.	5001600400	1		2	1	1
Mesochaetopterus taylori	5001490401					
Microphthalmus sczelkowii	5001210201					
Micropodarke dubia	5001210801					
Neosabellaria cementarium	5001650201					
Nephtys caeca	5001250103					
Nephtys cornuta	5001250104	1	6	4	3	2
Nephtys ferruginea	5001250111	7	10	7	3	4
Nephtys nr. ciliata	5001250102					
Nephtys sp. Indet.	5001250100					
Nephtys sp. Juv.	5001250100					
Nereidae sp. Indet.	5001240000					
Nereis procera	5001240404		4	1	2	
Nereis sp. Juv.	5001240400					
Notomastus latericius	5001600306	1				
Notomastus sp. Indet.	5001600300					
Notomastus tenuis	5001600302	8	7	14	6	5
Odontosyllis phosphorea	5001231303					
Oligochaeta sp. Indet.						

PIER 53-55 CAP						
METRO - SEATTLE						
INVERTEBRATE SPECIES DATA						
By Marine Taxonomic Services, Ltd.						
December, 1996						
TAXON	NODOC CODE	VG4-1	VG4-2	VG4-3	VG4-4	VG4-5
Onuphidae sp. Indet.	5001290000					
Onuphis elegans	5001290111					
Onuphis iridescens	5001290103	1			1	1
Onuphis sp. Juv.	5001290100					
Ophelina acuminata	5001580607		1		1	2
Orbiniidae sp. Indet.	5001400000					
Paleonotus bellis	5001080101					
Paranaitis polynoides	5001130803					
Parandalia fauveli	5001220802	2	3		2	
Paraprionospio pinnata	5001431701	1			2	4
Parougia caeca						
Pectinaria californiensis	5001660304					
Pectinaria granulata	5001660303		1			3
Pectinaria sp. Indet.	5001660300				1	2
Pholoe glabra	5001060102					
Pholoe minuta	5001060101					
Pholoides aspera	5001040202					
Phyllochaetopterus prolifica	5001490202					
Phyllodoce groenlandica	5001130102	2	1			
Phyllodoce hartmanae	5001131402	2				
Phyllodoce sp. Indet.	5001131400					
Phyllodoce sp. Juv.	5001131400					
Phyllodocidae sp. Juv.	5001130000					
Phylo felix	5001400401					1
Pilargis maculata	5001220303	1		1	1	
Pionosyllis sp. Indet.	5001230200					
Pista bansei						
Pista elongata	5001680703		1			
Pista sp. Indet.	5001680700					
Platynereis bicanaliculata	5001240501					
Podarkeopsis glabrus	5001211903					
Polycirrus californicus	5001680810		1			
Polycirrus sp. Indet.	5001680800					
Polycirrus sp. complex						
Polydora limicola	5001430415	1	1	1		
Polydora sp. Indet.	5001430400					
Polynoidae sp. Indet.	5001020000			1		
Prionospio jubata		37	60	67	38	75
Prionospio lighti	5001430521					
Prionospio multibranchiata	5001433601					
Prionospio sp. Indet.	5001430500					
Prionospio sp. Juv.	5001430500					
Proclea graffi	5001681702		6	2	1	
Protodorvillea gracilis	5001360201	1		1		

PIER 53-55 CAP
METRO - SEATTLE
INVERTEBRATE SPECIES DATA
By Marine Taxonomic Services, Ltd.
December, 1996

TAXON	NODOC CODE	VG4-1	VG4-2	VG4-3	VG4-4	VG4-5
Rhodine bitorquata	5001631001					
Scoletoma luti	5001310109	4	8	11	7	3
Scoloplos armiger	5001400301					
Sigalion spinosa						
Sphaerodoropsis sphaerulifer	5001260202		3	3	5	1
Sphaerosyllis californiensis	5001230808					
Sphaerosyllis ranunculus						
Sphaerosyllis sp. Indet.	5001230800					
Spio cirrifera	5001430703	1				1
Spio sp. Indet.	5001430700					
Spiochaetopterus costarum	5001490302	5	31	7	8	10
Spionidae sp. Juv.	5001430000					
Spiophanes berkeleyorum	5001431004	2		1	2	
Sthenalais fusca	5001060306					
Streblosoma bairdi	5001682502					
Syllidae sp. Indet.	5001230000					
Syllis sp. Indet.	5001230300					
Tenonia priops	5001022302					
Terebellidae sp. Juv.	5001680000					
Terebellides californica	5001690103		1			1
Terebellides sp. Indet.	5001690100		1			
Travisia forbesii	5001580402					
Travisia sp. Juv.	5001580400					
Trochochaeta multisetosa	5001450203		2		1	2
Typosyllis harti	5001230510			1		2
MOLLUSCA						
Acila castrensis	5502020101					1
Adontorhina cyclia	5515020102					
Aeolidiidae sp. Indet.	5142030000					
Alvania compacta	5103200106			1	1	
Articulata sp. Juv.						
Astarte elliptica	5515190114					
Astyris gausapata		8	4	3	3	7
Axinopsida serricata	5515020201	237	498	402	279	275
Balcis sp. Indet.	5103530600					
Bivalvia sp. Juv.	5500000000		2			
Cardiidae sp. Juv.	5515220000					
Cardiomya pectinata	5520100101	2	2		1	1
Chaetoderma sp. Indet.	5402010100					
Clinocardium blandum						
Clinocardium nuttalli	5515220102					
Clinocardium sp. Juv.	5515220100					
Compsomyax subdiaphana	5515470301	1	1	2		1

PIER 53-55 CAP						
METRO - SEATTLE						
INVERTEBRATE SPECIES DATA						
By Marine Taxonomic Services, Ltd.						
December, 1996						
TAXON	NODOC CODE	VG4-1	VG4-2	VG4-3	VG4-4	VG4-5
Crepipatella lingulata	5103640301					
Cryptonatica affinis	5103760201					
Cylichna attonsa	5110040214					
Gastropoda sp. Indet.	5100000000					
Gastropteron pacificum	5110070101	1		1		
Hiatella arctica	5517060201					
Kurtzia arteaga	5106024101					
Lacuna vincta	5103090305					
Lirobittium sp. Indet.						
Lottia pelta						
Lottia sp. Juv.						
Lucinoma annulatum	5515010201		3	1		2
Lyonsia californica	5520050202	2		2	3	3
Macoma calcarea	5515310101					
Macoma carlottensis	5515310112	8	17	5	3	3
Macoma elimata	5515310102		3		1	1
Macoma inquinata	5515310115					
Macoma obliqua	5515310106	1				
Macoma sp. Juv.	5515310100	5	7	4	9	4
Macoma yoldiformis	5515310111		1			
Margarites pupillus	5102100308					
Megacrenella columbiana	5507010301	4	9	11	3	3
Melanochlamys diomedea	5110060101					
Modiolus sp. Juv.	5507010600					1
Mysella tumida	5515100102				1	2
Mytilidae sp. Juv.	5507010000				1	
Mytilus edulis sp. complex	5507010100					
Nassarius mendicus	5101080101					
Nemocardium centrifilosum	5515220301	2	5		2	1
Nucula tenuis	5502020201					1
Nuculana minuta	5502040202				1	2
Nudibranchia sp. Juv.	5127000000					
Odostomia sp. Indet.	5108010100		1			
Olivella baetica	5105100102					
Onchidoris bilamellata	5131050507					
Pandora filosa	5520020102		4			
Pandora sp. Juv.	5520020100					
Panomya ampla	5517060303					
Parvilucina tenuisculpta	5515010101	48	74	76	47	31
Pododesmus macroschisma	5509090101					
Protothaca staminea	5515470701					
Psephidia lordi	5515470501					
Rictaxis punctocaelatus	5110010401					
Saxidomus giganteus	5515470201					

PIER 53-55 CAP						
METRO - SEATTLE						
INVERTEBRATE SPECIES DATA						
By Marine Taxonomic Services, Ltd.						
December, 1996						
TAXON	NODOC CODE	VG4-1	VG4-2	VG4-3	VG4-4	VG4-5
Solen sicarius	5515290201					
Tellina modesta	5515310204					
Tellina nuculoides	5515310202					
Teredinidae sp. Indet.	5518020000					
Thracia cf. challisiana	5520080207					
Thracia sp. Juv.	5520080200					
Thracia trapezoides	5520080203					
Thyasira gouldi	5515020325	1	2	4	2	1
Turbonilla sp. Indet.	5108010200		1			
CRUSTACEA						
Ampelisca careyi	6169020135		1		1	
Ampelisca cristata	6169020112					
Ampelisca hancocki	6169020113		1			
Ampelisca lobata	6169020134					
Aoroides exilis	6169060106			1		
Aoroides inermis	6169060104			1		
Aoroides intermedia	6169060107					
Aruga oculata						
Balanomorpha sp. Indet.	6134000000			4		
Balanus glandula	6134020107					
Bopyroides hippolytes	6165040401					
Brachyura sp. Indet.	6184000000					
Byblis millsi	6169020209	2	5	4	9	4
Byblis sp. Indet.	6169020200					
Cancer gracilis	6188030105	2	5	3	2	1
Cancer productus	6188030101					
Caprella laeviuscula	6171010710					
Caprella mendax	6171010719					
Chthamalus dalli	6134010101					
Corophium crassicorne	6169150203					
Crangon alaskensis	6179221003			2	1	2
Crangon sp. Indet.	6179220100					
Crangonidae sp. Indet.	6179220000					
Cyclopoida sp. Indet.	6120000000					
Deflexilodes aenigmaticus						2
Desdimelita californica	6169211005					
Diastylis santamariensis						
Eobrolgus chumashi	6169421902					
Euaulus pusiolus	6179160408					
Eudorella pacifica	6154040202	2	12	9	4	9
Euphilomedes carcharodonta	6111070301	172	216	177	248	208
Euphilomedes producta	6111070303	3	3	7	4	4
Exosphaeroma inornata	6161020402					

PIER 53-55 CAP						
METRO - SEATTLE						
INVERTEBRATE SPECIES DATA						
By Marine Taxonomic Services, Ltd.						
December, 1996						
TAXON	NODOC CODE	VG4-1	VG4-2	VG4-3	VG4-4	VG4-5
Gammaridea sp. Indet.	6169210000					
Gammaropsis thompsoni	6169260401					
Haliophasma geminatum	6160011601					
Harpacticoida sp. Indet.	6119000000					
Hemigrapsus oregonensis	6189070102					
Heterophoxus conlanae			1	5	2	4
Hippolytidae sp. Indet.	6179160000					1
Hippomedon coecus	6169341411				1	4
Leptochelia dubia	6157020103		1			
Leptognathia gracilis	6157090102				1	
Mayerella banksia	6171010301					
Melphisana "bola"	6169350201					
Munnogonium tillerae	6163120303					
Mysidae sp. Indet.	6153010000					
Nebalia "pugettensis"	6145010102		1			
Neotrypaea sp. Indet.					1	1
Nymphon pixellae	6001010107					1
Opisa tridentata	6169342802					
Orchomene pacificus	6169342903					
Orchomene pinguis	6169342904					
Pachynus barnardi	6169343101					
Pagurus dalli	6183060223					
Pagurus granosimanus	6183060211					
Pagurus sp. Indet.	6183060200	1				2
Parametaphoxus quaylei		1	1	2	3	5
Parasterope barnesi	6111030503		1		1	1
Peramphithoe tea						
Photis brevipes	6169260201					
Phoxichelidium femoratum	6001060102					
Pinnixa schmitti	6189060404		1	1		3
Pinnixa sp. Indet.	6189060400	1	1	1	1	
Pinnotheridae sp. Indet.	6189060000					
Pleusymtes sp A						
Protomedeia prudens	6169260312					
Protomedeia sp. Indet.	6169260300					
Rhepoxynius abronius	6169421504					
Rutiderma lomae	6111060103		1	1	1	
Solidobalanus hesperius	6134050201			1		
Spirontocaris snyderi	6179160204					
Spirontocaris sp. Indet.	6179160200					
Synchelidium pectinatum		1		1	1	
Synchelidium rectipalmum	6169371403					
Synchelidium variabilum						
Westwoodilla caecula	6169371502		2			2

PIER 53-55 CAP						
METRO - SEATTLE						
INVERTEBRATE SPECIES DATA						
By Marine Taxonomic Services, Ltd.						
December, 1996						
TAXON	NODOC CODE	VG4-1	VG4-2	VG4-3	VG4-4	VG4-5
MISCELLANEOUS						
Amphiodia periercta	8129030107					
Amphiodia sp. Indet.	8129030100					
Amphipholis sp. Indet.	8129030900					
Amphipholis squamata	8129030202					
Amphiuridae sp. Indet.	8129030000					
Anthozoa sp. Indet.	3740000000					
Chironomidae sp. Juv.	6505080000					
Crossaster papposus	8113010103	1				
Cucumaria piperata	8172060111					1
Ephemeroptera sp. Juv.						
Golfingia sp. Indet.	7200020100	3	3	2	1	2
Golfingia sp. Juv.	7200020100					
Holothuroidea sp. Indet.	8170000000					
Nematoda sp. Indet.	4700000000					
Nemertinea sp. Indet.	4300000000		2	2		
Nynantheae sp. Indet.					1	2
Ophiura lutkeni	8127010607	1	3	7	4	
Ophiura sarsi	8127010610					1
Ophiura sp. Indet.	8127010600					
Pentamera sp. Indet.	8172060300					
Phoronis sp. Indet.	7700010200					
Platyhelminthes sp. Indet.	3900000000					
Spinulosida sp. Indet.	8112000000		1			
Strongylocentrotus sp. Juv.	8149030200					
Tunicate sp. Indet.						

PIER 53-55 CAP						
METRO - SEATTLE						
INVERTEBRATE SPECIES DATA						
By Marine Taxonomic Services, Ltd.						
December, 1996						
TAXON	NODOC CODE	27REF-1	27REF-2	27REF-3	27REF-4	27REF-5
Amage anops	5001670101					
Ampharete labrops	5001670215					
Ampharete sp. Indet.	5001670200					
Ampharete cf. crassiseta			3	1	3	2
Ampharetidae sp. Indet.	5001670000	1			1	
Amphicties mucronata	5001670306					
Anobothrus gracilis	5001670701	3		3		
Aphelochaeta monilaris	5001500301					
Aphelochaeta sp. Indet.						
Aphelochaeta sp. N-1		1	1			
Aphrodita sp. Juv.	5001010100					
Aricidea ramosa	5001410706					
Aricidea wassi	5001410206	1		8	2	1
Armandia brevis	5001580202					1
Ascleriocheilus beringainus	5001570201					
Barantolla nr. americana	5001600601					
Capitella capitata 'hyperspecies'	5001600101	1		1		1
Capitellidae sp. Indet.	5001600000					
Caulleriella pacifica					1	
Chaetozone acuta			1			
Chaetozone nr. setosa	5001500401	1				
Chaetozone sp. Indet.	5001500400	2	3	7	2	1
Cirratulidae sp. Indet.	5001500000					
Cirratulidae sp. Juv.	5001500000					
Cirratulus robustus	5001500102	1				
'Clymenura' gracilis	5001631203					
Cossura pygodactyla	5001520106					
Demonax sp. Indet.	5001702800	1	1	2	1	1
Diopatra ornata	5001290202	3		3	1	3
Dipolydora cardalia	5001430431					
Dipolydora caulleryi	5001430404					
Dipolydora socialis	5001430402			1		
Dorvillea annulata	5001360502			1		
Dorvillea pseudorubrovittata	5001360101					
Dorvillidae sp. Indet.	5001360000					
Drilonereis longa	5001330103					
Ehlersia heterochaeta	5001232201					
Ehlersia hyperioni	5001230321	1	1	1		
Ehlersia sp. Indet.	5001232200					
Eteone sp. Indet.	5001130200					
Euchone incolor	5001700204					
Euclymeninae sp. Indet.						
Eulalia californiensis				1		
Eumida longicornuta		1	1	15		2

PIER 53-55 CAP						
METRO - SEATTLE						
INVERTEBRATE SPECIES DATA						
By Marine Taxonomic Services, Ltd.						
December, 1996						
TAXON	NODOC CODE	27REF-1	27REF-2	27REF-3	27REF-4	27REF-5
Exogone lourei	5001230703			3		
Exogone sp. Juv.	5001230700					
Gattyana ciliata	5001020602					
Gattyana cirrosa	5001020603					1
Glycera americana	5001270104	2		3	5	3
Glycera nana						
Glycera sp. Indet.	5001270100					
Glycera sp. Juv.	5001270100					
Glycinde armigera	5001280103	4		2	1	4
Glycinde polygnatha	5001280105					
Glycinde sp. Juv.	5001280100					
Goniada maculata	5001280202				1	
Harmothoe imbricata	5001020806	1		4		2
Hesionidae sp. Indet.	5001210000			1		
Heteromastus filobranchus	5001600203					
Isocirrus longiceps	5001632001					
Laonice cirrata	5001430201					
Laonice pugettensis	5001430204					
Leitoscoloplos pugettensis	5001401601	2	2	5	1	3
Levinsenia gracilis	5001410801					
Lumbrineridae sp. Indet.	5001310000			1		
Lumbrineris californiensis	5001310132	3	3	1	6	8
Lumbrineris limicola	5001310128					
Magelona longicornis	5001440105			3	1	1
Maldanidae sp. Indet.	5001630000					
Mediomastus sp. Indet.	5001600400		2	3	3	
Mesochaetopterus taylori	5001490401					
Microphthalmus sczelkowii	5001210201					
Micropodarke dubia	5001210801					
Neosabellaria cementarium	5001650201	1				
Nephtys caeca	5001250103					
Nephtys cornuta	5001250104					
Nephtys ferruginea	5001250111	1	4	3	1	2
Nephtys nr. ciliata	5001250102		2			2
Nephtys sp. Indet.	5001250100					
Nephtys sp. Juv.	5001250100					
Nereidae sp. Indet.	5001240000					
Nereis procera	5001240404					
Nereis sp. Juv.	5001240400					
Notomastus latericius	5001600306					
Notomastus sp. Indet.	5001600300					
Notomastus tenuis	5001600302					2
Odontosyllis phosphorea	5001231303					
Oligochaeta sp. Indet.						

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Onuphidae sp. Indet.	5001290000					
Onuphis elegans	5001290111					
Onuphis iridescens	5001290103				4	6
Onuphis sp. Juv.	5001290100			2		
Ophelina acuminata	5001580607			2		
Orbiniidae sp. Indet.	5001400000					
Paleonotus bellis	5001080101					
Paranaitis polynoides	5001130803					
Parandalia fauveli	5001220802					
Paraprionospio pinnata	5001431701					
Parougia caeca						
Pectinaria californiensis	5001660304					
Pectinaria granulata	5001660303			2		1
Pectinaria sp. Indet.	5001660300					
Pholoe glabra	5001060102					
Pholoe minuta	5001060101			1		1
Pholoides aspera	5001040202	13	3	6	1	1
Phyllochaetopterus prolifica	5001490202					
Phyllodoce groenlandica	5001130102	2		1		2
Phyllodoce hartmanae	5001131402					1
Phyllodoce sp. Indet.	5001131400					
Phyllodoce sp. Juv.	5001131400					
Phyllodocidae sp. Juv.	5001130000					
Phylo felix	5001400401					
Pilargis maculata	5001220303					
Pionosyllis sp. Indet.	5001230200					
Pista bansei		2		1		
Pista elongata	5001680703					
Pista sp. Indet.	5001680700	1				
Platynereis bicanaliculata	5001240501				1	2
Podarkeopsis glabrus	5001211903					
Polycirrus californicus	5001680810	1		3		1
Polycirrus sp. Indet.	5001680800			1	1	1
Polycirrus sp. complex						
Polydora limicola	5001430415					
Polydora sp. Indet.	5001430400					
Polynoidae sp. Indet.	5001020000					
Prionospio jubata		3	2	5	4	10
Prionospio lighti	5001430521			1		
Prionospio multibranchiata	5001433601					
Prionospio sp. Indet.	5001430500					
Prionospio sp. Juv.	5001430500					
Proclea graffi	5001681702					
Protodorvillea gracilis	5001360201					

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Rhodine bitorquata	5001631001					
Scoletoma luti	5001310109				1	
Scoloplos armiger	5001400301		2			
Sigalion spinosa				1		
Sphaerodoropsis sphaerulifer	5001260202	1				
Sphaerosyllis californiensis	5001230808			2		
Sphaerosyllis ranunculus						
Sphaerosyllis sp. Indet.	5001230800			1		
Spio cirrifera	5001430703					1
Spio sp. Indet.	5001430700	1				
Spiochaetopterus costarum	5001490302			3		1
Spionidae sp. Juv.	5001430000					
Spiophanes berkeleyorum	5001431004					
Sthenalais fusca	5001060306					
Streblosoma bairdi	5001682502				1	
Syllidae sp. Indet.	5001230000					
Syllis sp. Indet.	5001230300					
Tenonia priops	5001022302	1		2	2	
Terebellidae sp. Juv.	5001680000	1		12	1	2
Terebellides californica	5001690103					
Terebellides sp. Indet.	5001690100					
Travisia forbesii	5001580402					
Travisia sp. Juv.	5001580400	1		2		1
Trochochaeta multisetosa	5001450203					
Typosyllis harti	5001230510					
MOLLUSCA						
Acila castrensis	5502020101					
Adontorhina cyclia	5515020102					
Aeolidiidae sp. Indet.	5142030000					
Alvania compacta	5103200106					
Articulata sp. Juv.						
Astarte elliptica	5515190114			1		
Astyris gausapata				1		2
Axinopsida serricata	5515020201	4		2	1	4
Balcis sp. Indet.	5103530600					
Bivalvia sp. Juv.	5500000000					
Cardiidae sp. Juv.	5515220000			1		
Cardiomya pectinata	5520100101	1			2	
Chaetoderma sp. Indet.	5402010100					
Clinocardium blandum				2	1	
Clinocardium nuttalli	5515220102	1			1	
Clinocardium sp. Juv.	5515220100	1		1		
Compsomyax subdiaphana	5515470301					

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Crepipatella lingulata	5103640301			3		
Cryptonatica affinis	5103760201				1	
Cylichna attonsa	5110040214	1				
Gastropoda sp. Indet.	5100000000					
Gastropteron pacificum	5110070101					
Hiatella arctica	5517060201					
Kurtzia arteaga	5106024101					
Lacuna vincta	5103090305					
Lirobittium sp. Indet.				2	3	
Lottia pelta						
Lottia sp. Juv.						
Lucinoma annulatum	5515010201				2	
Lyonsia californica	5520050202	1	1	4		
Macoma calcarea	5515310101	1				
Macoma carlottensis	5515310112			1		
Macoma elimata	5515310102					
Macoma inquinata	5515310115					
Macoma obliqua	5515310106		1			
Macoma sp. Juv.	5515310100			10		
Macoma yoldiformis	5515310111	1	1	6	3	8
Margarites pupillus	5102100308	1	1			
Megacrenella columbiana	5507010301	3	1	5	1	2
Melanochlamys diomedea	5110060101					
Modiolus sp. Juv.	5507010600					
Mysella tumida	5515100102	1		11		
Mytilidae sp. Juv.	5507010000					
Mytilus edulis sp. complex	5507010100					
Nassarius mendicus	5101080101				1	
Nemocardium centrifilosum	5515220301		1			
Nucula tenuis	5502020201					
Nuculana minuta	5502040202					
Nudibranchia sp. Juv.	5127000000					
Odostomia sp. Indet.	5108010100					
Olivella baetica	5105100102					
Onchidoris bilamellata	5131050507					
Pandora filosa	5520020102			2		
Pandora sp. Juv.	5520020100			1		
Panomya ampla	5517060303	1				
Parvilucina tenuisculpta	5515010101	16	8	8	16	13
Pododesmus macroschisma	5509090101					
Protothaca staminea	5515470701					
Psephidia lordi	5515470501	6	10	11	13	3
Rictaxis punctocaelatus	5110010401					
Saxidomus giganteus	5515470201					

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Solen sicarius	5515290201			2		
Tellina modesta	5515310204			3		
Tellina nuculoides	5515310202	1		2		
Teredinidae sp. Indet.	5518020000	1				
Thracia cf. challisiana	5520080207			1		
Thracia sp. Juv.	5520080200			1		
Thracia trapezoides	5520080203				1	
Thyasira gouldi	5515020325					
Turbonilla sp. Indet.	5108010200					
CRUSTACEA						
Ampelisca careyi	6169020135				2	
Ampelisca cristata	6169020112	1		1	2	
Ampelisca hancocki	6169020113	1				
Ampelisca lobata	6169020134	2	1			
Aoroides exilis	6169060106					
Aoroides inermis	6169060104				1	1
Aoroides intermedia	6169060107					
Aruga oculata					1	
Balanomorpha sp. Indet.	6134000000				53	
Balanus glandula	6134020107					
Bopyroides hippolytes	6165040401					
Brachyura sp. Indet.	6184000000	1				
Byblis millsi	6169020209	1	1	1	3	3
Byblis sp. Indet.	6169020200					
Cancer gracilis	6188030105		1	1		1
Cancer productus	6188030101					1
Caprella laeviuscula	6171010710					
Caprella mendax	6171010719				1	
Chthamalus dalli	6134010101					
Corophium crassicorne	6169150203	1		12		
Crangon alaskensis	6179221003	2	5	6	1	7
Crangon sp. Indet.	6179220100		1		3	5
Crangonidae sp. Indet.	6179220000					
Cyclopoida sp. Indet.	6120000000					
Deflexilodes aenigmaticus		3	1	5	3	1
Desdimelita californica	6169211005					
Diastylis santamariensis			1	1		
Eobrolgus chumashi	6169421902	5				
Euaulus pusiolus	6179160408	1				
Eudorella pacifica	6154040202					
Euphilomedes carcharodonta	6111070301	169	340	234	215	191
Euphilomedes producta	6111070303					
Exosphaeroma inornata	6161020402					

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Gammaridea sp. Indet.	6169210000					
Gammaropsis thompsoni	6169260401	2	5		1	2
Haliophasma geminatum	6160011601				1	
Harpacticoida sp. Indet.	6119000000					
Hemigrapsus oregonensis	6189070102					
Heterophoxus conlanae						
Hippolytidae sp. Indet.	6179160000	3				5
Hippomedon coecus	6169341411	2	2		5	1
Leptochelia dubia	6157020103			4		
Leptognathia gracilis	6157090102					
Mayerella banksia	6171010301				2	
Melphisana "bola"	6169350201					1
Munnogonium tillerae	6163120303					
Mysidae sp. Indet.	6153010000					
Nebalia "pugettensis"	6145010102	1	1	2	2	
Neotrypaea sp. Indet.			1	1	3	
Nymphon pixellae	6001010107					
Opisa tridentata	6169342802				1	
Orchomene pacificus	6169342903	2	1	5	3	1
Orchomene pinguis	6169342904				1	
Pachynus barnardi	6169343101					
Pagurus dalli	6183060223			1	1	1
Pagurus granosimanus	6183060211					
Pagurus sp. Indet.	6183060200					1
Parametaphoxus quaylei				1		
Parasterope barnesi	6111030503			2		
Peramphithoe tea						
Photis brevipes	6169260201					
Phoxichelidium femoratum	6001060102					
Pinnixa schmitti	6189060404	4	2	1	3	4
Pinnixa sp. Indet.	6189060400					
Pinnotheridae sp. Indet.	6189060000					
Pleusymtes sp A		1		2		
Protomedeia prudens	6169260312				2	5
Protomedeia sp. Indet.	6169260300			1		1
Rhepoxynius abronius	6169421504	8	10	17	10	7
Rutiderma lomae	6111060103					
Solidobalanus hesperius	6134050201					
Spirontocaris snyderi	6179160204				1	
Spirontocaris sp. Indet.	6179160200		1			
Synchelidium pectinatum		3	2	6	2	1
Synchelidium rectipalmum	6169371403		1			
Synchelidium variabilum						
Westwoodilla caecula	6169371502	2	7	1	3	3

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MISCELLANEOUS						
Amphiodia periercta	8129030107					
Amphiodia sp. Indet.	8129030100					
Amphipholis sp. Indet.	8129030900					
Amphipholis squamata	8129030202	1				1
Amphiuridae sp. Indet.	8129030000				1	
Anthozoa sp. Indet.	3740000000	1				
Chironomidae sp. Juv.	6505080000					
Crossaster papposus	8113010103	1				
Cucumaria piperata	8172060111		3			2
Ephemeroptera sp. Juv.						
Golfingia sp. Indet.	7200020100					1
Golfingia sp. Juv.	7200020100					
Holothuroidea sp. Indet.	8170000000					
Nematoda sp. Indet.	4700000000					
Nemertinea sp. Indet.	4300000000	5	5	7	3	1
Nynantheae sp. Indet.				3		
Ophiura lutkeni	8127010607					
Ophiura sarsi	8127010610					
Ophiura sp. Indet.	8127010600					
Pentamera sp. Indet.	8172060300			2		
Phoronis sp. Indet.	7700010200	1		3		
Platyhelminthes sp. Indet.	3900000000					
Spinulosida sp. Indet.	8112000000					
Strongylocentrotus sp. Juv.	8149030200	1				
Tunicate sp. Indet.						