2011 BASELINE SEDIMENT SAMPLING REPORT

Gateway Pacific Terminal

Whatcom County, Washington

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June 15, 2012

Project No. 0-915-15338-C.06.04

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PREFACE

Pacific International Terminals, Inc., a subsidiary of SSA Marine, proposes to develop the Gateway Pacific Terminal (the "Terminal"), a multimodal terminal for transfer of dry bulk commodities, at Cherry Point in Whatcom County, Washington. Construction and operation of the Terminal and associated facilities require the approval of local, state, and federal agencies.

Agency decision makers are to be informed of the potential environmental impacts of the proposed project by preparation of an Environmental Impact Statement (EIS). The EIS will be prepared under guidelines of the National Environmental Policy Act and State Environmental Policy Act by a lead federal agency and lead state and county agencies working in cooperation.

This report is one of several technical reports prepared on behalf of Pacific International Terminals, Inc., that provide scientific technical information about the existing conditions of the proposed project site and in some cases the projected effects of project operations. This report is provided to the lead agencies for their use in preparation of a Draft EIS. Several of the technical reports have been prepared to also support specific project permit applications submitted to local, state, and federal agencies, or as part of the consultation process with resource agencies and affected Indian tribes.

A more detailed description of the proposed Terminal, including a complete list of proposed commodities and the phasing plan, is provided in the *Gateway Pacific Terminal Project Information Document* (Pacific International Terminals, Inc. Revised 2012).

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TABLE OF CONTENTS

1.0 INTRODUCTION 1
- 1.1 STUDY PURPOSE 1
- 1.2 SETTLEMENT AGREEMENT 1
  - 1.2.1 Environmental Documentation 2
  - 1.2.2 State Aquatic Lands Lease 2
  - 1.2.3 Compliance with Study Requirements 5
- 1.3 GATEWAY PACIFIC TERMINAL 5

2.0 STUDY OBJECTIVES AND DESIGN 6
- 2.1 STUDY AREA 6
- 2.2 OBJECTIVES 15
- 2.3 STUDY DESIGN 15
- 2.4 STATISTICAL DESIGN 16

3.0 METHODS 18
- 3.1 ANALYSIS SCHEDULE 18
- 3.2 FIELD SAMPLING METHODS 21
  - 3.2.1 Station Positioning 21
  - 3.2.2 Sediment Sample Collection 21
  - 3.2.3 Sample Preparation 22
  - 3.2.4 Decontamination Procedures 22
  - 3.2.5 Waste Sediment 23
- 3.3 DATA ANALYSIS AND INTERPRETATION 23

4.0 RESULTS 24
- 4.1 DEVIATIONS FROM THE 2011 SEDIMENT IMPLEMENTATION WORK PLAN 24
  - 4.1.1 Sampling Locations 25
  - 4.1.2 QA/QC Review of Sediment Chemistry Results 25
  - 4.1.3 Amphipod Species Selection 26
  - 4.1.4 Selection of Chronic Sediment Bioassay 28
- 4.2 SEDIMENT TIER I RESULTS 29
  - 4.2.1 Sediment Conventionals 29
  - 4.2.2 Metals 29
  - 4.2.3 Chlorinated Pesticides 30
  - 4.2.4 Semivolatile Organic Compounds 32
  - 4.2.5 Polycyclic Aromatic Hydrocarbons 34
  - 4.2.6 Polychlorinated Biphenyls 38
  - 4.2.7 Volatile Organic Compounds 39
- 4.3 SEDIMENT TIER II RESULTS 39
  - 4.3.1 Reference Sediments 40
  - 4.3.2 10-Day Amphipod Bioassay 41
  - 4.3.3 48-Hour Larval Development Bioassay 42
  - 4.3.4 20-Day Juvenile Polychaete Bioassay 42

5.0 SUMMARY 43

6.0 REFERENCES 44

TABLES

Table 1 Tiered Analysis Schedule 17
Table 2 Sediment Sample Locations for Permitted Configuration 19
Table 3 Sediment Sample Locations for Alternative Configuration 20
Table 4 Quality Assurance / Quality Control Deviations from the Work Plan 27
Table 5 Summary of Detected Pesticides 31
Table 6 Summary of Detected Pesticides 31
Table 7 Summary of Detected Semivolatile Organic Compounds (Dry-Weight Concentrations) 33
Table 8 Summary of Detected Semivolatile Organic Compounds (Carbon-Normalized Concentrations) 33
Table 9 Summary of Detected Polycyclic Aromatic Hydrocarbons (Dry-Weight Concentrations) 35
Table 10 Summary of Detected Polycyclic Aromatic Hydrocarbons (Carbon-Normalized Concentrations) 36
Table 11 Summary of Total Polychlorinated Biphenyls 38
Table 12 Biological Effects Criteria for Puget Sound Marine Sediment Bioassays 40

FIGURES

Figure 1 Vicinity Map 3
Figure 2 Proposed Project Layout 7
Figure 3 Permitted Alignment 9
Figure 4 Alternative Alignment 11
Figure 5 Actual July 2011 Sediment Sampling Locations 13

APPENDICES

Appendix A Sediment Sample Photographs
Appendix B Qualitative Sample Characteristic Forms
Appendix C Data Quality Review and Validation Report
Appendix D Complete Laboratory Analytical Results
- Table D-1 Sediment Conventionals
- Table D-2 Sediment Metals and Organometals
- Table D-3 Sediment Chlorinated Pesticides
- Table D-4 Sediment Semivolatile Organic Compounds (Dry-Weight Concentrations)
- Table D-5 Sediment Semivolatile Organic Compounds (Carbon-Normalized Concentrations)
- Table D-6 Sediment Polycyclic Aromatic Hydrocarbons (Dry-Weight Concentrations)
- Table D-7 Sediment Polycyclic Aromatic Hydrocarbons (Carbon-Normalized Concentrations)
- Table D-8 Sediment Polychlorinated Biphenyls
- Table D-9 Sediment Volatile Organic Compounds (Dry-Weight Concentrations)

Appendix E Results of Biological Testing of Sediment

ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
AMEC	AMEC Environment & Infrastructure, Inc.
ARI	Analytical Resources, Inc.
BNSF Railway	BNSF Railway Company
cm	centimeter
DGPS	Differential Global Positioning System
DMMO	Dredged Material Management Office
DMMP	Dredged Material Management Program
DO	dissolved oxygen
Ecology	Washington State Department of Ecology
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
HPAH	high-molecular-weight polycyclic aromatic hydrocarbon
LPAH	low-molecular-weight polycyclic aromatic hydrocarbon
µg/kg	micrograms per kilogram
MAP Team	Multi-Agency Permit Team
MLLW	mean lower low water
Mtpa	million metric tons per annum
NAD83	North American Datum of 1983
OC	organic carbon
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
ppt	parts per thousand
PSEP	Puget Sound Estuary Program
QA	quality assurance
QC	quality control
SHB	Shoreline Hearings Board
SMS	Sediment Management Standards
SQS	Washington Marine Sediment Quality Standards
SL	screening level
SVOC	semivolatile organic compound
Terminal	Gateway Pacific Terminal
TOC	total organic carbon
UGA	Urban Growth Area
UV	ultraviolet
VOC	volatile organic compound
WAC	Washington Administrative Code
WDNR	Washington Department of Natural Resources

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1.0 INTRODUCTION

Pacific International Terminals, Inc. (Pacific International Terminals), proposes to develop the Gateway Pacific Terminal (the "Terminal") at Cherry Point in Whatcom County, Washington (Figure 1). Designed for export and import of dry bulk commodities, the proposed Terminal would include a deep-draft wharf with access trestle, dry bulk materials handling and storage facilities, and rail transportation access. This report presents the results of a field and laboratory investigation conducted in July 2011 to characterize baseline sediment quality in the Strait of Georgia at the location of this proposed Terminal project.

1.1 STUDY PURPOSE

This sediment sampling study and resulting report meets several purposes:

- Information in this report meets requirements stipulated in the Settlement Agreement for sediment and water quality analysis.
- The investigation was conducted based on the *2011 Sediment Implementation Work Plan* (Work Plan) (AMEC Earth & Environmental 2011), which was prepared by AMEC on behalf of Pacific International Terminals and reviewed and approved by Ecology in 2010.
- The results of this study provide information relevant to environmental analysis, including reviews under the National Environmental Policy Act (NEPA), State Environmental Policy Act (SEPA), and reviews necessary for several permits, approvals, and leases.

1.2 SETTLEMENT AGREEMENT

Pacific International Terminals' proposal to construct a terminal at this location was first evaluated in a Draft and Final Environmental Impact Statement in 1996-1997 (Whatcom County 1996 and 1997). Under Whatcom County's Shoreline Management Program, the property is designated as part of the Cherry Point Management Area, where port and water-dependent industrial facilities are a permitted use. Following the environmental review in 1997, Whatcom County issued a Shoreline Substantial Development Permit (SHS92-0020) and a Major Development Permit (MDP92-0020) for the project.

The Washington Environmental Council, Washington Department of Fish and Wildlife (WDFW), and Washington State Department of Ecology (Ecology), along with five other appellants, appealed the Shoreline Substantial Development permit (Shoreline Hearings Board [SHB] Appeals Numbers 97-22 and 97-23, filed on August 31, 1999). In 1999, Pacific International Terminals and the appellants entered into a Settlement Agreement on issues raised during the permit appeal (Settlement Agreement, Pacific International Terminals, Shoreline Substantial Permit SHS 92-0020 and SHB Appeals Numbers 97-22 and 97-23).

This report complies with Section 2.5 of the Settlement Agreement, which calls for

> "…*annual sampling of sediments, marine water, and shellfish and/or other identified indicator species in the vicinity of the project site in accordance with the State Sediment Management Standards/Sediment Sampling and Analysis Plan Appendix and the Puget Sound Estuary Program 1996 Protocols*."

Section 2.5 of the Settlement Agreement requires that sediment sampling:

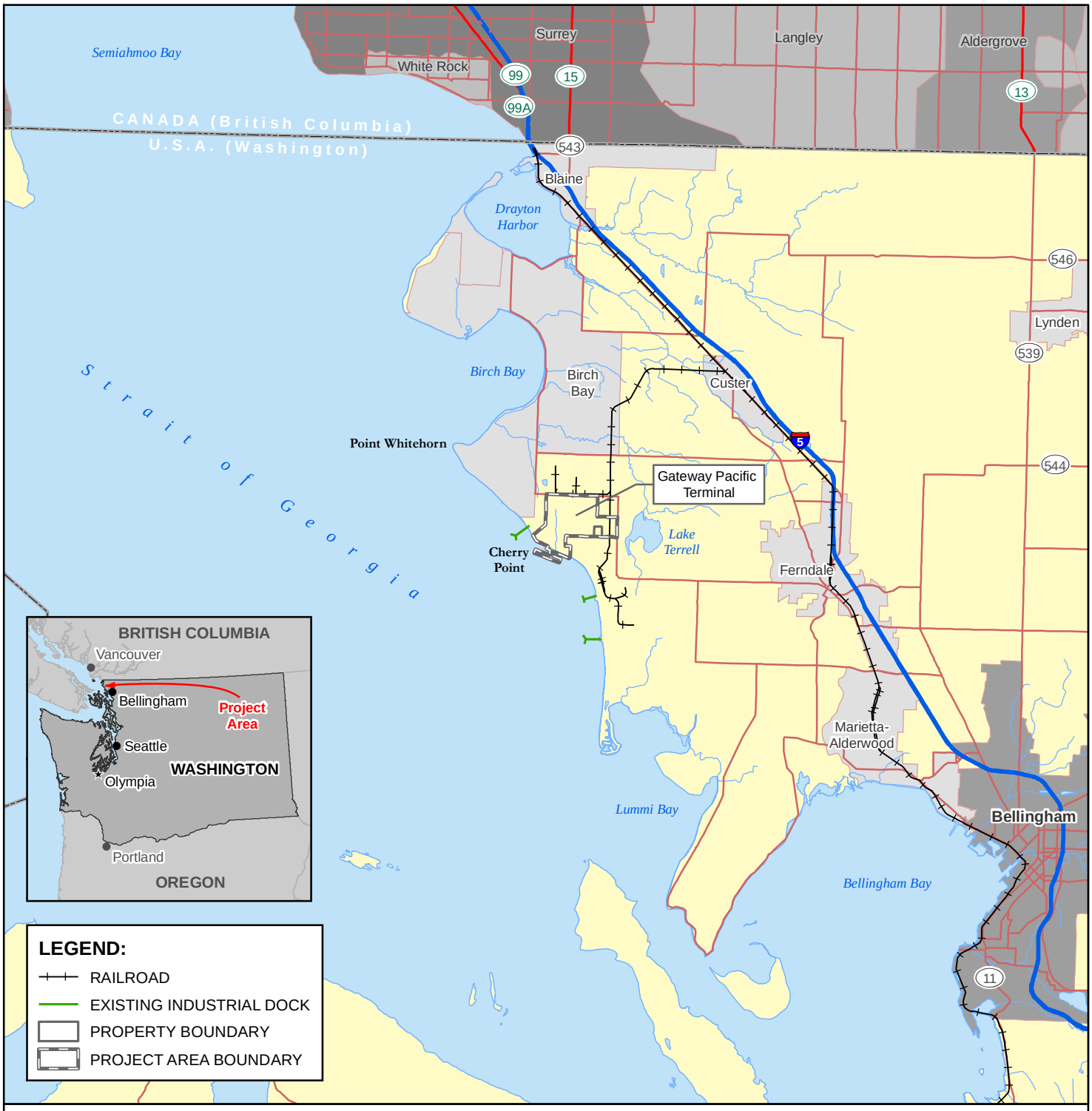
- "…provide a scientifically sound basis for establishing existing pollutant levels [i.e., baseline conditions] and related biological conditions in the proposed Department of Natural Resources lease area…", and
- conduct annual sampling of sediments and compare the results to baseline conditions in order to detect changes or trends in sediment quality.

1.2.1 Environmental Documentation

Permitting of the proposed Terminal will include preparation of an NEPA/SEPA compliant EIS. The purpose of the EIS is to inform the agency decision makers and officials who will issue permits or approvals about the potential environmental effects of the project. One element of the marine water quality assessment is evaluation of contaminant sediments that may be disturbed by project construction or operation. This study provides information on the presence or absence of contamination in the marine sediments at the location of the access trestle and wharf.

1.2.2 State Aquatic Lands Lease

A portion of the access trestle and all of the wharf would be built on lands leased from the State of Washington. This report presents the results of the initial sediment investigation undertaken to document existing, baseline sediment quality the state aquatic lands lease area.



AMEC 11810 North Creek Parkway N Bothell, WA 98011	amec	Pacific International Terminals	CLIENT: PACIFIC INTERNATIONAL TERMINALS, INC.

PROJECT: GATEWAY PACIFIC TERMINAL	DWN BY: SD	DATUM: NAD83	DATE: APRIL 2012
TITLE: VICINITY MAP	CHK'D BY: KD	REV. NO.: 1	PROJECT NO.: 091515338C-04-01
	PROJECTION: WA SP North, Ft.	SCALE: 1 inch=3 miles	FIGURE No.: FIGURE 1

K:\AMEC US OFFICES\KIRKLAND\15338-0\15338C\T-04-01 - Bird-Wildlife-Plant Assessment\dwg\Revised\Figure 1 - Vicinity Map.mxd

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1.2.3 Compliance with Study Requirements

To ensure that the study meets to the greatest extent possible with the three purposes described above a detailed Work Plan was prepared in advance of the investigation and reviewed by agencies and Settlement Agreement parties prior to the initiation of field work in 2011. The Work Plan was reviewed by members of the Gateway Pacific Terminal Project Multi-Agency Permit (MAP) Team[1] in June 2011. Comments were received regarding the list of analytes to be measured for sediments. All recommended analytes were analyzed as part of the July 2011 sediment investigation.

1.3 GATEWAY PACIFIC TERMINAL

Gateway Pacific Terminal would serve as a deep-water, multimodal Terminal for the export and import of dry bulk commodities between rail and oceangoing vessels.

The proposed Terminal would include the following (see Figure 2 for layout):

- **Access Trestle and Wharf** – The proposed Terminal's access trestle and wharf would extend to the south into the Strait of Georgia. The access trestle and wharf would be constructed partially on state tidelands property leased from the Washington State Department of Natural Resources (WDNR). The access trestle connects the materials handling and storage facilities to the wharf. The wharf would provide three deep-water berths for ship docking for loading and unloading.
- **Materials Handling and Storage** – The Terminal's material handling and storage areas would consist of two areas: one for storing commodities outdoors ("East Loop") and the other for covered and silo storage ("West Loop"). Commodities would be moved on conveyor belts from these two areas to or from ships at berth. Conveyor belts would be fully enclosed on the access trestle and wharf per the requirements of the Settlement Agreement.
- **Rail Connection** – The Cherry Point industrial area is served by BNSF Railway Company's Custer Spur Industrial rail line (Custer Spur). Both the East Loop and the West Loop would have rail connections to Custer Spur. Rail would not extend onto the access trestle or wharf.

The Shoreline Permit identified an alignment for the proposed wharf known as the original or Permitted Configuration. Through the course of negotiations with the Settlement Agreement parties over the years since the Shoreline Permit was issued in 1996, a second alignment has been identified (called Alternative Configuration in this report).

[1] Washington State Senate Bill 6578 directs the Governor's Office of Regulatory Assistance to promote Multi-Agency Permit (MAP) teams to support projects with complex environmental and land-use permitting by improving government agency permit coordination; reducing permit application revisions and review turnaround time; and facilitating project changes to improve long-term environmental outcomes from federal, state, and local permitting processes.

The two alignments considered are:

- The original alignment (location shown in Figure 3) that was evaluated in the 1996 EIS and for which the Shoreline Substantial Development Permit was issued; and
- The “Alternative Configuration” (location shown in Figure 4), which is located slightly south of the Permitted Configuration.

The area that would be leased from WDNR for each of the potential wharf and trestle configurations is shown on Figures 3 and 4.

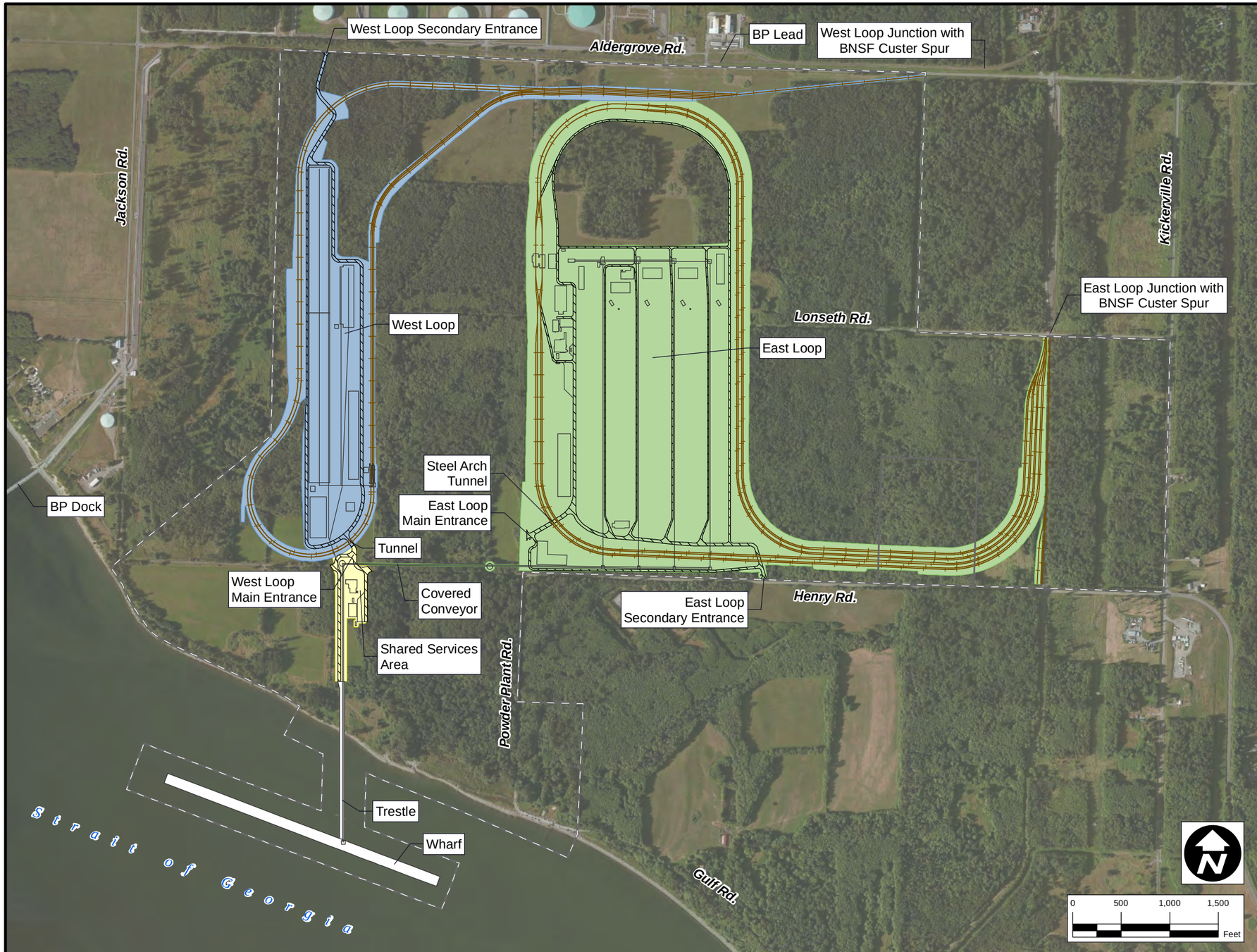
A more detailed description of the proposed Terminal, including a complete list of proposed commodities and the phasing plan, is provided in the revised *Gateway Pacific Terminal Project Information Document* (Pacific International Terminals, Inc. 2012).

2.0 STUDY OBJECTIVES AND DESIGN

The objective of this investigation was to evaluate baseline conditions in the potential WDNR lease areas prior to entering into a lease agreement, as specified in the Settlement Agreement (Section 1.3).

2.1 STUDY AREA

This investigation addressed the potential WDNR lease area under both the Permitted Alignment (Figure 3) and the Alternative Configuration (Figure 4) for the wharf and trestle. The combined potential lease area will be referred to as the Baseline Study Area. The boundary of the Baseline Study Area is shown in Figure 5.



LEGEND

- NEW RAILWAY TRACK
- ROAD
- TRESTLE & WHARF
- EAST LOOP
- WEST LOOP
- SHARED SERVICES AREA
- PROPERTY AND PROJECT AREA BOUNDARY
- PROJECT AREA BOUNDARY

Source:
Ausenco Sandwell, 143166-A100-WC001-1.dwg (Rev. P1), 12/22/2011.

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DWN BY:	SD
CHK'D BY:	KD
DATUM:	NAD83
PROJECTION:	WA SP North, Ft.
SCALE:	1 inch = 1,100 feet

PROJECT:
GATEWAY PACIFIC TERMINAL

TITLE:
PROPOSED PROJECT LAYOUT

DATE:	APRIL 2012
PROJECT NO.:	091515338C-06-04
REV. NO.:	1
FIGURE NO.:	FIGURE 2

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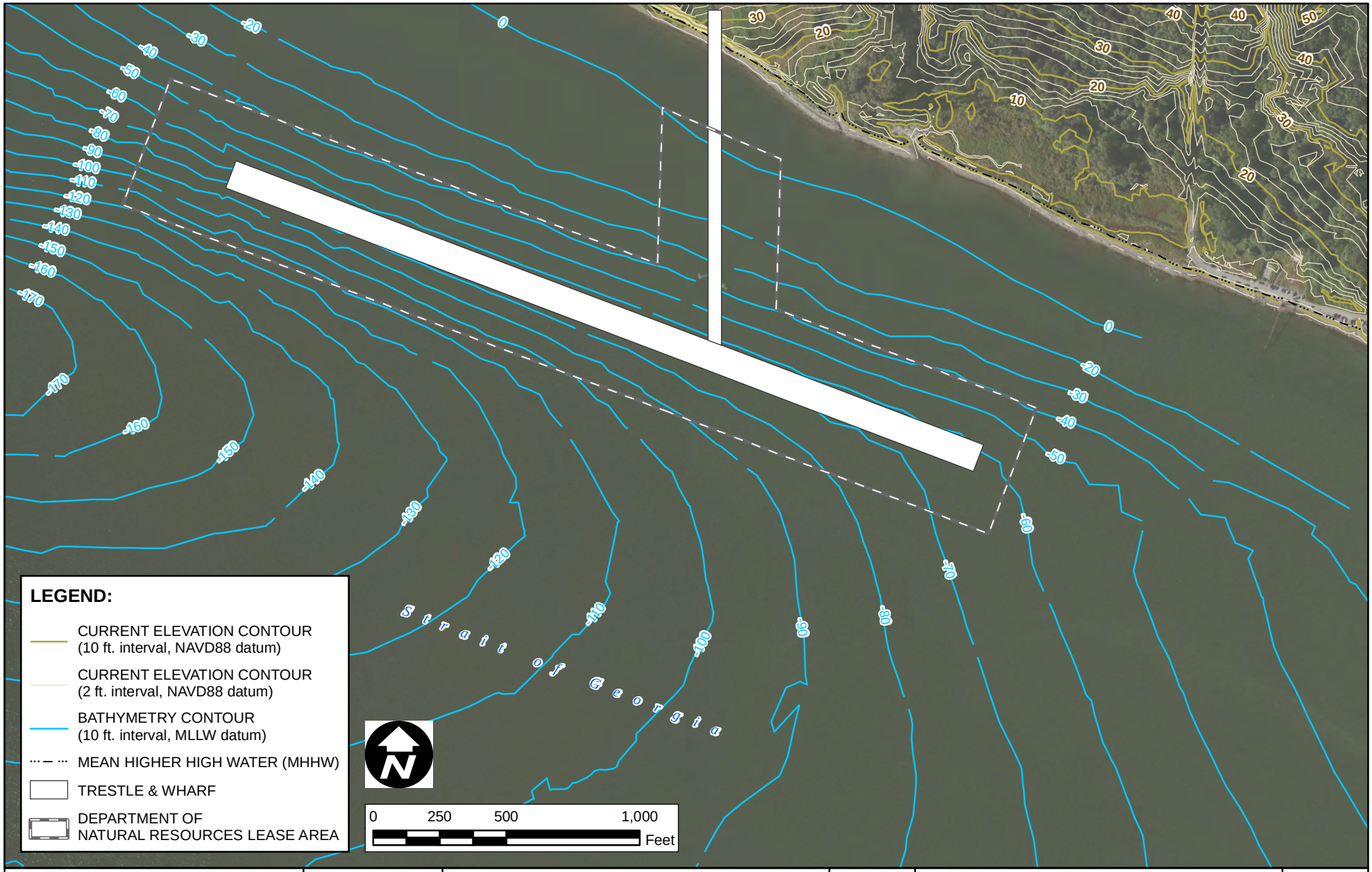

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2010-04-14-svTPXpiti0006-DEGROSS.dwg, David Evans & Associates, 07/20/2010.

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DWN BY:	SD
CHK'D BY:	MG
DATUM:	NAD83
PROJECTION:	WA SP North, Ft.
SCALE:	1 inch = 500 feet

PROJECT: GATEWAY PACIFIC TERMINAL

TITLE: PERMITTED ALIGNMENT

DATE:	APRIL 2012
PROJECT NO.:	091515338C-06-04
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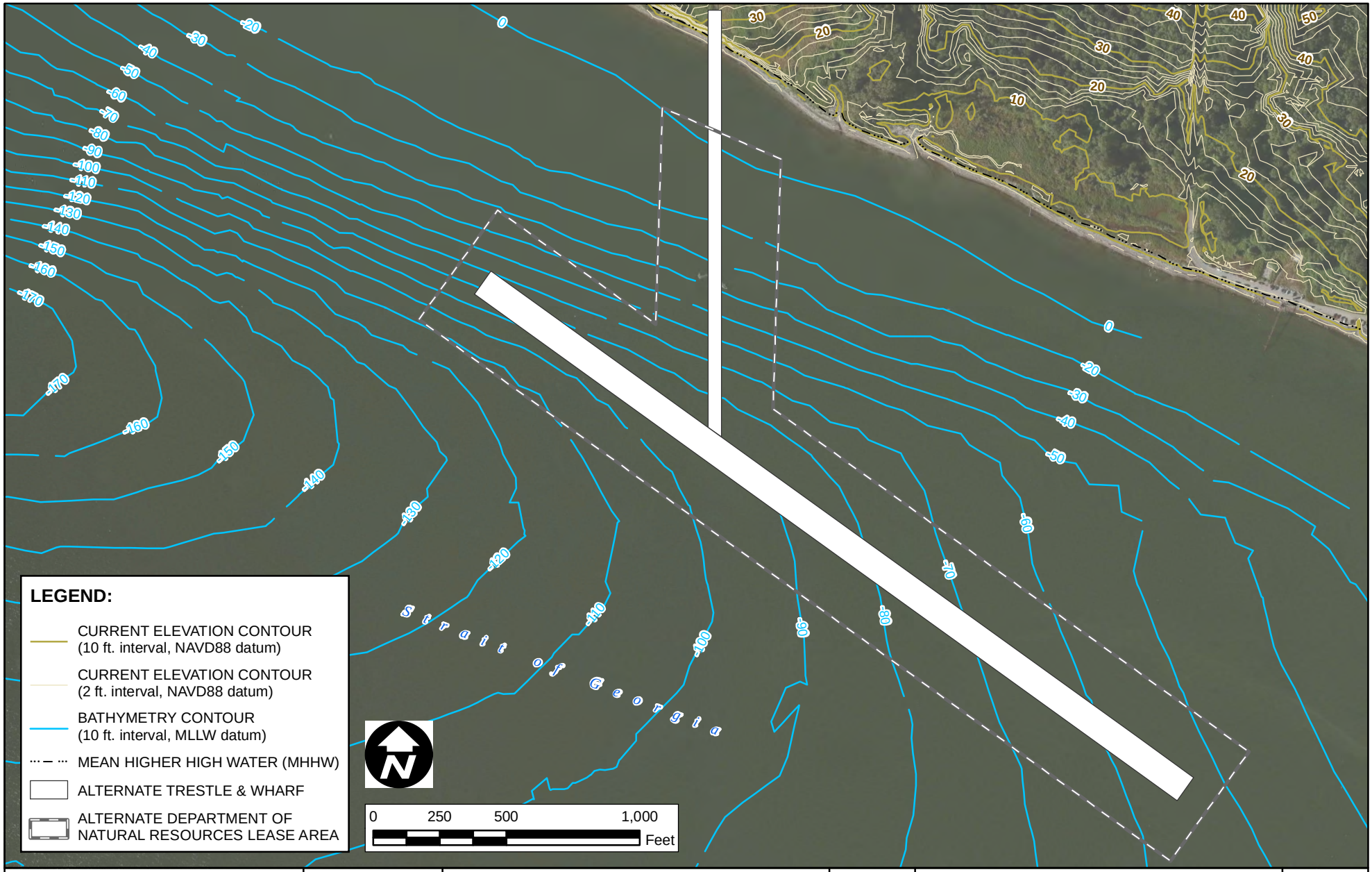

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DATUM:	NAD83
PROJECTION:	WA SP North, Ft.
SCALE:	1 inch = 500 feet

PROJECT: GATEWAY PACIFIC TERMINAL

TITLE: ALTERNATIVE ALIGNMENT

DATE:	APRIL 2012
PROJECT NO.:	091515338C-06-04
REV. NO.:	-
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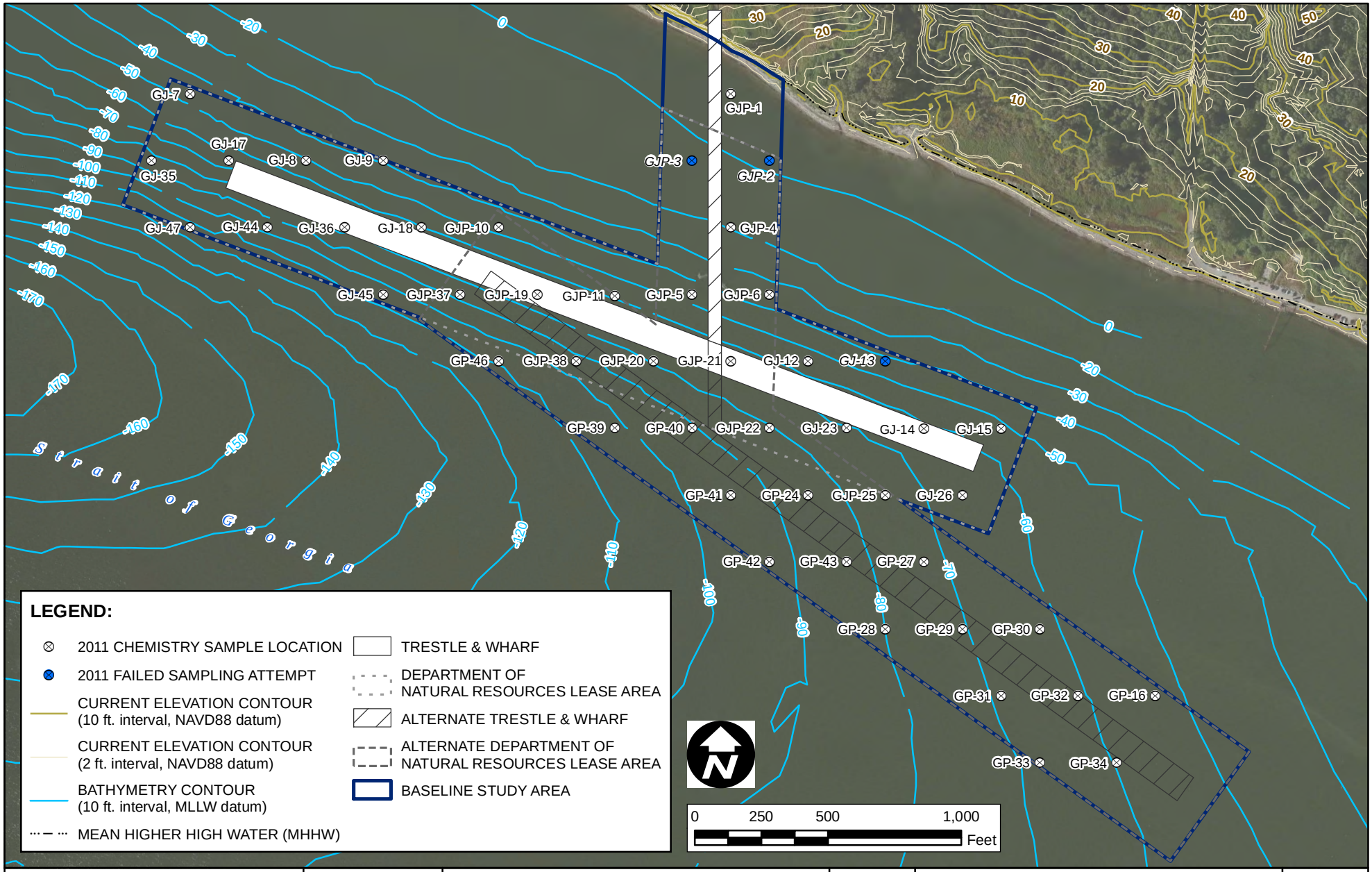

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2010-04-14-svTPXpiti0006-DEGROSS.dwg, David Evans & Associates, 07/20/2010.

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DWN BY: SD
CHK'D BY: MG
DATUM: NAD83
PROJECTION: WA SP North, Ft.
SCALE: 1 inch = 500 feet

PROJECT: GATEWAY PACIFIC TERMINAL

TITLE: ACTUAL JULY 2011 SEDIMENT SAMPLING LOCATIONS GATEWAY PACIFIC TERMINAL

DATE: APRIL 2012
PROJECT NO.: 091515338C-06-04
REV. NO.: -
FIGURE NO.: 5

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2.2 OBJECTIVES

The objectives of the investigation were to:

- Characterize the concentration of metals and organic chemicals in sediments within the Baseline Study Area (Figure 5);
- Determine if sediments within the Baseline Study Area meet Washington State Marine Sediment Quality Standards (SQS) chemical criteria (Washington Administrative Code [WAC] 173-204-320);
- Determine if analyte concentrations in sediments within the Baseline Study Area are below Dredged Material Management Program (DMMP) screening levels (SLs)[2];
- Assess potential toxicity of sediments using sediment bioassays at locations where SQS criteria or DMMP screening levels are exceeded; and
- Evaluate the statistical variance of chemical concentrations within the Baseline Study Area to develop a future monitoring program to detect changes from baseline conditions.

This study was designed to address the objectives of sediment investigations conducted under the Sediment Source Control Program, as established by WAC 173-204-100.

This report completes the first four objectives listed above, and meets the objectives of the Settlement Agreement to develop a scientifically sound basis for establishing existing pollutant conditions and related biological conditions in the proposed Baseline Study Area. The statistical design for a future monitoring program to detect future changes from baseline sediment quality conditions will be submitted in a separate report.

2.3 STUDY DESIGN

This study employed a statistical design (Section 2.4) to assess sediment quality using a tiered testing approach that is consistent with the Washington State Marine SQS. A summary of the tiered testing approach is presented in Table 1. For the Tier I analysis, surficial sediment samples (upper 10 centimeters [cm]) were collected at each of the locations shown on Figure 5. The sample from each location was split into two individual aliquots. One sample aliquot from each location was analyzed for the list of metals and organic chemicals included in the Washington Marine SQS and/or included in the list of SLs for in-water disposal of dredged material (DMMO 2008). The second split

[2] A screening level is a guidance value that identifies the concentrations of specific constituents at or below which there is no reason to believe that dredged material disposal would result in unacceptable adverse effects (DMMP 2008).

sediment sample aliquot collected from each location was archived at the NewFields Laboratory in Port Gamble, Washington, for Tier II sediment bioassay analyses, if needed.

Sediment concentrations measured in Tier I analyses at each sampling location were compared to the SQS chemical criteria and the DMMP SL values, as detailed in Section 3.3. If detected concentrations in a Tier I sample exceeded the SQS criteria or the SL values, a Tier II analysis was conducted on the archived sediment samples at each location where chemical criteria were exceeded. The Tier II analysis evaluates sediment quality by determining compliance with the Washington Sediment Management Standards for Biological Effects Criteria (WAC 173-204-320[3]). Sediment samples that pass all biological tests are designated as passing the Washington State Sediment Management Standards (SMS) (WAC 173-204-320 through 173-204-340), regardless of whether sediment chemical concentrations exceed SQS values. Any sample that fails any of the biological tests is interpreted as not complying with the SMS.

The two acute sediment bioassay tests consisted of: (1) 10-day amphipod mortality bioassay using *Eohaustorius estuarius,* and (2) 48-hour mussel larval development bioassay using *Mytilus galloprovincialis*. The chronic test consisted of a 20-day juvenile polychaete growth bioassay using *Neanthes arenaceodentata*.

The 2011 Baseline Sediment Study design considered shallow sampling locations (water depths less than -12 feet relative to mean lower low water [MLLW]) and deeper sampling locations as two separate areas of investigation. The study design included two zones because benthic organisms exposed to polycyclic aromatic hydrocarbon (PAH) compounds in waters shallower than -12 feet MLLW may experience increased toxicity due to the photoactivation of selected PAHs from ultraviolet (UV) radiation (Ecology 2008). If Tier II analysis was required for sediments collected in the shallow area, the study design requires that bioassays be performed in the presence of full spectrum laboratory lighting that includes ultraviolet wavelengths of sufficient intensity to mimic shallow water conditions.

2.4 STATISTICAL DESIGN

A computer program, Visual Sample Plan, Version 6.0, was used to develop the sampling design presented in the Work Plan (AMEC Earth & Environmental 2011). This program was specifically created to develop sampling designs based on specified statistical objectives. Current sponsors of the model include the U.S. Environmental Protection Agency (EPA), U.S. Department of Energy, U.S. Department of Defense, U.S. Department of Homeland Security, U.S. Centers for Disease Control, and the United Kingdom Atomic Weapons Establishment.

Table 1 Tiered Analysis Schedule

Stations Tested	Parameters	Methods
Tier I – Chemical Analysis		
All samples collected within the Baseline Study Area (Figure 5)	SMS metals	EPA 6010/EPA 7471A
	Metal – antimony	EPA 6010/EPA 7471A
	Metal – nickel	EPA 6010/EPA 7471A
	SMS aromatic hydrocarbons	EPA 8270D
	SMS chlorinated benzenes	EPA 8270D
	SMS phthalate esters	EPA 8270D
	SMS miscellaneous	EPA 8270D
	PCB Aroclors	EPA 8082
	Chlorinated pesticides	EPA 8081/PSEP
	Volatile organic compounds	EPA 8260C/5030B
	SMS ionizable organic compounds	EPA 8270D
Tier I – Chemical Analysis		
All locations where SMS criteria or SLs are exceeded	Amphipod survival	PSEP
	Mollusc larval development	PSEP
	Chronic juvenile polychaete growth	PSEP

Abbreviation(s)
EPA: U.S. Environmental Protection Agency
DMMP: Dredged Material Management Program
PCB: polychlorinated biphenyls
PSEP: Puget Sound Estuary Program
SL: DMMP Screening Level
SMS: Sediment Management Standards

Visual Sample Plan produces a set of sample coordinates from a random starting point based on input parameters specified by the user. The input parameters include statistical objectives and overall sampling pattern. For this study, we specified the following input parameters:

- A systematic, triangular grid sampling pattern;
- The statistical objective of 95 percent probability that the sampling would identify a localized area of chemical contamination; and
- The contaminated area is assumed to be a circular area with a diameter of 50 feet (an area of 70,686 square feet).

The program output specified a set of sampling coordinates for 47 sample locations within the Baseline Study Area in a systematic triangular grid pattern with a spacing of 290 feet between sampling locations. The sampling coordinates are presented in Tables 2 and 3. The sampling design specified the collection of sediment samples at 47 sampling stations. Of these proposed sampling locations, 44 lie in water depths greater than -12 feet MLLW, and 3 lie in waters shallower than -12 feet MLLW. In addition, 32 proposed sampling locations lie within the Permitted Configuration area, and 30 lie within the Alternative Configuration area; 15 of the 47 proposed sampling locations lie within the area where the two configurations overlap.

3.0 METHODS

This section describes the methods used to conduct the sediments investigation. The investigation was conducted generally in accordance with the *2011 Sediment Implementation Work Plan* (AMEC Earth & Environmental 2011), except as described below. The Work Plan defined the scope of work needed to evaluate sediment quality following the guidelines for sediment sampling presented in Ecology's *Sediment Sampling and Analysis Plan Appendix* (Ecology 2008) and in the *Puget Sound Estuary Program 1996 Protocols,* as specified by the Settlement Agreement. The Work Plan also addressed the objectives of standard sediment investigations conducted under the Sediment Source Control Program as established by WAC 173-204-100.

3.1 ANALYSIS SCHEDULE

The initial Tier I analysis (Table 1) consisted of chemical testing of sediments collected within the Baseline Study Area (Figure 5). Tier II biological effects testing was conducted on sediment samples with concentrations of constituents that failed to meet the SQS Marine Sediment Management Standards or that exceeded DMMP SL values.

Table 2 Sediment Sample Locations for Permitted Configuration

Station Name[1]	Sampling Location (SPCS WA N [4601] NAD83 Survey Feet) Easting	Northing	Depth Range
GJP-1	683474.88	1181638.35	0 to -12 feet MLLW
GJP-2	683223.90	1181783.25	0 to -12 feet MLLW
GJP-3	683223.90	1181493.44	0 to -12 feet MLLW
GJP-4	682972.92	1181638.35	-15 to -40 feet MLLW
GJP-5	682721.94	1181493.44	-40 to -60 feet MLLW
GJP-6	682721.94	1181783.25	-15 to -40 feet MLLW
GJ-7	683474.88	1179609.70	-40 to -60 feet MLLW
GJ-8	683223.90	1180044.41	-40 to -60 feet MLLW
GJ-9	683223.90	1180334.22	-40 to -60 feet MLLW
GJP-10	682972.92	1180768.93	-40 to -60 feet MLLW
GJP-11	682716.94	1181203.64	-40 to -60 feet MLLW
GJ-12	682470.96	1181928.16	-40 to -60 feet MLLW
GJ-13	682470.96	1182217.96	-40 to -60 feet MLLW
GJ-14	682219.98	1182362.87	-40 to -60 feet MLLW
GJ-15	682219.98	1182652.67	-40 to -60 feet MLLW
GJ-17	683223.90	1179754.60	-60 to -80 feet MLLW
GJ-18	682972.92	1180479.12	-60 to -80 feet MLLW
GJP-19	682721.94	1180913.83	-60 to -80 feet MLLW
GJP-20[2]	682470.96	1181348.54	-60 to -80 feet MLLW
GJP-21	682470.96	1181638.35	-60 to -80 feet MLLW
GJP-22	682219.98	1181783.25	-60 to -80 feet MLLW
GJ-23	682219.98	1182073.06	-60 to -80 feet MLLW
GJP-25	681969.00	1182217.96	-60 to -80 feet MLLW
GJ-26	681969.00	1182507.77	-60 to -80 feet MLLW
GJ-35	683223.90	1179464.79	-80 to -100 feet MLLW
GJ-36	682972.92	1180189.31	-80 to -100 feet MLLW
GJP-37	682721.94	1180624.02	-80 to -100 feet MLLW
GJP-38	682470.96	1181058.73	-80 to -100 feet MLLW
GJ-44	682972.92	1179899.51	-100 to -120 feet MLLW
GJ-45	682721.94	1180334.22	-100 to -120 feet MLLW
GJ-47	682972.92	1179609.70	-120 to -130 feet MLLW

Notes
1. Station names with “J” are located in permitted alignment; station names with “P” are located in alternate alignment.
2. A duplicate sample for chemistry will be collected at this location.

Abbreviations
MLLW: mean lower low water
NAD83: North American Datum of 1983
SPCS WA: State Plane Coordinate System of Washington, Zone 4601

Table 3 Sediment Sample Locations for Alternative Configuration

Station Name[1]	Sampling Location (SPCS WA N [4601] NAD83 Survey Feet) Easting	Northing	Depth Range
GJP-1	683474.88	1181638.35	0 to -12 feet MLLW
GJP-2	683223.90	1181783.25	0 to -12 feet MLLW
GJP-3	683223.90	1181493.44	0 to -12 feet MLLW
GJP-4	682972.92	1181638.35	-15 to -40 feet MLLW
GJP-5	682721.94	1181493.44	-40 to -60 feet MLLW
GJP-6	682721.94	1181783.25	-15 to -40 feet MLLW
GJP-10	682972.92	1180768.93	-40 to -60 feet MLLW
GJP-11	682716.94	1181203.64	-40 to -60 feet MLLW
GP-16	681216.06	1183232.29	-40 to -60 feet MLLW
GJP-19	682721.94	1180913.83	-60 to -80 feet MLLW
GJP-20[2]	682470.96	1181348.54	-60 to -80 feet MLLW
GJP-21	682470.96	1181638.35	-60 to -80 feet MLLW
GJP-22	682219.98	1181783.25	-60 to -80 feet MLLW
GP-24	681969.00	1181928.16	-80 to -100 feet MLLW
GJP-25	681969.00	1182217.96	-60 to -80 feet MLLW
GP-27	681718.02	1182362.87	-60 to -80 feet MLLW
GP-28	681467.04	1182217.96	-60 to -80 feet MLLW
GP-29	681467.04	1182507.77	-60 to -80 feet MLLW
GP-30	681467.04	1182797.58	-60 to -80 feet MLLW
GP-31	681216.06	1182652.67	-60 to -80 feet MLLW
GP-32	681216.06	1182942.48	-60 to -80 feet MLLW
GP-33	680965.08	1182797.58	-60 to -80 feet MLLW
GP-34	680965.08	1183087.38	-60 to -80 feet MLLW
GJP-37	682721.94	1180624.02	-80 to -100 feet MLLW
GJP-38	682470.96	1181058.73	-80 to -100 feet MLLW
GP-39	682219.98	1181203.64	-80 to -100 feet MLLW
GP-40	682219.98	1181493.44	-80 to -100 feet MLLW
GP-41	681969.00	1181638.35	-80 to -100 feet MLLW
GP-42	681718.02	1181783.25	-80 to -100 feet MLLW
GP-43	681718.02	1182073.06	-80 to -100 feet MLLW
GP-46	682470.96	1180768.93	-100 to -120 feet MLLW

Notes

1. Station names with “J” are located in permitted alignment; station names with “P” are located in alternate alignment.
2. A duplicate sample for chemistry will be collected at this location.

Abbreviations

MLLW: mean lower low water
NAD83: North American Datum of 1983
SPCS WA: State Plane Coordinate System of Washington, Zone 4601

3.2 FIELD SAMPLING METHODS

This section describes the field methods employed to locate sediment sampling locations, and to collect sediment samples. Sediment samples were collected from a 36-foot, shallow-draft, research vessel (the Carolyn Dow), owned and operated by Research Support Services in Bainbridge Island, Washington. Samples were collected from July 2 to 8, 2011.

3.2.1 Station Positioning

The sampling locations are shown on Figure 5. Coordinates for the sampling stations are provided in Table 2 for stations located within the potential WDNR lease area for the Permitted Configuration and in Table 3 for stations located within the potential WDNR lease area for the Alternative Configuration. Sample stations were located using a Trimble Model GeoXT Differential Global Positioning System (DGPS) with an accuracy of ±1 meter. The datum used for designating sample coordinates was the North American Datum of 1983 (NAD83), State Plane Coordinate System, Washington North, Zone 4601. Samples were collected within 3 meters of the proposed sampling locations. If samples could not be collected after two attempts, the AMEC Project Manager was notified, and the station was abandoned. Sediments could not be collected at three proposed stations (GJP-2, GJP-3, and GJ-13) due to substrate composition that prevented penetration of the sediment grab sampler.

3.2.2 Sediment Sample Collection

The Work Plan specified that a hand-core sediment sampler (20 cm diameter by 10 cm deep) be used to collect the sediment samples at the shallowest water depth (Station GJP-1). Sediments at this location were too coarse to sample using a hand-core sediment sampler, and the station was instead sampled by hand at low tide using a spoon, as described in Section 4.1.1. Sediment samples at all other sampling locations were collected using a 0.2-square-meter (m^2) stainless-steel van Veen grab sampler deployed from the sampling vessel. The van Veen sampler consists of two center-hinged, weighted jaws that are deployed from a cable in the open position. The jaws extend into the sediments when contact occurs with the bottom substrate; tension on the deployment cable causes the jaws to close, which captures a relatively undisturbed sediment sample.

Samples were collected at 44 of the sample stations proposed in the Work Plan. Three samples could not be collected, as described in Section 4.1. In addition, one duplicate sample was collected at station GJP-20 for quality assurance/quality control (QA/QC) purposes. Each grab sample that was collected and saved for analysis was photographed, visually inspected, and logged. Photographs of the samples and selected photographs of field activities are provided in Appendix A.[3]

[3] Photographs of infaunal samples are provided in Appendix A. Infauna are described in the *Marine Biology Baseline Inventory Report* (AMEC In Prep).

Sample characteristics were recorded on Qualitative Sample Characteristics forms, which are provided in Appendix B.

3.2.3 Sample Preparation

Samples for chemical analysis were taken from a single grab collected at each station location. The upper 10 cm of sediment not in contact with the grab sides was removed and placed in a clean stainless-steel bowl. A portion of the sediment was homogenized and placed into a labeled clean container obtained from the analytical laboratory. This material was analyzed for chemical analytes as part of the Tier I analysis. Sediments to be analyzed for volatile organic compounds were not homogenized. Instead, discrete samples for analysis for volatile organic compounds were collected from each grab with as little disturbance of the sample as possible, and the samples were placed into the appropriate sample containers.

The remaining sediment was not homogenized, placed in a clean container, and sent to the bioassay laboratory (NewFields), where the samples were archived in the dark at 4 degrees Celsius (°C) to be held for possible biological effects testing pending the results of chemical analysis.

3.2.4 Decontamination Procedures

Sample containers, instruments, working surfaces, technician protective gear, and other items potentially contacting sediment sample material met high standards of cleanliness. All sediment-handling equipment was cleaned and decontaminated prior to arrival at the site and between each sampling station. All equipment and instruments used to remove sediment from the sampler or to homogenize samples were made of stainless steel and were decontaminated before and in between each use.

The decontamination procedure consisted of the following steps:

- Rinse the equipment with in situ salt water to remove all visible traces of sediment;
- Scrub with an Alconox solution;
- Rinse with in situ salt water;
- Perform a second scrub with Alconox, followed by a second rinse with in situ salt water; and
- Perform final rinse with distilled water.

Items that were not used immediately after decontamination were covered or wrapped with aluminum foil.

The AMEC standard decontamination procedure for the van Veen grab sampler and other sample handling equipment is modeled after Puget Sound Estuary Program (PSEP) protocols (PSEP, 1997). However, the decontamination procedure did not include any acid or solvent rinses; rather, the final rinse was performed using distilled water.

3.2.5 Waste Sediment

All solid waste derived during this investigation was placed into lined 55-gallon steel drums, labeled, characterized, and disposed of by AMEC in accordance with applicable regulations.

3.3 Data Analysis and Interpretation

Chemical analyses of sediment samples were completed by Analytical Resources, Inc. (ARI), in Tukwila, Washington. Concentrations of all analytes were provided on a dry weight basis. Interpretation of the quality of sediments within the study area was based on comparison to SMS (WAC 173-204). No state SMS criteria have been established for some constituents potentially present in nearshore sediments. For these analytes, DMMP SLs have been established for marine sediment to evaluate the suitability of open water disposal for dredged sediments (DMMO 2008). The DMMP SLs were used when available to evaluate sediment quality for those analytes with no established SMS standards.

Washington State SMS include chemical concentration criteria for three metals and 35 organic compounds. In addition, SMS criteria have been established for the sum of multiple compounds within four categories of compounds: low-molecular-weight PAHs (LPAHs), high-molecular-weight PAHs (HPAHs), total benzofluoranthenes, and total polychlorinated biphenyls (PCBs). The criteria for metals and six of the organic compounds (phenol, 2-methylphenol, 4-methylphenol, 2,4-dimethylphenol, pentachlorophenol, benzyl alcohol, and benzoic acid) are expressed on a dry weight basis (i.e., chemical concentration per dry weight of sediment). The criteria for the other organic compounds and multiple compound categories are expressed as carbon-normalized sediment concentrations (i.e., chemical concentration per dry weight of organic carbon in sediment). Carbon-normalized chemical concentrations were calculated using the sediment chemical concentrations expressed on a dry weight basis and the measured percentage of total organic carbon (TOC) in each sediment sample following the methods described by Michelsen (1992).

Washington State SMS provide provisions to confirm exceedances of chemical standards for sediments by conducting confirmatory marine sediment biological tests (WAC 173-204-315). These biological tests use approved bioassay methods to test representative marine organisms for two acute effects and one chronic effect. Sediment samples that pass all required confirmatory biological tests are designated as passing the applicable SQS of WAC 173-204-320 through 173-204-340, even if chemical standards are exceeded.

The DMMP SLs are guideline values that identify concentrations at or below which there is no reason to believe that dredged material disposal would result in unacceptable effects on the marine environment (DMMO 2008). If sediment chemical concentrations are greater than the DMMP SL values, sediment bioassays are required if open water disposal of dredged material is being considered. These biological tests also must assess two acute effect endpoints and one chronic effect endpoint using approved bioassay methods and test organisms. The bioassay test organisms selected to evaluate sediments within the study area are approved for use under SMS and the dredging guidance.

The methods used to interpret sediment quality within the study area follow the SMS methods. Chemical concentrations were compared to the applicable standard for marine sediments (i.e., expressed on carbon-normalized or dry weight basis). If a detected concentration of any analyte exceeded the SMS standard or a DMMP SL value, sediment bioassays were conducted as a confirmatory biological test (this occurred at one sampling location). Results of the bioassays are assessed relative to the criteria specified in the SQS (WAC 173-204, Part III). If sediment samples pass the bioassay tests according to SQS criteria, the sediments were considered to be in compliance with the SMS as noted above. Sediments with detected analytes that were all below the SMS and SL values were also considered to be in compliance with SMS.

4.0 RESULTS

This section describes the results from the 2011 sediment investigation, including deviations from the *2011 Sediment Implementation Work Plan*; an overview of the QA/QC reviews of the sediment chemistry analytical results; results of the Tier I chemical analyses; and results of Tier II biological testing.

4.1 DEVIATIONS FROM THE 2011 SEDIMENT IMPLEMENTATION WORK PLAN

Implementation of the 2011 baseline sediment investigation resulted in the following deviations from activities proposed in the 2011 Work Plan.

- Sediment samples were not collected at 3 of the 47 proposed sampling locations (GJP-2, GJP-3, and GJ-13) (Section 4.1.1);
- Sediment samples at Station GJP-1 were collected with a spoon rather than a hand-core sediment sampler due to the coarse substrate characteristics (Section 4.1.1);
- Some minor deviations for project-specific QA/QC objectives were noted for some laboratory results, although these minor QA/QC deviations do not affect the overall usability of the analytical data (Section 4.1.2);

- The Tier II acute amphipod 10-day mortality sediment bioassay was conducted with the species *Eohaustorius estuarius* instead of *Rhepoxynius abronius* (Section 4.1.3); and
- The Tier II testing was conducted using a chronic bioassay test for the juvenile polychaete *Neanthes arenaceodentata* instead of the Microtox luminescence test using the bacteria *Vibrio fisheri* (Section 4.1.4).

Each of these deviations is discussed in greater detail below.

4.1.1 Sampling Locations

At sampling locations where the surface substrates consist of gravel, cobble, rock, large woody debris, or macrophytes, penetration of the Van Veen grab sampler into the sediment is often insufficient for sample collection, and frequently the jaws of the sampler will not completely close, as these materials are caught between the jaws of the sampler.

Two attempts were made to collect sediment samples at, and near, the sampling coordinates proposed for Stations GJP-2, GJP-3, and GJ-13 (Figure 5). The van Veen grab sampler was unable to collect sediment samples at these locations because no sediment was retained by the sampler.

The Work Plan specified that a hand-core sediment sampler (20 cm diameter by 10 cm deep) be used to collect the sediment samples at the shallowest water depth (Station GJP-1). Sediments at this location were too coarse to sample using a hand-core sediment sampler; therefore, the station was sampled by hand at low tide using a spoon to dig sediment out from between the coarse gravel and cobble that was present.

4.1.2 QA/QC Review of Sediment Chemistry Results

Forty-five sediment samples were submitted to Analytical Resources, Inc. (ARI), of Tukwila, Washington, for Tier I chemical analyses. AMEC conducted a data quality review and validation of the analytical results and data package provided by ARI. Results of the review are summarized in this section. The complete data review and data validation report are presented in Appendix C.

All data were evaluated for precision, accuracy, completeness, representativeness, and comparability with respect to project data quality objectives. Results of the data review determined that data completeness is greater than 99 percent, and results are valid as reported with limited qualifications. Analyses were conducted in compliance with the cited laboratory methods and with specific requirements of the Work Plan. Laboratory QA measures were implemented and indicate acceptable accuracy and precision for analyses on samples as submitted.

A limited number of data points have been qualified as estimated or as nondetected with elevated reporting limits due to minor deviations from quality control limits. These QA/QC deviations are summarized in Table 4. The affected analytical results were assigned data qualifiers in accordance with EPA's recommendations. These qualifications do not limit the usability of the data for project purposes.

Data review and qualification were performed following EPA guidance documents for Superfund data review (EPA 2008, 2010), which were developed specifically for the EPA's Contract Laboratory Program. For the purposes of data validation for this investigation, the EPA's Superfund data review procedures were modified where the Superfund data review guidelines differed from EPA's SW-846 quality-control requirements or data quality requirements specified in the Work Plan. In the absence of Work Plan criteria or EPA guidance, laboratory historical control limits were applied for the data evaluation.

4.1.3 Amphipod Species Selection

The 10-day amphipod bioassay using *Rhepoxynius abronius* was proposed in the Work Plan for the acute toxicity tests. However, three species of amphipods are approved under the Washington SMS for biological testing of marine sediments *(Ampelisca abdita, Rhepoxynius abronius,* and *Eohaustorius estuarius*). The selection of the appropriate species is based upon the predominant grain size of the sediments to be tested, the interstitial salinity of pore water, and the availability of the species at the time of year testing is conducted. *A. abdita* is recommended when the fraction of fine-grained particles (clay and silt) is greater than 60 percent. This species is not native to the Pacific Northwest and may not be available from suppliers at the specified juvenile life stage year-round (RSET 2009). *R. abronius* or *E. estuarius* is recommended when the fraction of sediment fine-grained particles is less than 60 percent (PSEP 1995). *R. abronius* is a free-burrowing amphipod that requires a porewater salinity of at least 25 parts per thousand (ppt). *R. abronius* has been shown to be sensitive to sediments with high (>60 percent) percentage of fines, particularly those with high clay content (RSET 2009). *E. estuarius* is also a free-burrowing amphipod. *E. estuarius* can tolerate a broader range of porewater salinities than *R. abronius* (approximately 0 to 36 ppt [RSET 2009]), and is suitable for use for the full range of grain sizes, except that there is some evidence that its survival is affected by high clay percentages (>20 percent or >70 percent [RSET 2009]).

E. estuaries was selected as the test amphipod because of its salinity tolerance, sediment grain-size tolerance, availability, and acceptability as one of the approved species of amphipods. Over the last decade, this species has been increasingly selected over *R. abronius* for bioassay testing in Puget Sound (B. Hessler, NewFields, personal communication).

Table 4 Quality Assurance / Quality Control Deviations from the Work Plan

Parameter	Comment
Metals	
Matrix spikes	Antimony recoveries in matrix spike samples for Station GP-23, GP-34, and GJ-45 were consistent (21 to 28 percent), but below the Work Plan lower limit of 75 percent. Because recoveries from the blank spikes were all 100 percent, this indicates a matrix effect specific to the site samples. Antimony was not detected with reporting limits more than an order of magnitude below applicable standards. Data are considered usable with reporting limits qualified as estimated (UJ).
Pesticides	
Reporting limits	With limited exceptions, reporting limits for pesticides were below limits specified in the Work Plan and below applicable standards. Reporting limits for Aldrin at three stations were exceeded applicable standards. Reporting limits exceeded the DMMP SL values for Aldrin in 3 samples, Heptachlor in 1 sample, and total Chlordane in 1 sample. Reporting limits affected by interferences were flagged with a "Y" qualifier.
Initial and continuing calibration	The 4,4'-DDT breakdown exceeded the Work Plan criterion prior to the analyses of Station GJ-14, GJ-15, GJP-22, and GP-41. 4,4'-DDT was not detected in any sample, but the reporting limits in the affected samples have been qualified as estimated (UJ).
Accuracy and precision	Dual-column results for detected pesticides – Trans-nonchlor measurements on the two gas chromatograph columns were near the reporting limit but differed by greater than 25 percent for Station GJP-25, GJ-26, and GP-42. Results were qualified as estimated (J).
Matrix spikes	Recoveries of Lindane, heptachlor, and 4,4'-DDT from Station GP-28 spikes were below the Work Plan QA objective. These pesticides were not detected in the sample, but reporting limits in sample GP-28 were flagged as estimated with potential low bias (UJ).
SVOCs and PAHs	
Reporting limits	With limited exceptions, all analyses achieved the project-specified reporting limits for a dry-weight basis. Reporting limits are elevated for phenol, 2-methylphenol and *N*-nitrosodiphenylamine in a limited number of samples. Reporting limits for benzoic acid, 4-methylphenol, and diethyl phthalate were above the project objectives but below the applicable standards identified in the Work Plan. Reporting limits for hexachlorobutadiene, 1,2-dichlorobenzene, 1,4-dichlorobenzene, 1,2,4-trichlorobenzene, and hexachlorobenzene were below the project objectives but marginally above one or more of the SMS identified in the Work Plan. Reporting limits for 1,2,4-trichlorobenzene and hexachlorobenzene were marginally above the Washington SQS when results are expressed as carbon-normalized concentrations. These analytes were not detected in any sample.
Blanks	Bis(2-ethylhexyl) phthalate was detected below the nominal reporting limit in the method blanks associated with some sample batches. Low concentrations of this analyte reported in Station GJ-23, GJP-4, GJ-26, GP-24, GP-41, and GJ-14 are potentially attributable to laboratory background and have been qualified to be non-detected at the concentration noted or at the reporting limit.
Matrix spikes	Benzoic acid recoveries were below Work Plan limits (40 percent) from the MS/MSD from Station GJ-9 (18.9 and 16.9 percent, respectively). Benzoic acid was detected at trace concentrations in a limited number of samples; data were qualified as estimated (J) below the reporting limit.

Parameter	Comment
PCBs	
Dual-column analyses	The dual-column analysis for Aroclor 1242 in Station GP-31 was qualified as estimated (J) due to variability between the results from the two columns.
Field duplicates	Aroclor 1242 was detected in one of the field duplicates, but not in the other. The difference between the reporting limit (3.9 µg/kg) in Station GJP-20 and the reporting limit in its duplicate (DGJP-20 [8.8 µg/kg]) slightly exceeds the control limit of ± the reporting limit for variability at low concentrations. Results in the duplicates are qualified as UJ (estimated reporting limit for the primary sample) and J (estimated value for the field duplicate).
VOCs	No QA/QC issues

Abbreviation(s)

J: The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample (due either because the concentration was below the reporting limit or because of minor deviations from certain quality control criteria.)
UJ: Indicates the analyte was analyzed for but not detected. The analyte detection limit is an estimated value.
Y: Interferences are present that affect the accuracy of the reporting limit.
DMMP Dredged Material Management Program
MS/MSD: matrix spike/matrix-spike duplicate
PAHs: polycyclic aromatic hydrocarbons
PCBs: polychlorinated biphenyls
QA: quality assurance
SL: screening level
SMS: Washington Sediment Management Standards
SQS: Washington Sediment Quality Standards
SVOCs: semivolatile organic compounds
VOCs: volatile organic compounds
QA/QC: quality assurance/quality control
µg/kg: micrograms/kilogram

4.1.4 Selection of Chronic Sediment Bioassay

The 20-day juvenile polychaete bioassay for growth rate was used for chronic toxicity tests instead of the Microtox bioassay indicated in the Work Plan. This change was based on recommendations received from Ecology on the draft work plan (L. Inouye, Ecology, e-mail dated July 14, 2011). Recent information has found that the number of bioassay failures for the Microtox test increases substantially with sediment holding time (Word, et al. 2011). To avoid this possible result, the juvenile polychaete bioassay (an approved sediment chronic bioassay for biological testing under Washington SMS) was used for chronic bioassay testing.

4.2 SEDIMENT TIER I RESULTS

This section discusses the sediment analytical results for each category of chemicals for which analyses were conducted, and addresses any deviations from data quality objectives specified in the Work Plan. Sediment samples were analyzed for the following chemical categories:

- Sediment conventionals;
- Metals;
- Chlorinated pesticides;
- Semivolatile organic compounds (SVOCs) (other than PAHs);
- PAHs;
- PCBs; and
- Volatile organic compounds (VOCs).

The sediment chemistry data are compared to Washington State Marine Sediment Quality Standards (WAC 173-204-320) and the DMMP sediment cleanup screening levels. Analytical results are summarized and discussed briefly below for each of these categories of chemical analytes. Complete analytical results are presented in Appendix D.

4.2.1 Sediment Conventionals

Sediment samples were analyzed for the following conventional parameters:

- Total solids;
- Preserved total solids;
- Total volatile solids;
- N-ammonia;
- Sulfide;
- TOC; and
- Grain size as percentage fines.

Results of analyses for sediment conventional parameters are presented in Appendix D (Table D-1).

4.2.2 Metals

Sediment samples were analyzed for the following metals and organometallic compounds:

- Antimony;
- Arsenic;
- Cadmium;
- Chromium;
- Copper;
- Lead;
- Mercury;
- Nickel;
- Silver;
- Zinc; and
- Tributyltin.

No metals were detected at concentrations exceeding the respective SQS or SL values. Complete analytical results are presented in Appendix D (Table D-2).

Summary statistics for detected metals are provided in Table 5. Arsenic, chromium, copper, lead, nickel, and zinc were detected at concentrations greater than the laboratory reporting limits in most sediment samples, but the maximum concentrations of these naturally occurring metals detected in any sample were lower than both the SQS or SL values. Cadmium was detected in three samples, but concentrations were less than the SQS and SL values.

No QA/QC validation issues were identified disqualifying any of the metals data.

4.2.3 Chlorinated Pesticides

Sediment samples were analyzed for the following chlorinated pesticides:

- Lindane;
- Heptachlor;
- Aldrin;
- Dieldrin;
- 4,4'-DDE;
- 4,4'-DDD;
- 4,4'-DDT;
- Total DDT;
- *trans*-Chlordane;
- *cis*-Chlordane;
- oxy-Chlordane;
- *cis*-Nonachlor;
- *trans*-Nonachlor; and
- Total chlordane.

No pesticides were detected at concentrations exceeding the respective SL values. Complete analytical results for pesticides are presented in Appendix D (Table D-3).

trans-Nonachlor was the only individual pesticide analyte detected above the laboratory reporting limit. *trans*-Nonachlor is one of the compounds that constitute total chlordane, and was detected in samples collected at 12 sediment sampling locations. No SQS or SL value has been established for *trans*-nonachlor, but all detected *trans*-nonachlor concentrations and all total chlordane concentrations were well below the SL established for total chlordane. Summary statistics for detections of total chlordane are provided in Table 6.

Except for aldrin for samples GJP-11 and GJ-18, the reporting limits for all pesticide analyses were within the applicable QA/QC standards.

No QA/QC validation issues were identified disqualifying any of the pesticides data.

Table 5 Summary of Detected Pesticides

Parameter	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)
Mean Concentration	9.2	0.3	27.8	16.0	6.2	0.05	26.2	49.1
Standard Deviation	1.3	0.1	8.4	5.8	1.9	0.01	9.1	16.1
Minimum Concentration	6	0.3	14.8	6.5	3	0.03	13	23
Maximum Concentration	12	0.4	38	23.1	8	0.07	38	69
Detection Frequency	41/45	3/45	45/45	45/45	40/45	35/45	45/45	45/45
SQS	**57**	**5.1**	**260**	**390**	**450**	**0.41**	NA	**410**
SL	**57**	**5.1**	**260**	**390**	**450**	**0.41**	**140**	**410**

Abbreviations
DMMP: Dredged Material Management Program
mg/kg: milligrams per kilogram
NA: not available
SL: DMMP Screening Level
SQS: Washington Marine Sediment Quality Standard

Table 6 Summary of Detected Pesticides

Parameter	Total Chlordane (µg/kg)
Mean Concentration	1.01
Standard Deviation	0.48
Minimum Concentration	0.53
Maximum Concentration	1.90
Detection Frequency	12/45
SL	**2.80**

Abbreviations
DMMP: Dredged Material Management Program
SL: DMMP Screening Level
µg/kg: micrograms per kilogram

4.2.4 Semivolatile Organic Compounds

Sediment samples were analyzed for the following SVOCs (not including PAHs):

- 1,2-Dichlorobenzene;
- 1,3- Dichlorobenzene;
- 1,4- Dichlorobenzene;
- 1,2,4-Trichlorobenzene;
- Hexachlorobenzene;
- Dimethyl phthalate;
- Diethyl phthalate;
- Di-n-butyl phthalate;
- Butyl benzyl phthalate;
- Bis(2-ethylhexyl) phthalate;
- Di-n-octyl phthalate;
- Dibenzofuran;
- Hexachlorobutadiene;
- *N*-Nitrosodiphenylamine;
- Phenol;
- 2-Methylphenol;
- 4-Methylphenol;
- 2,4-Dimethylphenol
- Pentachlorophenol;
- Benzyl alcohol; and
- Benzoic acid.

Concentrations were reported as micrograms of analyte per kilogram (µg/kg) of sample material on a dry weight basis and as milligrams per kilogram (mg/kg) of organic carbon (OC), and the results were evaluated as described in Section 3.3. No SVOC was detected at concentrations exceeding either the respective SQS or SL values on a dry weight basis. One SVOC was detected in a single sample at a carbon-normalized concentration that exceeds the carbon-normalized SQS. Complete analytical results for SVOCs are presented in Appendix D. Table D-4 provides SVOC concentrations on a sediment dry-weight basis, and Table D-5 provides SVOC concentrations normalized to sediment total organic carbon content.

A few SVOCs were detected above reporting limits at a number of stations. The detected SVOCs comprised bis(2-ethylhexyl) phthalate, dibenzofuran, phenol, 2-methylphenol, 4-methylphenol, 2,4-dimethylphenol, benzyl alcohol, and benzoic acid. Concentrations on a dry weight basis for all of the detected SVOC analytes are less than the respective SQS and SL values. One analytical result exceeded the carbon-normalized SQS: the concentration of dibenzofuran in the sample collected at station GJ-8 exceeded the carbon-normalized SQS value.

Summary statistics for the detected SVOCs are provided in Table 7 (dry weight concentrations) and Table 8 (carbon-normalized concentrations).

Table 7 Summary of Detected Semivolatile Organic Compounds (Dry-Weight Concentrations)

Parameter	Bis-[2-ethylhexyl] phthalate (µg/kg)	Dibenzo-furan (µg/kg)	Phenol (µg/kg)	2-Methyl-phenol- (µg/kg)	4-Methyl-phenol (µg/kg)	2,4-Dimethyl-phenol- (µg/kg)	Benzyl alcohol (µg/kg)	Benzoic acid (µg/kg)
Mean Concentration	15.0	86	28.2	8.2	16.1	6.1	10.5	127.2
Standard Deviation	1.4	100	36.0	NA	3.8	0.9	4.6	32.1
Minimum Concentration	14.0	15	9.3	NA	11.0	4.7	5.2	92.0
Maximum Concentration	17.0	200	160.0	NA	22.0	7.8	26.0	190.0
Detection Frequency	5/45	3/45	16/45	1/45	9/45	8/45	19/45	10/45
SL	**1,300**	**540**	**420**	**63**	**670**	**29**	**57**	**650**

Abbreviation(s)
DMMP: Dredged Material Management Program
SL: DMMP Screening Level (µg/kg dry weight)
µg/kg: micrograms per kilogram

Table 8 Summary of Detected Semivolatile Organic Compounds (Carbon-Normalized Concentrations)

Parameter	Bis[2-ethylhexyl] phthalate (mg/kg OC)	Dibenzo-furan (mg/kg OC)
Mean Concentration	1.3	11.2
Standard Deviation	0.2	15.7
Minimum Concentration	1.2	1.0
Maximum Concentration	1.6	29.2
Detection Frequency	5/45	3/45
SQS	**47**	**15**

Note(s)
1. Shaded cell indicates detected concentration exceeds SQS.

Abbreviation(s)
mg/kg OC: milligrams per kilogram organic carbon
SQS: Washington Marine Sediment Quality Standard (mg/kg OC)

With limited exceptions, all SVOC analyses achieved the project-specified reporting limits for a dry-weight basis. Reporting limits for benzoic acid, 4-methylphenol, and diethyl phthalate were above the project-specific data quality objectives, but the reporting limits were below all the applicable SQS and RL values. ARI was able to report estimated concentrations for detections of these analytes in some samples at concentrations near or below the project data-quality objectives. Reporting limits for 1,2,4-trichlorobenzene and hexachlorobenzene for the carbon-normalized results were within the project data-quality objectives, but marginally above one or more of the SMS. None of these analytes was detected in any sample.

No QA/QC validation issues were identified disqualifying any of the pesticides data.

4.2.5 Polycyclic Aromatic Hydrocarbons

Sediment samples were analyzed for the following PAHs:

- Total LPAHs;
- Naphthalene;
- Acenaphthylene;
- Acenaphthene;
- Fluorene;
- Phenanthrene;
- Anthracene;
- 2-Methylnaphthalene;
- Total HPAHs;
- Fluoranthene;
- Pyrene;
- Benz(a)anthracene;
- Chrysene;
- Total benzofluoranthenes;
- Benzo(a)pyrene;
- Indeno(1,2,3-c,d)pyrene;
- Dibenz(a,h)anthracene; and
- Benzo(g,h,i)perylene.

Results are reported on both a dry-weight and carbon-normalized basis. One or more PAHs were detected at concentrations greater than the laboratory reporting limit in all sediment samples; however, only the sample from Station GJ-8 contained concentrations of any PAH compound that exceeded either SQS or SL criteria. The sample from Station GJ-8 contained both LPAHs and HPAHs at concentrations that exceeded SQS and/or SL criteria. Complete analytical results for PAH analyses are presented in Appendix D; Table D-6 provides PAH concentrations on a sediment dry-weight basis, and Table D-7 provides PAH concentrations normalized to sediment organic carbon content.

Summary statistics for the detected PAHs are provided in Table 9 (concentrations based on dry-weight sediment) and Table 10 (concentrations normalized to organic carbon).

No QA/QC validation issues were identified disqualifying any of the PAH data.

Table 9 Summary of Detected Polycyclic Aromatic Hydrocarbons (Dry-Weight Concentrations)

Parameter	Total LPAH (µg/kg)	Naphtha-lene (µg/kg)	Acenaph-thylene (µg/kg)	Acenaph-thene (µg/kg)	Fluorene (µg/kg)	Phenan-threne (µg/kg)	Anthra-cene (µg/kg)	2-Methyl-naphthalene (µg/kg)	Total HPAH (µg/kg)
Mean Concentration	291.3	24.4	193.0	57.7	57.2	199.4	92.4	24.8	778.9
Standard Deviation	1184.1	37.3	282.0	62.7	140.1	805.6	237.2	12.3	3234.3
Minimum Concentration	12.0	11.0	11.0	20.0	11.0	12.0	9.2	9.2	9.4
Maximum Concentration	7,630	210	610	130	580	5,200	900	67	21,740
Detection Frequency	42/45	27/45	4/45	3/45	17/45	42/45	14/45	35/45	45/45
SL	**5,200**	**2,100**	**560**	**500**	**540**	**1,500**	**960**	**670**	**12,000**

Parameter	Fluoran-thene (µg/kg)	Pyrene (µg/kg)	Benz[a]-anthracene (µg/kg)	Chrysene (µg/kg)	Benzo-fluoran-thenes (µg/kg)	Benzo[a]-pyrene (µg/kg)	Indeno-[1,2,3-c,d]-pyrene (µg/kg)	Dibenzo-[a,h]-anthracene (µg/kg)	Benzo-[g,h,i]-perylene (µg/kg)
Mean Concentration	201.7	183.3	80.8	84.2	125.9	89.9	85.7	26.2	74.7
Standard Deviation	841.6	755.7	280.3	276.4	463.9	311.1	296.3	76.4	252.8
Minimum Concentration	13.0	11.0	10.0	10.0	9.4	10.0	9.3	4.8	9.5
Maximum Concentration	5,400	4,900	1,600	1,700	3,100	1,800	1,500	340	1,400
Detection Frequency	41/45	42/45	32/45	37/45	44/45	33/45	25/45	19/45	30/45
SL	**1,700**	**2,600**	**1,300**	**1,400**	**3,200**	**1,600**	**600**	**230**	**670**

Notes

1. Shaded cell indicates detected concentration exceeds DMMP screening level value.

Abbreviations

DMMP: Dredged Material Management Program
HPAH: high-molecular-weight polycyclic aromatic hydrocarbon
LPAH: low-molecular-weight polycyclic aromatic hydrocarbon
SL: DMMP Screening Level (µg/kg dry weight)
µg/kg: micrograms per kilogram

Table 10 Summary of Detected Polycyclic Aromatic Hydrocarbons (Carbon-Normalized Concentrations)

Parameter	Total LPAH (mg/kg OC)	Naphthalene (mg/kg OC)	Acenaphthylene (mg/kg OC)	Acenaphthene (mg/kg OC)	Fluorene (mg/kg OC)	Phenanthrene (mg/kg OC)	Anthracene (mg/kg OC)
Mean Concentration	35.4	2.6	25.4	7.4	6.8	24.3	12
Standard Deviation	171.7	5.6	42.7	10.1	20.3	116.9	35
Minimum Concentration	1.2	0.9	0.9	1.5	0.9	1.2	1
Maximum Concentration	1,116	31	89	19	85	760	132
Detection Frequency	42/45	27/45	4/45	3/45	17/45	42/45	14/45
SQS	**370**	**99**	**66**	**16**	**23**	**100**	**220**

Parameter	2-Methyl-naphthalene (mg/kg OC)	Total HPAH (mg/kg OC)	Fluoranthene (mg/kg OC)	Pyrene (mg/kg OC)	Benz[a]-anthracene (mg/kg OC)	Chrysene (mg/kg OC)	Benzo-fluoranthenes (mg/kg OC)
Mean Concentration	2.3	94.9	24.9	22.5	9.8	9.9	15.0
Standard Deviation	1.6	471.5	122.7	110.0	41.0	40.4	67.8
Minimum Concentration	0.7	1.7	1.1	1.0	0.8	0.8	1.3
Maximum Concentration	9.8	3,178	789	716	234	249	453
Detection Frequency	35/45	45/45	41/45	42/45	32/45	37/45	44/45
SQS	**38**	**960**	**160**	**1000**	**110**	**110**	**230**

Parameter	Benzo[a]-pyrene (mg/kg OC)	Indeno-[1,2,3-c,d]-pyrene (mg/kg OC)	Dibenzo-[a,h]-anthracene (mg/kg OC)	Benzo-[g,h,i]-perylene (mg/kg OC)
Mean Concentration	10.8	10.8	3.3	9.1
Standard Deviation	45.4	43.5	11.3	37.0
Minimum Concentration	0.9	0.7	0.3	0.8
Maximum Concentration	263	219	50	205
Detection Frequency	33/45	25/45	19/45	30/45
SQS	**99**	**34**	**12**	**31**

Notes

1. Shaded cell indicates detected concentration exceeds SQS value.

Abbreviations

HPAH: high-molecular-weight polycyclic aromatic hydrocarbon
LPAH: low-molecular-weight polycyclic aromatic hydrocarbon
SQS: Washington Marine Sediment Quality Standard (mg/kg OC)
mg/kg OC: milligrams per kilogram organic carbon

4.2.6 Polychlorinated Biphenyls

Sediment samples were analyzed for PCB content for the following individual Aroclors:

- Aroclor 1016;
- Aroclor 1242;
- Aroclor 1248;
- Aroclor 1254;
- Aroclor 1260;
- Aroclor 1221;
- Aroclor 1232; and
- Total PCBs.

The concentrations of total PCBs were less than the SL or SQS values in all sediment samples. The sediment PCB data are provided in Appendix D (Table D-8). The concentrations of total PCBs shown in Table D-8 are expressed both on a sediment dry-weight basis and normalized to organic carbon content.

Only two Aroclors were detected at concentrations above the laboratory reporting limit: Aroclor 1242 was detected in 17 of the 45 sediment samples, and Aroclor 1248 was detected in one sample. No SQS or SL criteria have been established for individual Aroclors; however, total PCB concentrations (normalized to organic carbon) were less than the sediment SQS criteria, and total PCB concentrations (on a dry-weight basis) were less than the SL values, in all of the sediment samples.

Summary statistics for analyses of total PCBs are provided in Table 11.

No QA/QC validation issues were identified disqualifying any of the PCB data.

Table 11 Summary of Total Polychlorinated Biphenyls

Parameter	Total PCBs (µg/kg)	Total PCBs (mg/kg OC)
Mean Concentration	6.97	0.67
Standard Deviation	4.37	0.45
Minimum Concentration	3.9	0.33
Maximum Concentration	24	2.03
Detection Frequency	19/45	19/45
SQS	NA	**12**
SL	**130**	NA

Abbreviations
DMMP: Dredged Material Management Program
mg/kg OC: milligrams per kilogram organic carbon
NA: not available
PCBs: polychlorinated biphenyls
SL: DMMP Screening Level (µg/kg)
SQS: Washington Marine Sediment Quality Standard (mg/kg OC)
µg/kg: micrograms per kilogram

4.2.7 Volatile Organic Compounds

Sediment samples were analyzed for the following VOCs:

- Trichloroethene;
- Tetrachloroethene;
- Ethylbenzene; and
- Total xylenes.

The VOC data are provided in Appendix D (Table D-9).

No VOCs were detected at concentrations greater than the laboratory reporting limits in any of the sediment samples.

No QA/QC validation issues were identified disqualifying any of the VOC data.

4.3 SEDIMENT TIER II RESULTS

This section provides an overview of the Tier II sediment bioassay testing. A detailed description of the bioassay tests and all bioassay data are provided in Appendix D.

Only one sampling station, GJ-8, showed detected concentrations of chemical analytes (PAHs and one other SVOC) that exceeded SQS or SL values. As such, marine bioassay tests were conducted on the archived sample from Station GJ-8 to assess compliance with the Washington SQS.

Under WAC 173-204-315, marine biological tests are conducted on samples that fail the SQS chemical criteria in order to determine whether sediments comply with the SWS. The marine biological tests are to include two acute toxicity bioassays and one chronic effects bioassay. In order to test the sediments from Station GJ-8, the archived sediment sample from Station GJ-8 was used to perform the following Ecology-approved bioassay tests:

- 10-day amphipod mortality acute bioassay using *E. estuarius;*
- 48-hour larval development acute bioassay using *M. galloprovincialis*; and
- 20-day juvenile polychaete chronic growth bioassay using *N. arenaceodentata*.

The sediments from Station GJ-8 passed all three marine bioassay tests and therefore comply with the Washington state SQS. Results of the tests and criteria for selection of reference sediments are presented in this section. Table 12 summarizes the biological effects criteria for Puget Sound marine sediment bioassay tests.

Table 12 Biological Effects Criteria for Puget Sound Marine Sediment Bioassays

Bioassay	Sediment Quality Standard[2]
Amphipod (*Eohaustaurius estuaries)*	The test sediment has a significantly higher (t-test, $p \leq 0.05$) mean mortality than the reference sediment, and the test sediment mean mortality is more than 25 percent greater, on an absolute basis, than the reference sediment mean mortality.
Larval (*Mytilus galloprovincialis*)	The test sediment has a mean survivorship of normal larvae that is significantly less (t-test, $p \leq 0.1$) than the mean normal survivorship in the reference sediment, and the mean normal survivorship in the test sediment is less than 85 percent of the mean normal survivorship in reference sediment.
Juvenile polychaete (*Neanthes arenaceodentata*)	The mean individual growth rate of polychaetes in the test sediment is less than 70 percent of the mean individual growth rate of the polychaetes in the reference sediment, and the test sediment mean individual growth rate is statistically different (t-test, $p \leq 0.05$) from the reference sediment mean individual growth rate.

Notes
1. Source: Ecology, 2008.
2. The sediment quality standards are exceeded if one test fails the listed criteria (WAC 173-04-320[3]).

4.3.1 Reference Sediments

Marine bioassay tests rely on reference sediments to provide a baseline against which to compare the toxicity of the *test sediments* (i.e., the sediment samples being tested). *Reference sediments* represent “clean” sediments that are relatively free of contaminants and representative of the environment where the test sediments were collected. As such, reference sediments are used to evaluate the baseline growth or mortality of the subject test organism assuming no effects from potential contamination.

Sediment grain-size characteristics and/or total organic carbon levels are important in selecting representative reference sediments for the bioassay tests. While no specific criteria have been established as to how closely the test and reference sediments should match in grain size and/or total organic carbon levels, one “rule of thumb“ provided in the *Dredged Material Evaluation and Disposal Procedures Users’ Manual* (DMMO 2008) suggests that an ideal reference sediment would have differences of less than 25 percent in percentage of fines (i.e., fraction of clay and silt-sized particles) and less than 1 percent in TOC content relative to the bioassay test sediment (RSET 2009).

Reference sediments for the bioassay tests were collected by the NewFields staff on July 27, 2011, from Carr Inlet (CI-01) and stored in a walk-in cold room at 4 ± 2°C in the dark until starting the bioassay tests. The Carr Inlet reference sediment consisted of 6.0 percent fines compared to 17.5 percent fines in Station GJ-8 test sediment; the difference in percentage of fines agrees with the DMMP “rule of thumb” guidance for reference sediments. Carr Inlet reference sediment has a TOC

content ranging from 0.2 to 11.8 percent (DMMO 2008), which overlaps the TOC measured for the Station GJ-8 test sediment (0.684 percent).

Carr Inlet sediments are recommended by the EPA and the DMMO as suitable reference material for marine sediment bioassay testing (DMMO 2008; PSEP 1995). A map of Carr Inlet reference areas published by the U.S. Army Corps of Engineers (Seattle District) Dredged Material Management Office can be found at the following Web site:
http://www.nws.usace.army.mil/PublicMenu/ documents/DMMO/EIM_DAIS_Carr_Inlet_Fines.jpg

4.3.2 10-Day Amphipod Bioassay

The 10-day acute mortality bioassay test with *E. estuarius* was initiated on August 5, 2011, using sediment samples from Station GJ-8 collected on July 6, 2011. Details on how the bioassay tests were set up and the monitoring results for dissolved oxygen (DO), pH, temperature, and salinity during the bioassay are provided in Appendix D.

The mean mortality of amphipods in Station GJ-8 sediments was 8 percent; this value was not significantly higher than the mean mortality of 5 percent in reference sediment (one-tailed *t*-test, $p > 0.05$). These results indicate the Station GJ-8 sediments passed the 10-day sediment amphipod mortality bioassay. Under the SMS, test sediments fail the acute amphipod mortality bioassay SQS if the mean mortality of amphipods in the test sediment has a significantly higher (one-tailed *t*-test, $p \leq 0.05$) mean mortality than the reference sediment, and the test sediment mean mortality is more than 25 percent greater, on an absolute basis, than the reference sediment mean mortality (Table 12).

Review of test results indicates that the amphipods used for testing were in good condition and the reference sediments were acceptable for comparison to SMS. The measured mortality in control sediment (3 percent) met the SMS performance criteria of <10 percent mortality, and the mean mortality in reference sediment (5 percent) met the SMS performance criteria of <25 percent mortality (WAC 173-204-315[2][a]).

The measured water quality parameters for salinity, DO, and pH during the 10-day testing period were within the recommended range for *E. estuarius* (Ecology, 2008). The temperature range recommended for testing (15 ± 1°C) was maintained during the first 6 days of the test; the temperature increased above this range during days 7 to 8 (17.1 to 17.4°C), day 9 (19.5°C) and day 10 (16.2 to 16.5°C). The low mortality observed in the control and test sediments during these periods indicates that the elevation in water temperature would not be expected to affect the test results. All other QA/QC test parameters (ammonia and sulfide concentrations, positive and negative controls) were within recommended limits established for this bioassay.

4.3.3 48-Hour Larval Development Bioassay

The acute larval development bioassay test with *M. galloprovincialis* was initiated on August 8, 2011, using sediments from Station GJ-8 collected on July 6, 2011. Details on how the bioassays were set up and the monitoring results for DO, pH, temperature, and salinity during the bioassay are provided in Appendix D.

The mean normal survival of *M. galloprovincialis* larvae exposed to sediments from Station GJ-8 (78.9 percent) was not significantly less than the mean normal survival of larvae exposed to reference sediment. These results indicate the Station GJ-8 sediments passed the sediment acute larval development bioassay. Under the SMS, test sediments fail the acute larval development bioassay SQS if the mean survival of normal larvae is significantly less (one-tailed *t*-test, $p \leq 0.1$) than the mean normal survival in the reference sediment, and the mean normal survival in the test sediment is less than 85 percent of the mean normal survival in the reference sediment (Table 12).

Review of test results indicates that the test conditions and reference sediments were acceptable for comparison to SMS. All measured water quality parameters and QA/QC test parameters were within recommended limits established for this bioassay. The mean mortality in the control sediment (3.6 percent) met the SMS acceptability criteria of <30 percent (WAC 173-204-315[2][b]).

4.3.4 20-Day Juvenile Polychaete Bioassay

The chronic juvenile polychaete bioassay with *N. arenaceodentata* was initiated on August 9, 2011, with sediments from Station GJ-8 collected on July 6, 2011. Details on how the bioassays were set up and the monitoring results for DO, pH, temperature, and salinity during the bioassay are provided in Appendix D.

The mean individual growth in the test sediments (MIG_T) from Station GJ-8 (0.543 milligrams per individual per day [mg/ind/day]) was not significantly less than the mean individual growth in the reference (MIG_R) (0.565 mg/ind/day). These results indicate the Station GJ-8 sediments passed the sediment chronic juvenile polychaete bioassay. Under the SMS, test sediments fail the chronic juvenile polychaete bioassay SQS if MIG_T is statistically lower (one-tailed *t*-test, $p < 0.05$) than MIG_R; and MIG_T < 70 percent MIG_R.

No mortality was observed in the control sediment, and mean individual growth in the control sediment was 0.611 mg/ind/day. These values fall within the test acceptability criteria of <10 percent mean mortality and ≥0.38 mg/ind/day mean individual growth for this bioassay. All measured water quality parameters and QA/QC test parameters were within recommended limits established for this bioassay.

5.0 SUMMARY

Surficial sediment samples (upper 10 cm) were collected during July 1 to 8, 2011, within two alternative configurations (referred to as the Permitted and Alternative Configurations) for the trestle and wharf being considered for Gateway Pacific Terminal Project. A total of 45 samples were collected from 44 locations (plus one field duplicate sample) extending from the ordinary high water mark to a maximum depth of approximately -125 feet MLLW.

As part of the Tier I analysis, all samples were analyzed for metals and organic chemicals for which Washington Marine Sediment Quality Standards and screening levels for in-water disposal of dredged material have been established. Samples were analyzed for the following classes of constituents:

- Metals;
- Chlorinated pesticides;
- PAHs;
- SVOCs;
- PCBs; and
- Volatile organic compounds.

In addition to the above analytes, sediment conventionals (grain size, total solids, total volatile solids, and TOC) were also analyzed.

With the exception of PAHs and one SVOC in the sediment sample from Station GJ-8, all detected analytes in samples from all sampling locations were at concentrations below Marine SQS. Because PAH concentrations in Station GJ-8 samples exceeded sediment management standards, sediment samples from Station GJ-8 samples were used for bioassay testing, in accordance with WAC 173-204-315, to assess compliance with the state SQS. Sediments from Station GJ-8 were used for the following Ecology-approved bioassay tests:

- 10-day amphipod mortality acute bioassay using *Eohaustorius estuarius;*
- 48-hour larval development acute bioassay using *Mytilus galloprovincialis*; and
- 20-day juvenile polychaete chronic growth bioassay using *Neanthes arenaceodentata*.

Test results indicated that sediments from Station GJ-8 passed all three bioassay tests. As noted in WAC 173-204-310(2), “Sediment samples that pass all the required confirmatory biological tests are designated as passing the applicable Sediment Quality Standards of WAC 173-204-320 through 173-204-340, notwithstanding the sediment’s previous initial designation under subsection (1) of this section.” Therefore, sediments at all 45 stations are compliant with SMS Marine Sediment Quality Standards, as well as the screening levels of the DMMP.

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APPENDIX A

Sediment Sample Photographs

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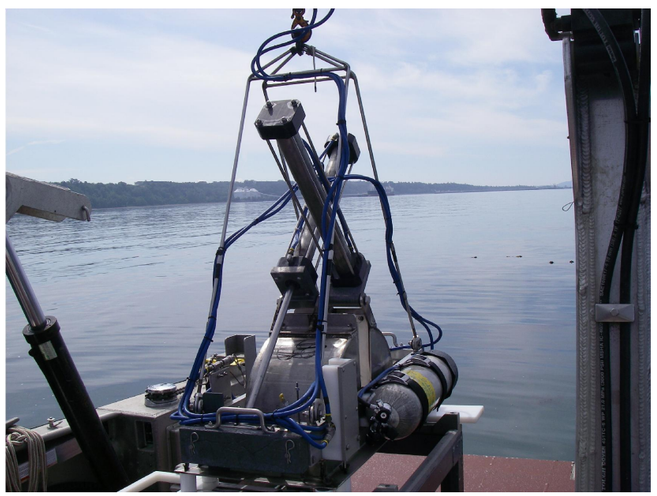


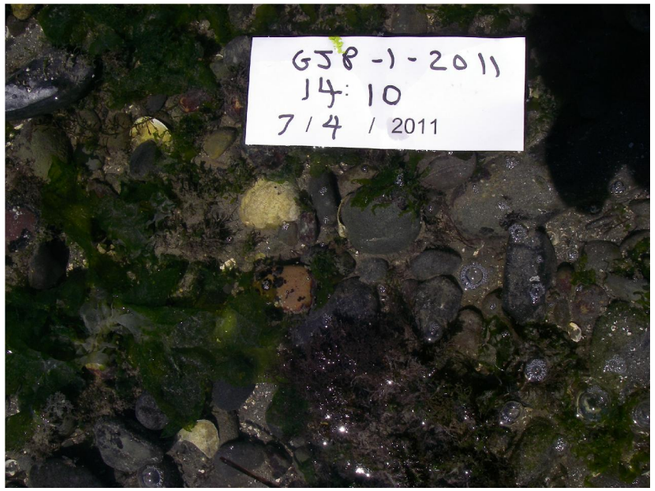
0.2 m^2 Sediment Grab

Infauna Sampling

Infauna Screening

CLIENT LOGO	CLIENT: PACIFIC INTERNATIONAL TERMINALS, INC.	DWN BY: GSM	PROJECT 2011 BASELINE SEDIMENT SAMPLING	DATE: JULY 2011
Pacific International Terminals.		CHK'D BY: -		PROJECT NO: 091515338C.06
	AMEC 3500 188th St SW, Suite 601 Lynnwood, WA 98037	DATUM: NAD83, NORTH	TITLE SEDIMENT SAMPLE PHOTOS	REV. NO.: -
	amec	PROJECTION: WA STATE PLANE		
		SCALE: AS SHOWN		FIGURE No. Sheet 1

Q:\Pacific International Terminals\CAD\Sediment Sampling\Appendix 2 photos\2011 Sediment Photos.dwg – Sheet 1 – Oct. 11, 2011 2:25pm – gary.maxwell



No Sample Collected
at Station
GJP-3-2011

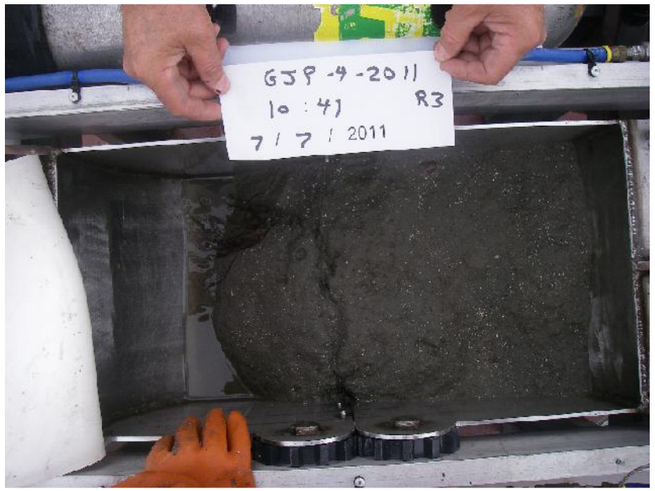
Infauna Sample

No Sample Collected
at Station
GJP-2-2011

Infauna Sample

	CLIENT LOGO Pacific International Terminals.	CLIENT: PACIFIC INTERNATIONAL TERMINALS, INC.	DWN BY: GSM CHK'D BY: - DATUM: NAD83, NORTH PROJECTION: WA STATE PLANE SCALE: AS SHOWN	PROJECT 2011 BASELINE SEDIMENT SAMPLING	DATE: JULY 2011 PROJECT NO: 091515338C.06
		AMEC 3500 188th St SW, Suite 601 Lynnwood, WA 98037	amec	TITLE SEDIMENT SAMPLE PHOTOS	REV. NO.: - FIGURE No. Sheet 2

Q:\Pacific International Terminals\CAD\Sediment Sampling\Appendix 2 photos\2011 Sediment Photos.dwg – Sheet 2 – Aug. 25, 2011 8:54am – gary.maxwell



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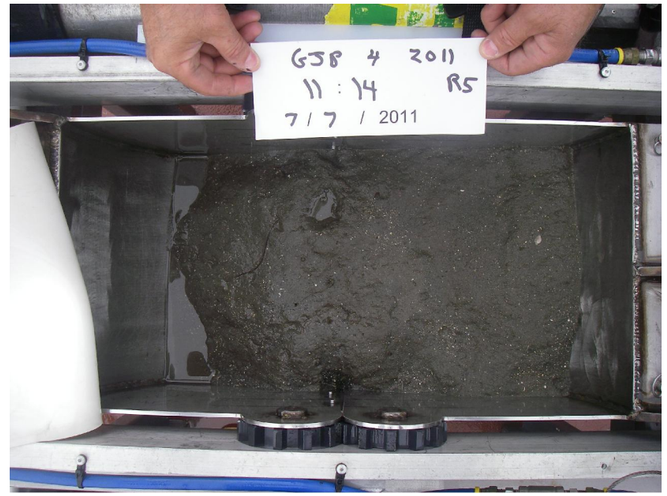


Infauna Sample

Infauna Sample

Infauna Sample

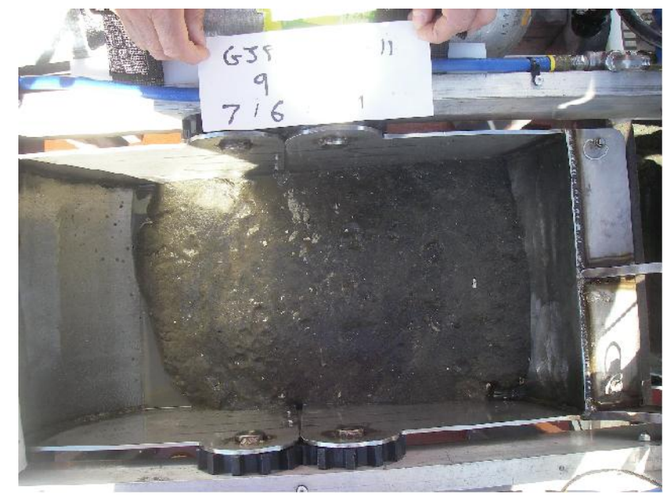
	CLIENT LOGO: Pacific International Terminals.	CLIENT: PACIFIC INTERNATIONAL TERMINALS, INC.	DWN BY: GSM CHK'D BY: - DATUM: NAD83, NORTH PROJECTION: WA STATE PLANE SCALE: AS SHOWN	PROJECT: 2011 BASELINE SEDIMENT SAMPLING	DATE: JULY 2011 PROJECT NO: 091515338C.06
		AMEC 3500 188th St SW, Suite 601 Lynnwood, WA 98037		TITLE: SEDIMENT SAMPLE PHOTOS	REV. NO.: - FIGURE No. Sheet 3

Q:\Pacific International Terminals\CAD\Sediment Sampling\Appendix 2 photos\2011 Sediment Photos.dwg – Sheet 3 – Aug. 25, 2011 8:55am – gary.maxwell

Infauna Sample

Station GJ-7-2011

Infauna Sample



Station GJP-10 at 09:16

	CLIENT LOGO Pacific International Terminals.	CLIENT: PACIFIC INTERNATIONAL TERMINALS, INC.	DWN BY: GSM CHK'D BY: -	PROJECT 2011 BASELINE SEDIMENT SAMPLING	DATE: JULY 2011 PROJECT NO: 091515338C.06
		AMEC 3500 188th St SW, Suite 601 Lynnwood, WA 98037	DATUM: NAD83, NORTH PROJECTION: WA STATE PLANE SCALE: AS SHOWN	TITLE SEDIMENT SAMPLE PHOTOS	REV. NO.: - FIGURE No. Sheet 4

Q:\Pacific International Terminals\CAD\Sediment Sampling\Appendix 2 photos\2011 Sediment Photos.dwg – Sheet 4 – Aug. 25, 2011 8:55am – gary.maxwell

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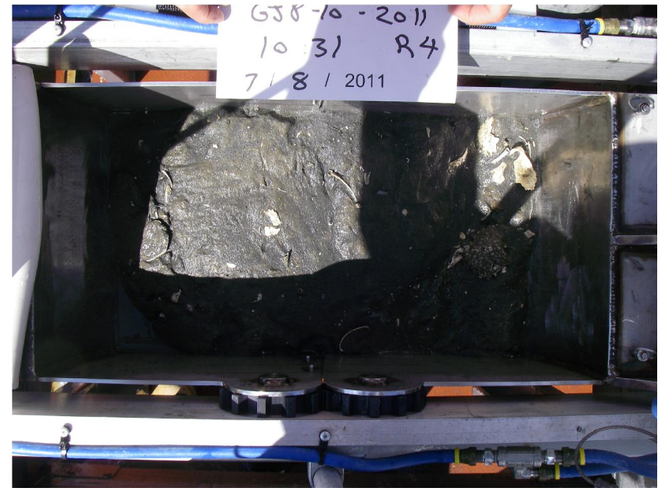

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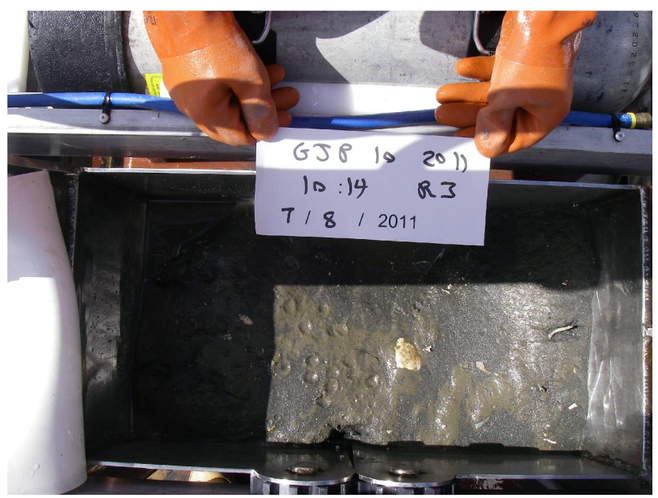
Station GJP-12-2011



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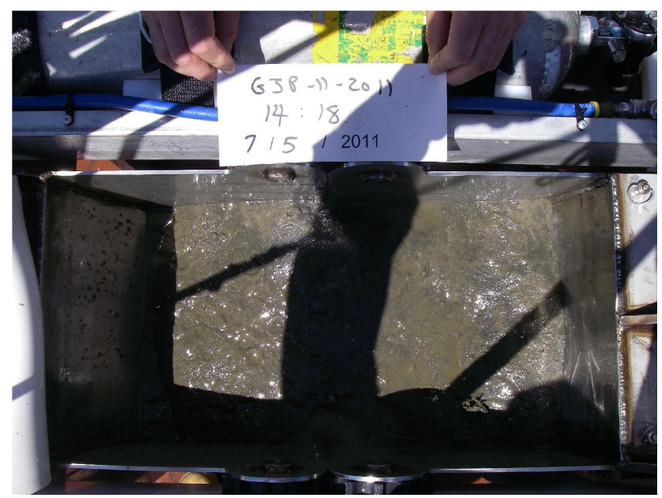

No Sample Collected
at Station
GJP-13-2011

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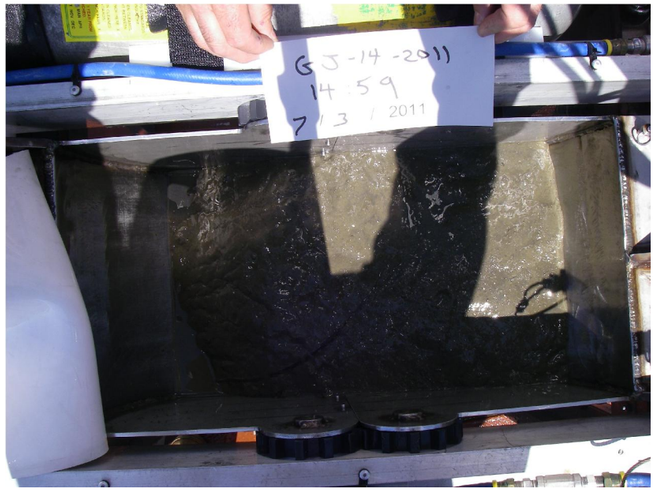
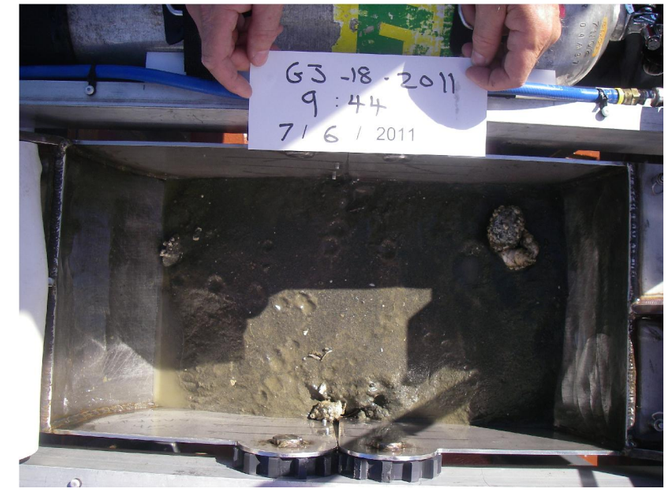
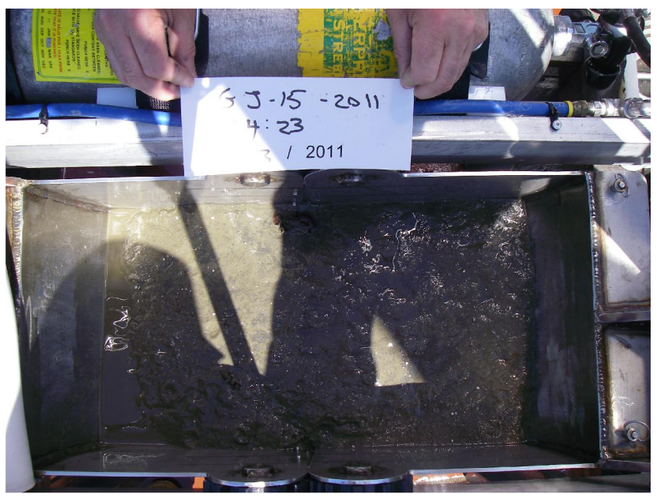
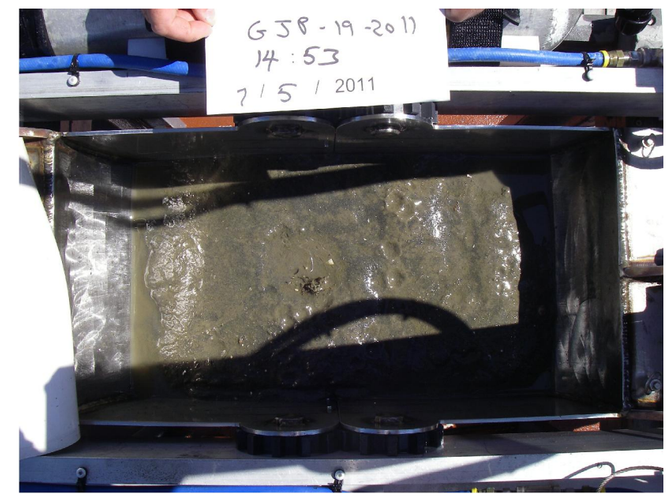
	Pacific International Terminals.	AMEC 3500 188th St SW, Suite 601 Lynnwood, WA 98037	amec	TITLE: SEDIMENT SAMPLE PHOTOS	REV. NO.: - FIGURE No. Sheet 5

Q:\Pacific International Terminals\CAD\Sediment Sampling\Appendix 2 photos\2011 Sediment Photos.dwg – Sheet 5 – Aug. 25, 2011 8:55am – gary.maxwell



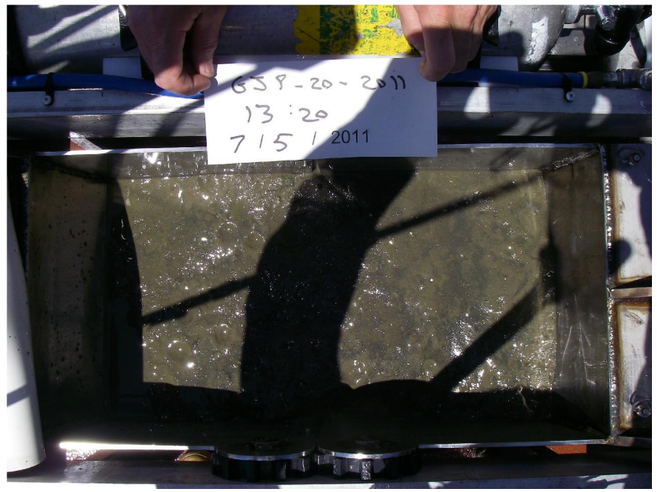


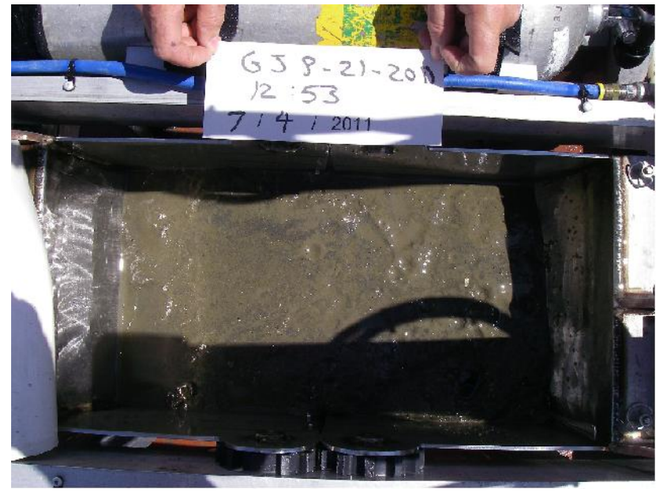


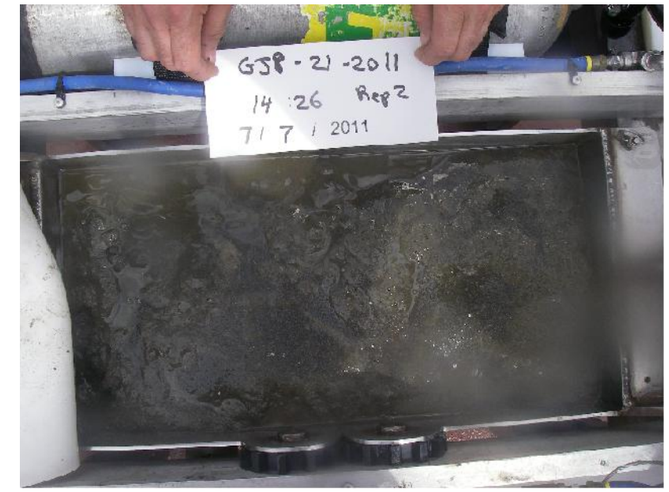


	CLIENT LOGO	CLIENT: PACIFIC INTERNATIONAL TERMINALS, INC.	DWN BY: GSM	PROJECT 2011 BASELINE SEDIMENT SAMPLING	DATE: JULY 2011
	Pacific International Terminals.		CHK'D BY: -		PROJECT NO: 091515338C.06
		AMEC 3500 188th St SW, Suite 601 Lynnwood, WA 98037	DATUM: NAD83, NORTH	TITLE SEDIMENT SAMPLE PHOTOS	REV. NO.: -
		amec	PROJECTION: WA STATE PLANE		FIGURE No. Sheet 6
			SCALE: AS SHOWN		

Q:\Pacific International Terminals\CAD\Sediment Sampling\Appendix 2 photos\2011 Sediment Photos.dwg – Sheet 6 – Aug. 25, 2011 8:55am – gary.maxwell







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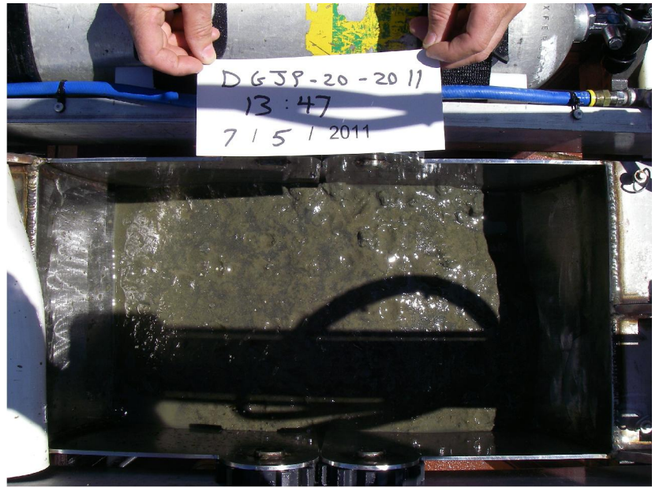
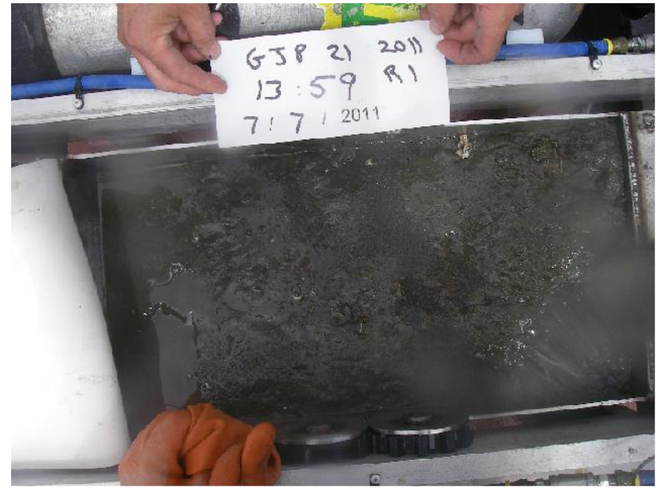


Duplicate Sample

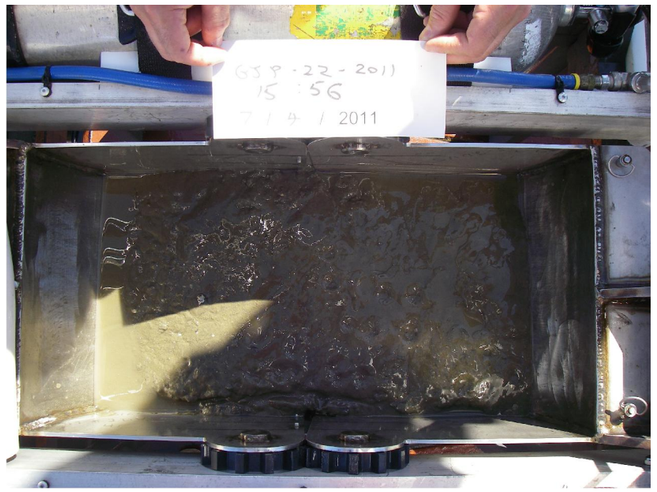


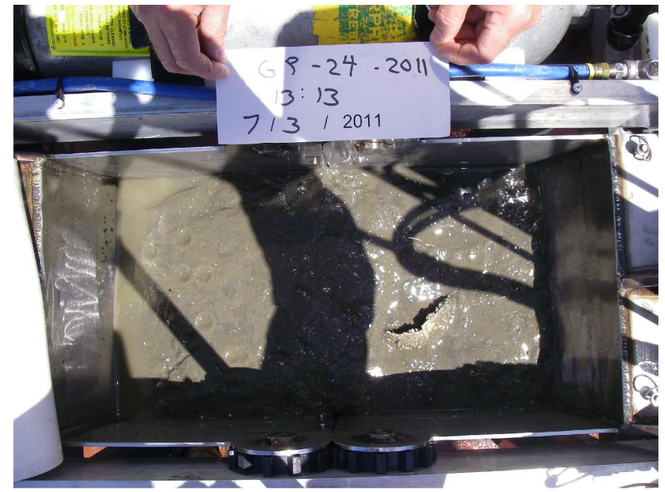
Infauna Sample

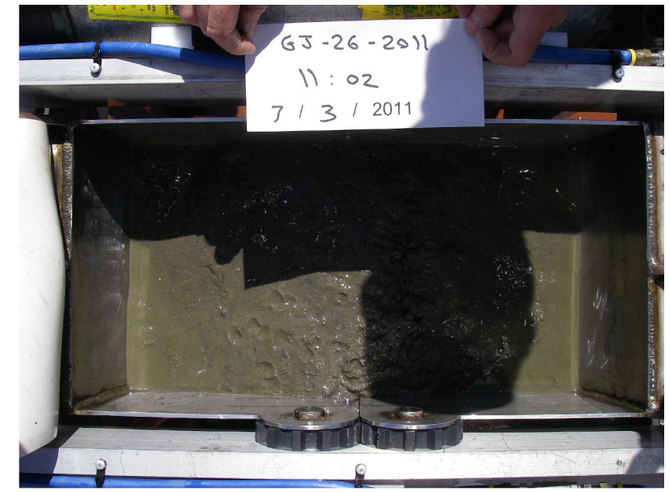
Infauna Sample

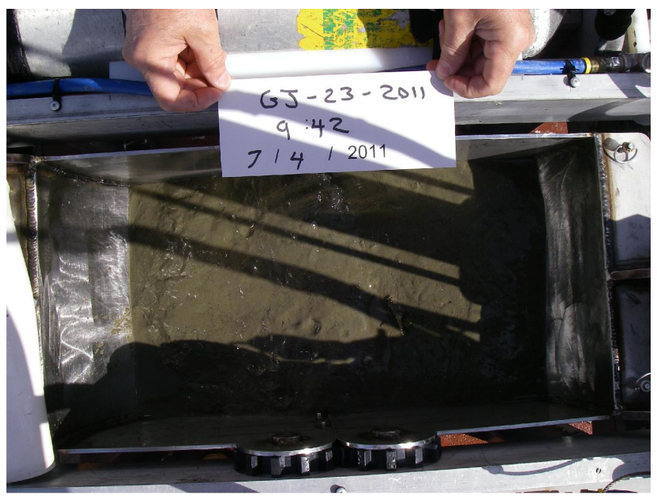
	CLIENT LOGO Pacific International Terminals.	CLIENT: PACIFIC INTERNATIONAL TERMINALS, INC.	DWN BY: GSM CHK'D BY: -	PROJECT 2011 BASELINE SEDIMENT SAMPLING	DATE: JULY 2011 PROJECT NO: 091515338C.06
		AMEC 3500 188th St SW, Suite 601 Lynnwood, WA 98037	DATUM: NAD83, NORTH PROJECTION: WA STATE PLANE SCALE: AS SHOWN	TITLE SEDIMENT SAMPLE PHOTOS	REV. NO.: - FIGURE No. Sheet 7

Q:\Pacific International Terminals\CAD\Sediment Sampling\Appendix 2 photos\2011 Sediment Photos.dwg – Sheet 7 – Aug. 25, 2011 8:56am – gary.maxwell



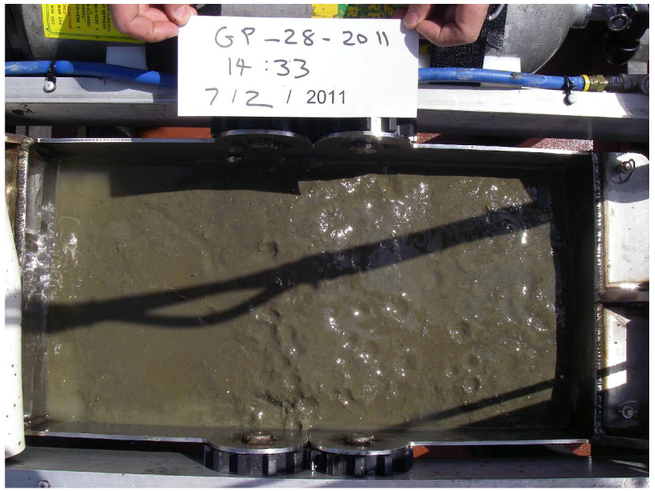


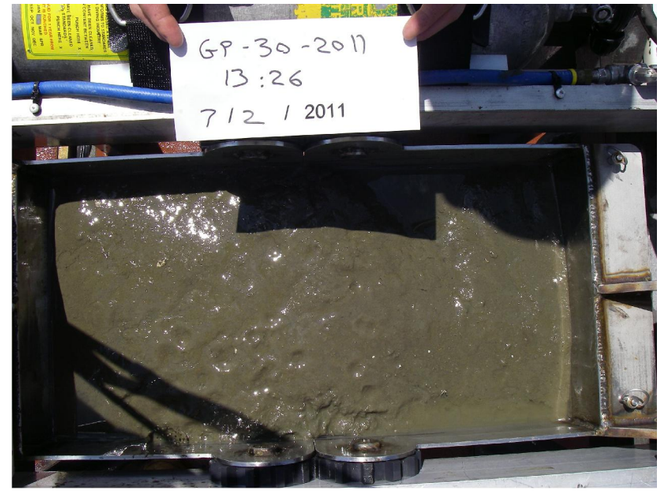


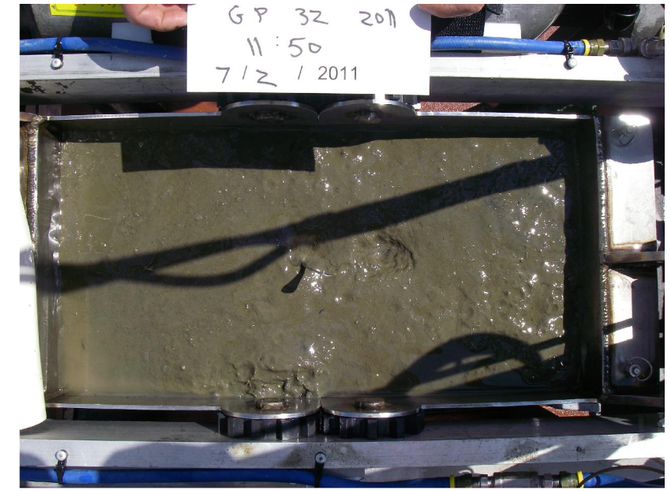


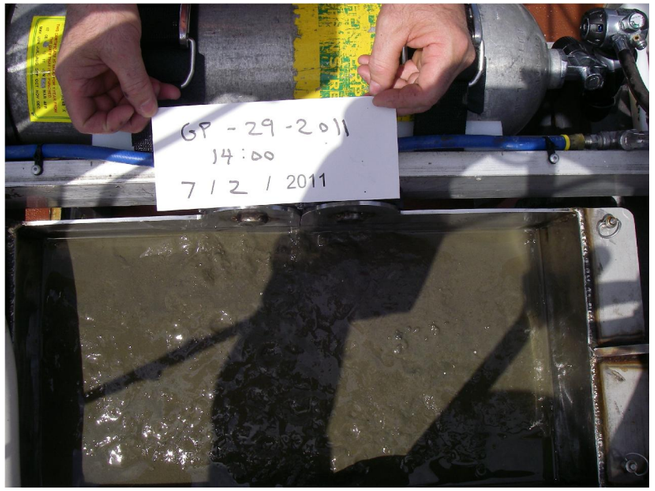
	CLIENT LOGO Pacific International Terminals.	CLIENT: PACIFIC INTERNATIONAL TERMINALS, INC.	DWN BY: GSM CHK'D BY: -	PROJECT 2011 BASELINE SEDIMENT SAMPLING	DATE: JULY 2011 PROJECT NO: 091515338C.06
		AMEC 3500 188th St SW, Suite 601 Lynnwood, WA 98037	DATUM: NAD83, NORTH PROJECTION: WA STATE PLANE SCALE: AS SHOWN	TITLE SEDIMENT SAMPLE PHOTOS	REV. NO.: - FIGURE No. Sheet 8

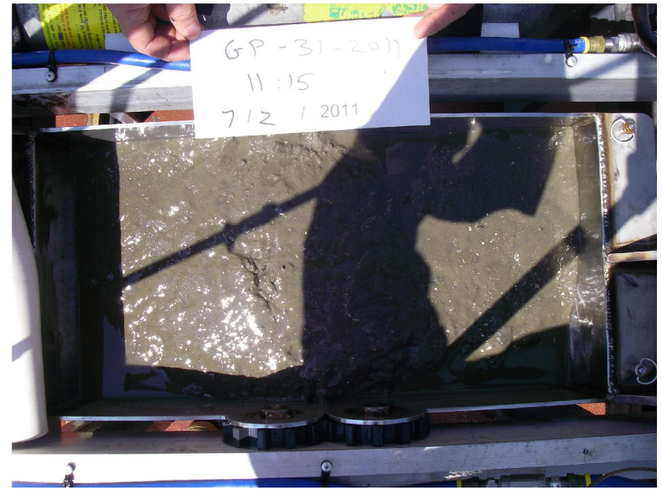
Q:\Pacific International Terminals\CAD\Sediment Sampling\Appendix 2 photos\2011 Sediment Photos.dwg – Sheet 8 – Aug. 25, 2011 8:56am – gary.maxwell











CLIENT LOGO

Pacific International Terminals.

CLIENT:

PACIFIC INTERNATIONAL TERMINALS, INC.

AMEC
3500 188th St SW, Suite 601
Lynnwood, WA 98037

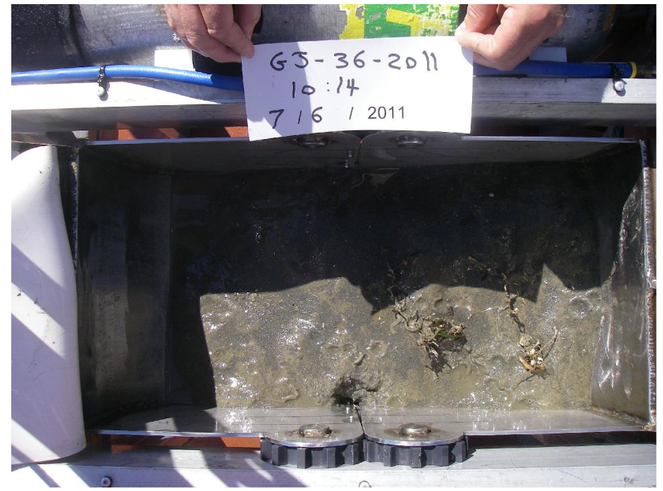
DWN BY:	GSM
CHK'D BY:	-
DATUM:	NAD83, NORTH
PROJECTION:	WA STATE PLANE
SCALE:	AS SHOWN

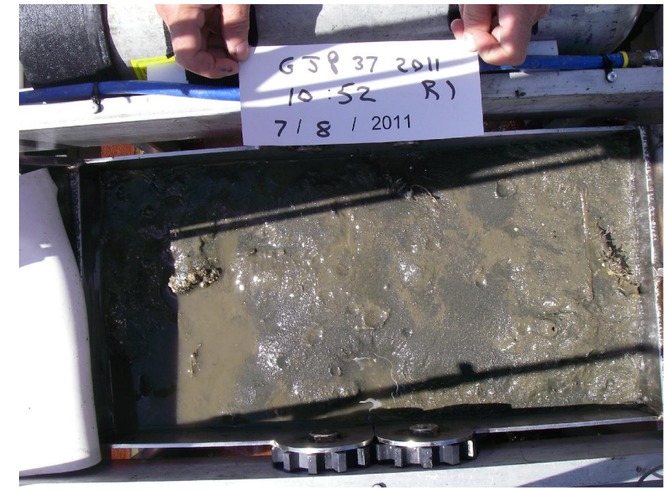
PROJECT: 2011 BASELINE SEDIMENT SAMPLING

TITLE: SEDIMENT SAMPLE PHOTOS

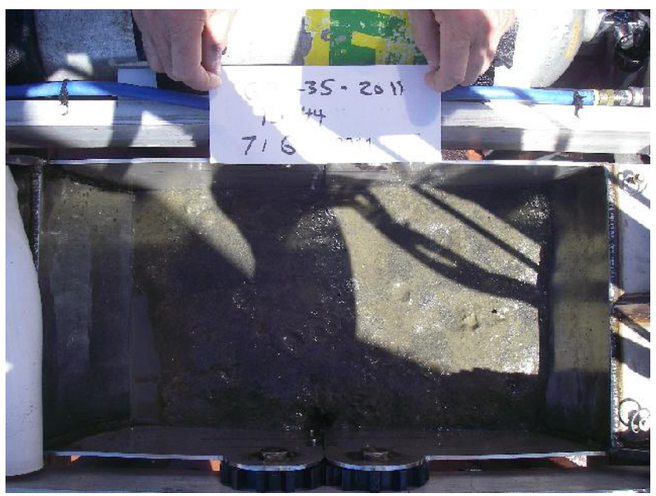
DATE:	JULY 2011
PROJECT NO:	091515338C.06
REV. NO.:	-
FIGURE No.	Sheet 9

Q:\Pacific International Terminals\CAD\Sediment Sampling\Appendix 2 photos\2011 Sediment Photos.dwg – Sheet 9 – Aug. 25, 2011 8:56am – gary.maxwell

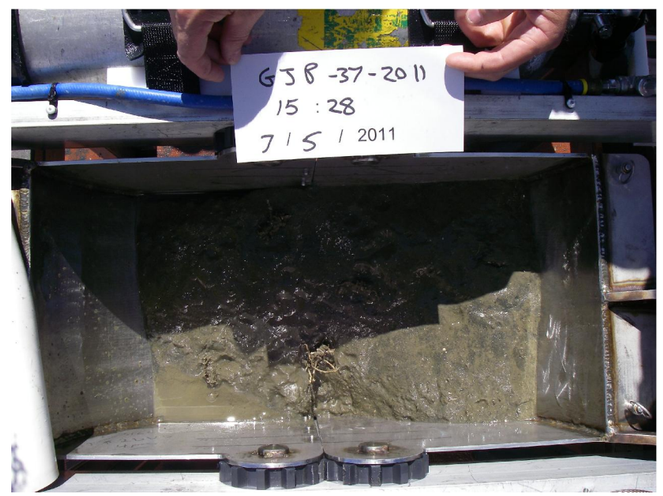


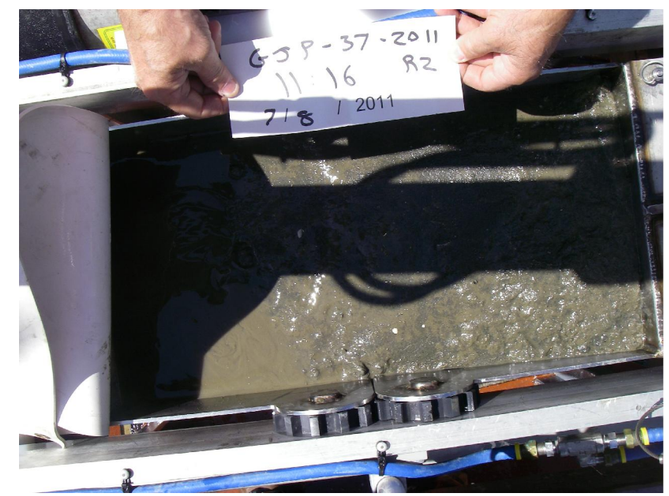


Infauna Sample



Sample GJ-35-2011 at 13:44



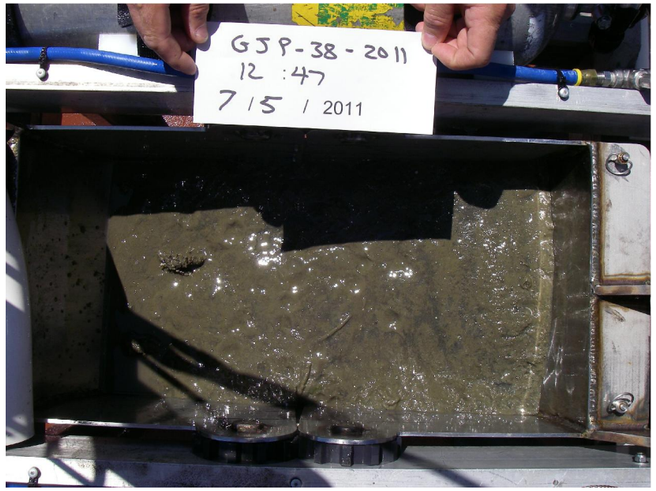


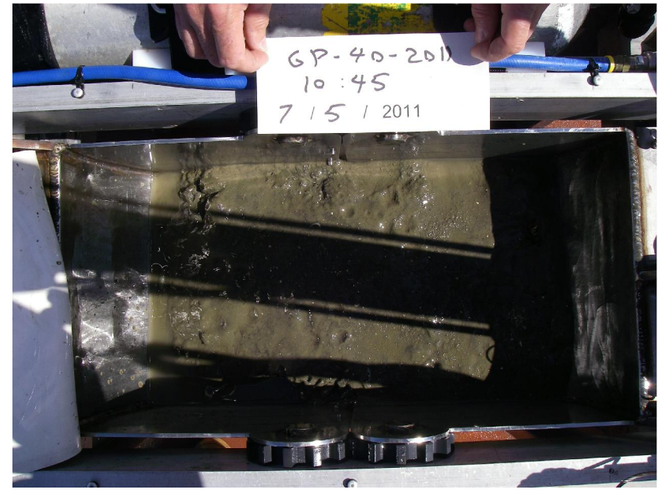
Infauna Sample

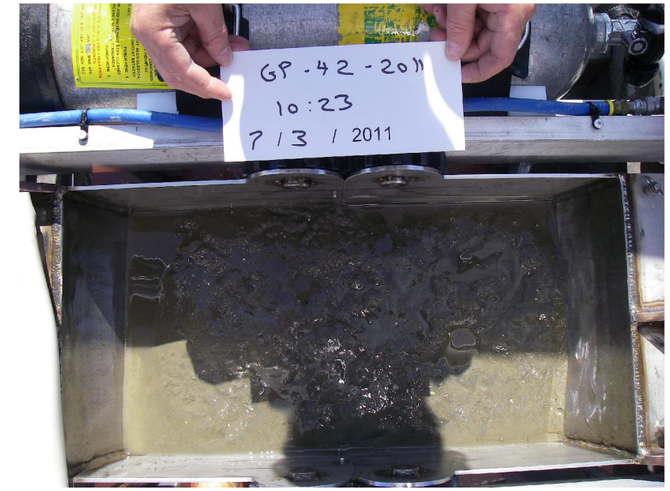
	CLIENT LOGO Pacific International Terminals.	CLIENT: PACIFIC INTERNATIONAL TERMINALS, INC.	DWN BY: GSM CHK'D BY: - DATUM: NAD83, NORTH PROJECTION: WA STATE PLANE SCALE: AS SHOWN	PROJECT 2011 BASELINE SEDIMENT SAMPLING	DATE: JULY 2011 PROJECT NO: 091515338C.06
		AMEC 3500 188th St SW, Suite 601 Lynnwood, WA 98037 amec		TITLE SEDIMENT SAMPLE PHOTOS	REV. NO.: - FIGURE No. Sheet 10

Q:\Pacific International Terminals\CAD\Sediment Sampling\Appendix 2 photos\2011 Sediment Photos.dwg – Sheet 10 – Aug. 25, 2011 8:57am – gary.maxwell

Infauna Sample

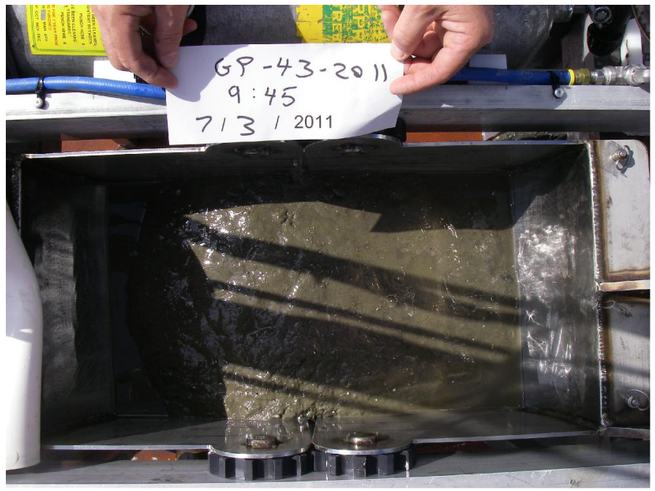


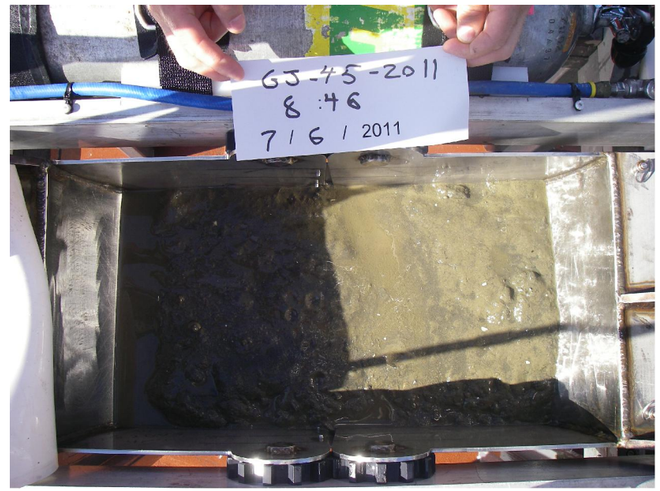


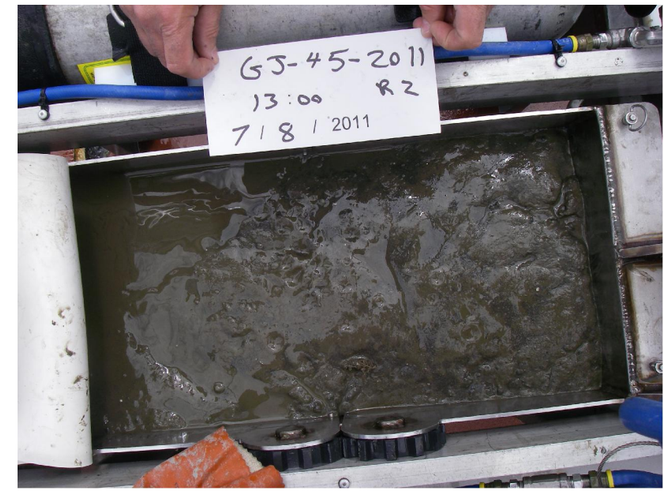


	CLIENT LOGO Pacific International Terminals.	CLIENT: PACIFIC INTERNATIONAL TERMINALS, INC.	DWN BY: GSM CHK'D BY: - DATUM: NAD83, NORTH PROJECTION: WA STATE PLANE SCALE: AS SHOWN	PROJECT 2011 BASELINE SEDIMENT SAMPLING	DATE: JULY 2011 PROJECT NO: 091515338C.06
		AMEC 3500 188th St SW, Suite 601 Lynnwood, WA 98037 amec		TITLE SEDIMENT SAMPLE PHOTOS	REV. NO.: - FIGURE No. Sheet 11

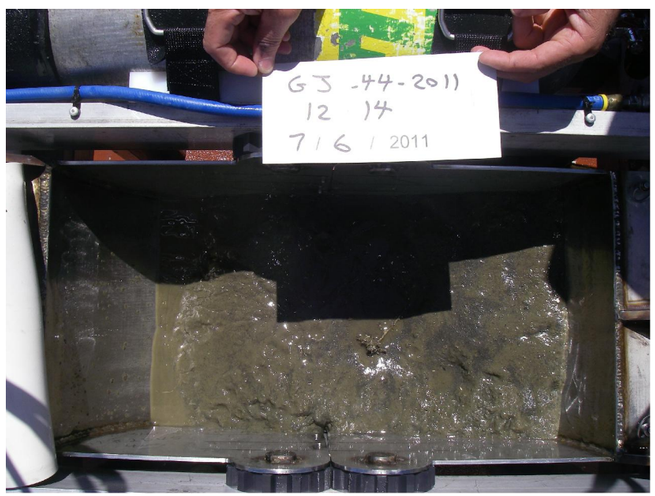
Q:\Pacific International Terminals\CAD\Sediment Sampling\Appendix 2 photos\2011 Sediment Photos.dwg – Sheet 11 – Aug. 25, 2011 8:57am – gary.maxwell

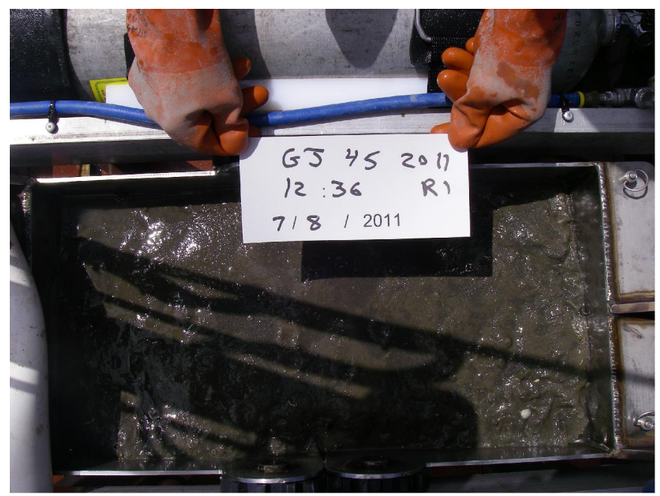






Infauna Sample





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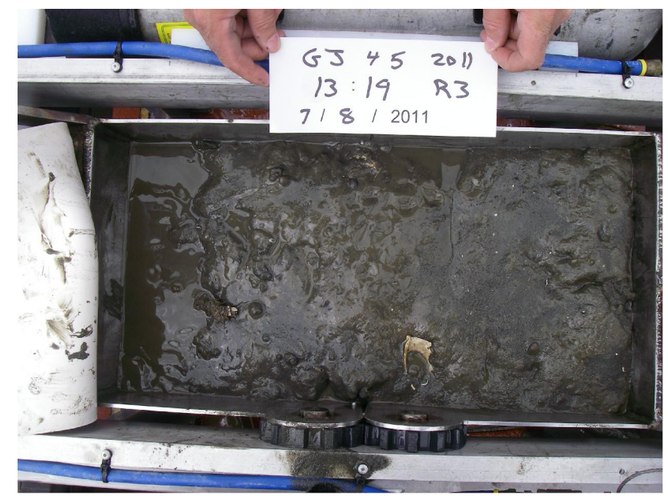

Infauna Sample

	CLIENT LOGO Pacific International Terminals.	CLIENT: PACIFIC INTERNATIONAL TERMINALS, INC.	DWN BY: GSM CHK'D BY: -	PROJECT 2011 BASELINE SEDIMENT SAMPLING	DATE: JULY 2011 PROJECT NO: 091515338C.06
		AMEC 3500 188th St SW, Suite 601 Lynnwood, WA 98037	DATUM: NAD83, NORTH PROJECTION: WA STATE PLANE SCALE: AS SHOWN	TITLE SEDIMENT SAMPLE PHOTOS	REV. NO.: - FIGURE No. Sheet 12

Q:\Pacific International Terminals\CAD\Sediment Sampling\Appendix 2 photos\2011 Sediment Photos.dwg – Sheet 12 – Aug. 25, 2011 8:57am – gary.maxwell

	CLIENT LOGO Pacific International Terminals.	CLIENT: PACIFIC INTERNATIONAL TERMINALS, INC.	DWN BY: GSM CHK'D BY: - DATUM: NAD83, NORTH PROJECTION: WA STATE PLANE SCALE: AS SHOWN	PROJECT 2011 BASELINE SEDIMENT SAMPLING	DATE: JULY 2011 PROJECT NO: 091515338C.06
		AMEC 3500 188th St SW, Suite 601 Lynnwood, WA 98037 amec		TITLE SEDIMENT SAMPLE PHOTOS	REV. NO.: - FIGURE No. Sheet 13

Q:\Pacific International Terminals\CAD\Sediment Sampling\Appendix 2 photos\2011 Sediment Photos.dwg – Sheet 13 – Aug. 25, 2011 8:57am – gary.maxwell

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APPENDIX B

Qualitative Sample Characteristic Forms

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-4-2011	Gateway Pacific	GJP 1 2011

GSM Coordinates		Water Depth					Time
~~North~~ East	~~East~~ North	Depth	Unit		Rep	Gear	
1181639	683475	0.2	f	t		0 2 V V	1410

Penetration Depth	Unit		Initials	Sulfide	VOA	Weather	Fines (%)
	c	m	GJM			sunny	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: 0 % **Debris:** 0 % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:
spoon sample - too coarse to use samplers
cobble + large gravel removed from sample

AMEC-Geomatrix
GJP-1-2011
QSC Form
Initials: GJM
Date: 7/4/2011 Time: 1460

QSC

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-4-2011	Gateway Pacific	GJP-2-2011

Coordinates		Water Depth					Time
North	East	Depth	Unit		Rep	Gear	
683223	1181780	5	f	t	1	02VV	1022

Penetration						
Depth	Unit	Initials	Sulfide	VOA	Weather	Fines (%)
	c m	GJM			sunny calm	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:
no sediment / algae + blenny eel

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-4-2011	Gateway Pacific	GSP 2 2011

Coordinates		Water Depth					Time
North	East	Depth	Unit		Rep	Gear	
683216	1181781	6	f	t	2	0 2 V V	1029

Penetration							
Depth	Unit		Initials	Sulfide	VOA	Weather	Fines (%)
	c	m	GSM			sunny calm	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments: Rep 3 683214, 1181777

algae in Rep 2 & 3, no sediment

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-4-2011	Gateway Pacific	GSP-3-2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
683224	1181496	12	f t	1	0 2 V V	10:40

Penetration			Sulfide	VOA	Weather	Fines (%)
Depth	Unit	Initials				
	c m	GSM			sunny calm	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:
R2 683210, 1181497 - 8" rock in jaws
R3 683217, 1181484
no sediment, algae in jaws

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-4-2011	Gateway Pacific	GJP-4-2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
682973	1181641	21	f t	1	0 2 V V	1057

Penetration							
Depth	Unit		Initials	Sulfide	VOA	Weather	Fines (%)
15	c	m	GSM			Sunny calm	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: Sea Pen % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:
Sand & pulverized shell

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GJP-4-2011
QSC Form
Initials: GSM
Date: 7/4/2011 Time: 1057

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-7-2011	Gateway Pacific	GJP - 4 - 2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
682977	1181631	25	f t	1	0 2 V V	944

Penetration			Sulfide	VOA	Weather	Fines (%)
Depth	Unit	Initials				
18	c m	GSM			cloudy light wind	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

GSM intanna

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GJP-4-2011
QSC Form
Initials:
Date: 7/7/2011 Time: 944

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-7-2011	Gateway Pacific	GJP 4 2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
1082974	1181637	25	f t	2	02VV	1024

Penetration			Sulfide	VOA	Weather	Fines (%)
Depth	Unit	Initials				
16	c m	GSD			cloudy light wind	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

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QSC Form
Initials:
Date: 7/7/2011 Time: 1024

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-7-2011	Gateway Pacific	GJP 4 2011

Coordinates		Water Depth					Time
North	East	Depth	Unit		Rep	Gear	
682975	1181638	24	f	t	3	02VV	1041

Penetration			Sulfide	VOA	Weather	Fines (%)
Depth	Unit	Initials				
	c m	GSM			clouds	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics: light wind

Biological: red algae 1 % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

GSM

infauna

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GJP-4-2011
QSC Form
Initials:
Date: 7/7/2011 Time: 1041

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-7-2011	Gateway Pacific	GJP 4 2011

Coordinates		Water Depth					Time
North	East	Depth	Unit	Rep	Gear		
682982	1181638	24	f t	4	0 2 V V		1057

Penetration			Sulfide	VOA	Weather	Fines (%)
Depth	Unit	Initials				
13	c m	GJM			cloudy light wind	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

GJM infauna

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GJP-4-2011
QSC Form
Initials:
Date: 7/7/2011 Time: 1057

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-7-2011	Gateway Pacific	GSR 4 2011

Coordinates		Water Depth					Time
North	East	Depth	Unit		Rep	Gear	
682979	1181646	34	f	t	5	0 2 V V	1114

Penetration			Sulfide	VOA	Weather	Fines (%)
Depth	Unit	Initials				
15	c m	GSM			cloudy light wind	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

GSM

Infauna

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-4-2011	Gateway Pacific	GSP 5 2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
682717	1181495	48	f t	1	0 2 V V	1222

Penetration			Sulfide	VOA	Weather	Fines (%)
Depth	Unit	Initials				
16	c m	GSM			sunny calm	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

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GJP-5-2011
QSC Form
Initials:
Date: 7/4/2011 Time: 1222

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-4-2011	Gateway Pacific	GJP 6 2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
682720	1181780	38	f t		0 2 V V	1150

Penetration Depth	Unit	Initials	Sulfide	VOA	Weather	Fines (%)
15	c m	GJM			sunny warm	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: Tubeworms Trace % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet (Moist) Damp Dry

Color **(Circle major & underline modifying)**
Light (Medium) Dark Olive (Gray) Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
(Fine) Medium Coarse Gravel (Sand) Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:
Fist size rock with Barnacles & possible abalone

AMEC-Geomatrix
GJP-6-2011
QSC Form
Initials: GJM
Date: 7/4/2011 Time: 1150

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-7-2011	Gateway Pacific	GJP 6 2011

Coordinates		Water Depth					Time
North	East	Depth	Unit	Rep	Gear		
682724	1181781	38	f t	3	0 2 V V		1252

attempt #3

Penetration			Sulfide	VOA	Weather	Fines (%)
Depth	Unit	Initials				
22	c m	GJM			cloudy light wind	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

Attempt 1 1229 poor penetration
2 1236 " "
3 1252 good

informa sample 1 + 2 taken from Rep 3

AMEC-Geomatrix
GJP-6-2011
QSC Form
Initials: GJM
Date: 7/7/2011 Time: 1252

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-7-2011	Gateway Pacific	GJP 6 2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
682724	1181778	40	f t	4	0 2 V V	1311

Penetration			Sulfide	VOA	Weather	Fines (%)
Depth	Unit	Initials				
10	c m	GJM			cloudy light wind	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

Inclining

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GJP-6-2011
QSC Form
Initials: GJM
Date: 7/7/2011 Time: 1311

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-7-2011	Gateway Pacific	GJP 6 2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
682732	1181784		f t	5	02VV	1328

Penetration Depth	Unit	Initials	Sulfide	VOA	Weather	Fines (%)
20	c m	GJM			cloudy moderate wind	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

sample 4 + 5 Intertidal taken from this grab

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GJP-6-2011
QSC Form
Initials: GJM
Date: 7/7/2011 Time: 1328

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-6-2011	Gateway Pacific	GJ 7 2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
683475	1179609	48	f t	1	0 2 V V	1415

Penetration			Sulfide	VOA	Weather	Fines (%)
Depth	Unit	Initials				
15	c m	GJM			sunny calm	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

AMEC-Geomatrix
GJ-7-2011
QSC Form
Initials: GJM
Date: 7/6/2011 Time: 1415

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-6-2011	Gateway Pacific	GJ 8 2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
683225	1180044	53	f t	1	0 2 V V	1116

Penetration Depth	Unit	Initials	Sulfide	VOA	Weather	Fines (%)
16	c m	GSM			sunny light wind	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

AMEC-Geomatrix
GJ-8-2011
QSC Form
Initials: GSM
Date: 7/6/2011 Time: 1116

Amin\Field Forms\QSC

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-6-2011	Gateway Pacific	GJ-9-2011

Coordinates		Water Depth					Time
North	East	Depth	Unit		Rep	Gear	
683222	1180337	42	f	t	1	0 2 V V	1047

Penetration						
Depth	Unit	Initials	Sulfide	VOA	Weather	Fines (%)
14	c m	GJM			sunny light wind	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

AMEC-Geomatrix
GJ-9-2011
QSC Form
Initials: GJM
Date: 7/6/2011 Time: 1047

s\QSC

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-6-2011	Gateway Pacific	GJP-10-2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
682975	1180768	53	f t	1	0 2 V V	916

Penetration						
Depth	Unit	Initials	Sulfide	VOA	Weather	Fines (%)
13	c m	GJM			Sunny light wind	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments: chemistry

AMEC-Geomatrix
GJP-10-2011
QSC Form
Initials: GJM
Date: 7/6/2011 Time: 916

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-8-2011	Gateway Pacific	GJP - 10-2011

Coordinates		Water Depth					Time
North	East	Depth	Unit		Rep	Gear	
682967	1180772	50	f	t	1	0 2 V V	945

Penetration							
Depth	Unit		Initials	Sulfide	VOA	Weather	Fines (%)
15	c	m	GM			cloudy light wind	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet (Wet) Moist Damp Dry

Color **(Circle major & underline modifying)**
Light (Medium) Dark Olive (Gray) Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
(Fine) Medium Coarse Gravel (Sand) Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose (Loose) Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet (Wet) Moist Damp Dry

Color **(Circle major & underline modifying)**
Light (Medium) Dark Olive (Gray) Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

in trauma
sample 1 & 2 taken from grab

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Initials:
Date: 7/8/2011 Time: 945

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7 - 8 - 2011	Gateway Pacific	GJP 10 2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
682977	1180770	50	f t	3	0 2 V V	~~1004~~ 1014

rep 2 reject

Penetration			Sulfide	VOA	Weather	Fines (%)
Depth	Unit	Initials				
15	c m	GSM			cloudy light wind	

Surficial Wood Estimate: 50

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color (Circle major & underline modifying)
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent (Circle major & underline modifying)
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color (Circle major & underline modifying)
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent (Circle major & underline modifying)
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:
Rep 2 poor penetration 1004
Rep 3 682976, 1180768 1014 good
in-tunnel sample 3 x 4 taken from grab

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QSC Form
Initials:
Date: 7/8/2011 Time: 1014

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-8-2011	Gateway Pacific	GJP 10 2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
682976	1180767	51	f t	4	0 2 V V	1031

Penetration Depth	Unit	Initials	Sulfide	VOA	Weather	Fines (%)
15	c m	GJM			cloudy light wind	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:
intumnce

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GJP-10-2011
QSC Form
Initials:
Date: 7/8/2011 Time: 1031

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-5-2011	Gateway Pacific	GJP-11-2011

Coordinates		Water Depth					Time
North	East	Depth	Unit		Rep	Gear	
682718	1181206	59	f	t	1	0 2 V V	1418

Penetration			Sulfide	VOA	Weather	Fines (%)
Depth	Unit	Initials				
15	c m	GJM			sunny calm	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

AMEC-Geomatrix
GJP-11-2011
QSC Form
Initials: GJM
Date: 7/5/2011 Time: 1418

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-4-2011	Gateway Pacific	GJ-12-2011

Coordinates		Water Depth					Time
North	East	Depth	Unit	Rep	Gear		
682471	1181927	55	f t	1	0 2 V V		1332

Penetration			Sulfide	VOA	Weather	Fines (%)
Depth	Unit	Initials				
13	c m	GJM			sunny calm	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

AMEC-Geomatrix
GJ-12-2011
QSC Form
Initials: GJM
Date: 7/7/2011 Time: 1332

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-4-2011	Gateway Pacific	GJ 13 2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
682470	1182217	45	f t	1	0 2 V V	1506

Penetration Depth	Unit	Initials	Sulfide	VOA	Weather	Fines (%)
	c m	GSM			sunny calm	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:
Rep 1 Rock in jaws - no sediment
Rep 2 1511 45 ft
REP 2 682472, 1182216 poor penetration 2-3 cm, not enough sediment
Rep 3 1520 42 ft 2 cm penetration
Rep 4 1534 42 ft 2 cm penetration

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-3-2011	Gateway Pacific	GJ-14-2011

Coordinates		Water Depth					Time
North	East	Depth	Unit		Rep	Gear	
682223	1182358	64	f	t	1	0 2 V V	1459

Penetration						
Depth	Unit	Initials	Sulfide	VOA	Weather	Fines (%)
15	c m	GSM			sunny	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics: choppy

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

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GJ-14-2011
QSC Form
Initials: GSM
Date: 7/3/2011 Time: 1459

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-3-2011	Gateway Pacific	GJ-15-2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
682222	1182653	53	f t		0 2 V V	1423

Penetration			Sulfide	VOA	Weather	Fines (%)
Depth	Unit	Initials				
16	c m	GJM			sunny choppy	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: Algae <5 % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

Piece of rope caught in anus

AMEC-Geomatrix
GJ-15-2011
QSC Form
Initials: GJM
Date: 7/3/2011 Time: 1423

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-2-2011	Gateway Pacific	GP-16-2010

Coordinates		Water Depth					Time
North	East	Depth	Unit		Rep	Gear	
608215	1183231	52	f	t		0 2 V V	1250

Penetration							
Depth	Unit		Initials	Sulfide	VOA	Weather	Fines (%)
24	c	m	GSM			sunny - calm	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: 0 % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

AMEC-Geomatrix
GP-16-2011
QSC Form
Initials: GSM
Date: 7/2/2011 Time: 1250

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-6-2011	Gateway Pacific	GJ-17-2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
683221	1179760	69	f t	1	0 2 V V	1242

Penetration Depth	Unit	Initials	Sulfide	VOA	Weather	Fines (%)
15	c m	GSM			sunny calm	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

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GJ-17-2011
QSC Form
Initials: GSM
Date: 7/6/2011 Time: 1242

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-6-2011	Gateway Pacific	GJ-18-2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
682976	1180478	61	f t	1	0 2 V V	944

Penetration						
Depth	Unit	Initials	Sulfide	VOA	Weather	Fines (%)
15	c m	GJM			sunny calm	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: Snails < 5 % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color (Circle major & underline modifying)
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent (Circle major & underline modifying)
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color (Circle major & underline modifying)
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent (Circle major & underline modifying)
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:
Thais sp snails & Hermit crab

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GJ-18-2011
QSC Form
Initials: GJM
Date: 7/6/2011 Time: 944

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-5-2011	Gateway Pacific	GJP 19 2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
682721	1180914	76	f t	1	0 2 V V	1453

Penetration			Sulfide	VOA	Weather	Fines (%)
Depth	Unit	Initials				
16	c m	GJM			sunny calm	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

AMEC-Geomatrix
GJP-19-2011
QSC Form
Initials: GJM
Date: 7/5/2011 Time: 1453

AMEC Geomatrix, Inc., 3500 188th St. SW, Suite 601, Lynnwood, WA 98037, (425) 921-4000

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-5-2011	Gateway Pacific	GJP 20 2011

Coordinates		Water Depth					Time
North	East	Depth	Unit	Rep	Gear		
682474	1181350	80	f t	1	0 2 V V		1320

Penetration			Sulfide	VOA	Weather	Fines (%)
Depth	Unit	Initials				
16	c m	GJM			Sunny calm	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

AMEC-Geomatrix
GJP-20-2011
QSC Form
Initials: GJM
Date: 7/5/2011 Time: 1320

Amin\Field Forms\QSC

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-5-2011	Gateway Pacific	DGJP-20-2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
682471	1181350	80	f t	1	02VV	1347

Penetration Depth	Unit		Initials	Sulfide	VOA	Weather	Fines (%)
16	c	m	GSM			sunny calm	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

AMEC-Geomatrix
DGJP-20-2011
QSC Form
Initials: GSM
Date: 7/5/2011 Time: 1347

AMEC Geomatrix, Inc., 3500 188th St. SW, Suite 601, Lynnwood, WA 98037, (425) 921-4000

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-4-2011	Gateway Pacific	GJP-21-2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
682470	1181637	68	f t		0 2 V V	1253

Penetration			Sulfide	VOA	Weather	Fines (%)
Depth	Unit	Initials				
16	c m	GJM			sunny calm	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

chemistry

AMEC-Geomatrix
GJP-21-2011
QSC Form
Initials: GJM
Date: 7/4/2011 Time: 1253

AMEC Geomatrix, Inc., 3500 188th St. SW, Suite 601, Lynnwood, WA 98037, (425) 921-4000

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-7-2011	Gateway Pacific	GJP 21 2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
682471	1181632	73	f t	1	0 2 V V	1359

Penetration			Sulfide	VOA	Weather	Fines (%)
Depth	Unit	Initials				
22	c m	GJM			cloudy light wind	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments: sample 1 and 2 taken from this grab

Intertidal

AMEC-Geomatrix
GJP-21-2011
QSC Form
Initials:
Date: 7/7/2011 Time: 1359

AMEC Geomatrix, Inc., 3500 188th St. SW, Suite 601, Lynnwood, WA 98037, (425) 921-4000

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-7-2011	Gateway Pacific	GJP - 21 - 2011

Coordinates		Water Depth					Time
North	East	Depth	Unit		Rep	Gear	
682479	1181637	70	f	t	2	0 2 V V	1426

Penetration							
Depth	Unit		Initials	Sulfide	VOA	Weather	Fines (%)
23	c	m	GSM			cloudy, moderate wind	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:
sample 3 + 4 taken from this grab
in tanna

AMEC-Geomatrix
GJP-21-2011
QSC Form
Initials:
Date: 7/___/2011 Time: 1426

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-7-2011	Gateway Pacific	GJP 21 2011

Coordinates		Water Depth					Time
North	East	Depth	Unit		Rep	Gear	
~~682474~~	~~1181638~~	70	f	t	~~3~~	0 2 V V	~~1453~~

Rep 3 Reject

Penetration Depth	Unit		Initials	Sulfide	VOA	Weather	Fines (%)
23	c	m	GPM			partly cloudy, moderate wind	

Surficial Wood Estimate: 4 1507

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color (Circle major & underline modifying)
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent (Circle major & underline modifying)
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color (Circle major & underline modifying)
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent (Circle major & underline modifying)
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

1453 Rep 3 - hit hole from previous grab - reject

1507 Rep 4 682469, 1181628

instance

AMEC-Geomatrix
GJP-21-2011
QSC Form
Initials:
Date: 7/7/2011 Time: 1507

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-4-2011	Gateway Pacific	GJP-22-2011

Coordinates		Water Depth					Time
North	East	Depth	Unit		Rep	Gear	
682222	1181781	80	f	t	1	02VV	1556

Penetration Depth	Unit		Initials	Sulfide	VOA	Weather	Fines (%)
17	c	m	GSM			sunny calm	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

AMEC-Geomatrix
GJP-22-2011
QSC Form
Initials: GSM
Date: 7/4/2011 Time: 1556

AMEC Geomatrix, Inc., 3500 188th St. SW, Suite 601, Lynnwood, WA 98037, (425) 921-4000

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-4-2011	Gateway Pacific	GJ-23-2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
682222	1182073	76	f t	1	0 2 V V	942

Penetration			Sulfide	VOA	Weather	Fines (%)
Depth	Unit	Initials				
16	c m	GSM			Sunny/calm	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

AMEC-Geomatrix
GJ-23-2011
QSC Form
Initials: GSM
Date: 7/4/2011 Time: 942

AMEC Geomatrix, Inc., 3500 188th St. SW, Suite 601, Lynnwood, WA 98037, (425) 921-4000

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-3-2011	Gateway Pacific	GP - 24 - 2011

Coordinates		Water Depth					Time
North	East	Depth	Unit		Rep	Gear	
618968	1181	83	f	t	1	0 2 V V	1255

Penetration							
Depth	Unit		Initials	Sulfide	VOA	Weather	Fines (%)
	c	m	GSM			sunny light wind	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments: water hard

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-3-2011	Gateway Pacific	GP 24 2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
1081965	1181928	84	f t	2	0 2 V V	1313

Penetration			Sulfide	VOA	Weather	Fines (%)
Depth	Unit	Initials				
16	c m	GSM			sunny choppy seas	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** shell <5 % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments: barnacle covered shell

AMEC-Geomatrix
GP-24-2011
QSC Form
Initials: GSM
Date: 7/3/2011 Time: 1313

Amin\Field Forms\QSC

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-3-2011	Gateway Pacific	GSP 25 2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
681969	1182225	75	f t	1	0 2 V V	1141

Penetration						
Depth	Unit	Initials	Sulfide	VOA	Weather	Fines (%)
	c m	GJM			Sunny light wind	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments: water hard

AMEC Geomatrix, Inc., 3500 188th St. SW, Suite 601, Lynnwood, WA 98037, (425) 921-4000

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-3-2011	Gateway Pacific	GJP 25 2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
6189164	11822224	75	f t	2	0 2 V V	1148

Penetration		Initials	Sulfide	VOA	Weather	Fines (%)
Depth	Unit					
16	c m					

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: 0 % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

AMEC-Geomatrix
GJP-25-2011
QSC Form
Initials: GSM
Date: 7/3/2011 Time: 1148

AMEC Geomatrix, Inc., 3500 188th St. SW, Suite 601, Lynnwood, WA 98037, (425) 921-4000

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-3-2011	Gateway Pacific	G5 -26-2011

Coordinates		Water Depth					Time
North	East	Depth	Unit		Rep	Gear	
681973	1182510	67	f	t	1	0 2 V V	1057

Penetration			Sulfide	VOA	Weather	Fines (%)
Depth	Unit	Initials				
	c m	GSM			sunny light wind	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments: water hard - no sediment

AMEC Geomatrix, Inc., 3500 188th St. SW, Suite 601, Lynnwood, WA 98037, (425) 921-4000

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-3-2011	Gateway Pacific	GJ 26 2011

Coordinates		Water Depth					Time
North	East	Depth	Unit		Rep	Gear	
681969	1182513	67	f	t	2	0 2 V V	1102

Penetration			Sulfide	VOA	Weather	Fines (%)
Depth	Unit	Initials				
18	c m	GSM			sunny light wind	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: 0 % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

AMEC-Geomatrix
GJ-26-2011
QSC Form
Initials: GSM
Date: 7/3/2011 Time: 1102

AMEC Geomatrix, Inc., 3500 188th St. SW, Suite 601, Lynnwood, WA 98037, (425) 921-4000

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-3-2011	Gateway Pacific	GP-27-2011

Coordinates		Water Depth					Time
North	East	Depth	Unit		Rep	Gear	
681720	1182365	80	f	t	1	0 2 V V	910

Penetration			Sulfide	VOA	Weather	Fines (%)
Depth	Unit	Initials				
17	c m	GSM				

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: clams 5 % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

AMEC-Geomatrix
GP-27-2011
QSC Form
Initials: GSM
Date: 7/3/2011 Time: 910

AMEC Geomatrix, Inc., 3500 188th St. SW, Suite 601, Lynnwood, WA 98037, (425) 921-4000

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-2-2011	Gateway Pacific	GP-28-2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
681466	1182218	81	f t	1	0 2 V V	1433

Penetration			Sulfide	VOA	Weather	Fines (%)
Depth	Unit	Initials				
24	c m	GSM			sunny - calm	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

AMEC-Geomatrix
GP-28-2011
QSC Form
Initials: GSM
Date: 7/2/2011 Time: 1433

AMEC Geomatrix, Inc., 3500 188th St. SW, Suite 601, Lynnwood, WA 98037, (425) 921-4000

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-2-2011	Gateway Pacific	GP 29 2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
6814466	1182507	70	f t	1	0 2 V V	1400

Penetration						
Depth	Unit	Initials	Sulfide	VOA	Weather	Fines (%)
23	c m	GSM			sunny - calm	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: 0 % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

AMEC-Geomatrix
GP-29-2011
QSC Form
Initials: GSM
Date: 7/2/2011 Time: 1400

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-2-2011	Gateway Pacific	GP 30 2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
681470	1182796	62	f t	1	0 2 V V	1326

Penetration		Initials	Sulfide	VOA	Weather	Fines (%)
Depth	Unit					
24	c m	GSM			sunny calm	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: 0 % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

AMEC-Geomatrix
GP-30-2011
QSC Form
Initials: GSM
Date: 7/2/2011 Time: 1326

AMEC Geomatrix, Inc., 3500 188th St. SW, Suite 601, Lynnwood, WA 98037, (425) 921-4000

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-2-11	Gateway Pacific	GP 31 2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
681215	1182653	69	f t	1	0 2 V V	1115

Penetration			Sulfide	VOA		Fines (%)
Depth	Unit	Initials			Weather	
25	c m					

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: None % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

AMEC-Geomatrix
GP-31-2011
QSC Form
Initials: GJM
Date: 7/2/2011 Time: 1115

s\QSC

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-2-2011	Gateway Pacific	GP-32-2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
681215	1182941	60	f t		0 2 V V	1150

Penetration						
Depth	Unit	Initials	Sulfide	VOA	Weather	Fines (%)
24	c m	GSM			Sunny calm	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: None % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: None % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

AMEC-Geomatrix
GP-32-2011
QSC Form
Initials: GSM
Date: 7/2/2011 Time: 1150

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-2-2011	Gateway Pacific	GL-33-2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
680950	1182807	69	f t	1	0 2 V V	1025

Penetration			Sulfide	VOA	Weather	Fines (%)
Depth	Unit	Initials				
25	c m	GSM			Sun	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: None % **Debris:** None % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: None. % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

AMEC-Geomatrix
GP-33-2011
QSC Form
Initials:
Date: 7/2/2011 Time: 1025

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-2-11	Gateway Pacific	GP-34-2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
680964	1183086	64	f t	1	0 2 V V	0856

Penetration			Sulfide	VOA	Weather	Fines (%)
Depth	Unit	Initials				
23	c m	GSM			sun	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: 0 % **Debris:** 0 % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet (Wet) Moist Damp Dry

Color **(Circle major & underline modifying)**
Light (Medium) Dark Olive (Gray) Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
(Fine) Medium Coarse Gravel Sand (Silt) Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft (Medium Stiff) Stiff Very Stiff Hard

Moisture
Very Wet Wet (Moist) Damp Dry

Color **(Circle major & underline modifying)**
Light Medium (Dark) Olive (Gray) Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand (Silt) Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: Polychaetes % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

AMEC-Geomatrix
GP-34-2011
QSC Form
Initials:
Date: 7/2/2011 Time: 856

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-6-2011	Gateway Pacific	GJ 35 2011

Coordinates		Water Depth					Time
North	East	Depth	Unit		Rep	Gear	
683223	1179465	88	f	t	1	02VV	1344

Penetration							
Depth	Unit		Initials	Sulfide	VOA	Weather	Fines (%)
15	c	m	GSM			sunny calm	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

AMEC-Geomatrix
GJ-35-2011
QSC Form
Initials: GSM
Date: 7/6/2011 Time: 1344

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-6-2011	Gateway Pacific	GJ 36 2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
682969	1180190	81	f t	1	02VV	1014

Penetration		Initials	Sulfide	VOA	Weather	Fines (%)
Depth	Unit					
15	c m				sunny light wind	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: Worm Tubes <5% **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

AMEC-Geomatrix
GJ-36-2011
QSC Form
Initials: GJM
Date: 7/6/2011 Time: 1014

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-5-2011	Gateway Pacific	GJP-37-2011

Coordinates		Water Depth					Time
North	East	Depth	Unit		Rep	Gear	
682722	1180622	88	f	t	1	0 2 V V	1528

Penetration			Sulfide	VOA	Weather	Fines (%)
Depth	Unit	Initials				
14	c m	GJM			sunny calm	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:
chemistry

AMEC-Geomatrix
GJP-37-2011
QSC Form
Initials: GJM
Date: 7/5/2011 Time: 1528

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-8-2011	Gateway Pacific	GJP 37 204

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
682724	1180619	92	f t	1	0 2 V V	1052

Penetration						
Depth	Unit	Initials	Sulfide	VOA	Weather	Fines (%)
24	c m	GSM			partly cloudy light wind	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

in tunnel

AMEC-Geomatrix
GJP-37-2011
QSC Form
Initials:
Date: 7/8/2011 Time: 1052

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-8-2011	Gateway Pacific	GJP 37 2011

Coordinates		Water Depth					Time
North	East	Depth	Unit		Rep	Gear	
682734	1180628	92	f	t	2	0 2 V V	1116

Penetration			Sulfide	VOA	Weather	Fines (%)
Depth	Unit	Initials				
	c m	GJM			partly cloudy light wind	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments: Intanna

AMEC-Geomatrix
GJP-37-2011
QSC Form
Initials:
Date: 7/8/2011 Time: 1116

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QUALITATIVE SAMPLE CHARACTERISTICS

Page 38 of ____

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-8-2011	Gateway Pacific	GJP 37 2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
682728	1180623	91	f t	3	0 2 V V	1138

Penetration						
Depth	Unit	Initials	Sulfide	VOA	Weather	Fines (%)
	c m	GJM			partly cloudy light wind	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: crabs tube worms % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:
intanna

AMEC-Geomatrix
GJP-37-2011
QSC Form
Initials:
Date: 7/8/2011 Time: 1138

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-5-2011	Gateway Pacific	GJP 38 2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
682472	1181061	96	f t	1	0 2 V V	1247

Penetration						
Depth	Unit	Initials	Sulfide	VOA	Weather	Fines (%)
17	c m	ESM			sunny calm	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: worm Tubes <5 % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

AMEC-Geomatrix
GJP-38-2011
QSC Form
Initials: ESM
Date: 7/5/2011 Time: 1247

Amin\Field Forms\QSC

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-5-2011	Gateway Pacific	GP-39-2011

Coordinates		Water Depth					Time
North	East	Depth	Unit		Rep	Gear	
682221	1181203	18	f	t		0 2 V V	1120

Penetration			Sulfide	VOA	Weather	Fines (%)
Depth	Unit	Initials				
16	c m	GJM			sunny calm	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace 1/2 to 1 in
~~Fine~~ Medium Coarse Gravel ~~Sand~~ ~~Silt~~ Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

AMEC-Geomatrix
GP-39-2011
QSC Form
Initials: GJM
Date: 7/5/2011 Time: 1120

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QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-5-2011	Gateway Pacific	GP-40-2011

Coordinates		Water Depth					Time
North	East	Depth	Unit		Rep	Gear	
682218	1181494	96	f	t		0 2 V V	1045

Penetration							
Depth	Unit		Initials	Sulfide	VOA	Weather	Fines (%)
15	c	m	GSM			sunny calm	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace 1-2"+
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** Shell <5 % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

AMEC-Geomatrix
GP-40-2011
QSC Form
Initials: SSM
Date: 7/5/2011 Time: 1045

Amin\Field Forms\QSC

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-3-2011	Gateway Pacific	GP-41-2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
681965	1181636	95	f t		0 2 V V	1351

Penetration			Sulfide	VOA	Weather	Fines (%)
Depth	Unit	Initials				
17	c m	GSM			Sunny choppy	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: 0 % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

AMEC-Geomatrix
GP-41-2011
QSC Form
Initials: GSM
Date: 7/3/2011 Time: 1351

Amin\Field Forms\QSC

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-3-2011	Gateway Pacific	GP 42 2011

Coordinates		Water Depth					Time
North	East	Depth	Unit		Rep	Gear	
681720	1181786	95	f	t	1	0 2 V V	1023

Penetration			Sulfide	VOA	Weather	Fines (%)
Depth	Unit	Initials				
17	c m	GSM			PC light wind	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

AMEC-Geomatrix
GP-42-2011
QSC Form
Initials: GSM
Date: 7/3/2011 Time: 1023

Amin\Field Forms\QSC

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-3-2011	Gateway Pacific	GP-43-2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
681720	1182072	86	f t		0 2 V V	945

Penetration						
Depth	Unit	Initials	Sulfide	VOA	Weather	Fines (%)
16	c m	CSR			PC-Hwind	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: 0 % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

AMEC-Geomatrix
GP-43-2011
QSC Form
Initials: GM
Date: 7/3/2011 Time: 945

AMEC Geomatrix, Inc., 3500 188th St. SW, Suite 601, Lynnwood, WA 98037, (425) 921-4000

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-6-2011	Gateway Pacific	GJ 44 2011

Coordinates		Water Depth					Time
North	East	Depth	Unit		Rep	Gear	
682974	1179900	99	f	t	1	0 2 V V	1214

Penetration		Initials	Sulfide	VOA	Weather	Fines (%)
Depth	Unit					
13	c m	GSM			sunny light wind	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

AMEC-Geomatrix
GJ-44-2011
QSC Form
Initials: GSM
Date: 7/6/2011 Time: 1214

AMEC Geomatrix, Inc., 3500 188th St. SW, Suite 601, Lynnwood, WA 98037, (425) 921-4000

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-5-2011	Gateway Pacific	GJ-45-2011

Coordinates		Water Depth					Time
North	East	Depth	Unit		Rep	Gear	
682721	1180335	110	f	t	1	0 2 V V	846

Penetration			Sulfide	VOA	Weather	Fines (%)
Depth	Unit	Initials				
16	c m	GSM			Sunny calm	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

chemistry

AMEC-Geomatrix
GJ-45-2011
QSC Form
Initials: GSM
Date: 7/5/2011 Time: 846

Amin\Field Forms\QSC

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-8-2011	Gateway Pacific	GJ 45 2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
682719	1180330	111	f t	1	02VV	1236

Penetration Depth	Unit	Initials	Sulfide	VOA	Weather	Fines (%)
23	c m	GJM			partly cloudy light wind	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

intanna

AMEC-Geomatrix
GJ-45-2011
QSC Form
Initials:
Date: 7/8/2011 Time: 1236

AMEC Geomatrix, Inc., 3500 188th St. SW, Suite 601, Lynnwood, WA 98037, (425) 921-4000

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-8-2011	Gateway Pacific	GJ 45 2011

Coordinates		Water Depth				Time
North	East	Depth	Unit	Rep	Gear	
682725	1180333	109	f t	2	0 2 V V	1300

Penetration						
Depth	Unit	Initials	Sulfide	VOA	Weather	Fines (%)
	c m	GSM			partly cloudy light wind	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: trace tube worms % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

intanna

AMEC-Geomatrix
GJ-45-2011
QSC Form
Initials:
Date: 7/8/2011 Time: 1300

AMEC Geomatrix, Inc., 3500 188th St. SW, Suite 601, Lynnwood, WA 98037, (425) 921-4000

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-8-2011	Gateway Pacific	GJ 45 2011

Coordinates		Water Depth					Time
North	East	Depth	Unit		Rep	Gear	
682729	1180332	107	f	t	3	02VV	1319

Penetration			Sulfide	VOA	Weather	Fines (%)
Depth	Unit	Initials				
	c m	GSM			partly cloudy light wind	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: trace tube worm % **Debris:** trace shell debris % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

in tanner

AMEC-Geomatrix
GJ-45-2011
QSC Form
Initials:
Date: 7/8/2011 Time: 1319

Amin\Field Forms\QSC

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-5-2011	Gateway Pacific	GP 46 2011

Coordinates		Water Depth					Time
North	East	Depth	Unit		Rep	Gear	
682467	1180769	113	f	t	1	0 2 V V	1151

Penetration		Initials	Sulfide	VOA	Weather	Fines (%)
Depth	Unit					
16	c m	GSM			sunny calm	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand ~~Silt~~ Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

AMEC-Geomatrix
GP-46-2011
QSC Form
Initials: GSM
Date: 7/5/2011 Time: 1151

Amin\Field Forms\QSC

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
Washington State Plane, NAD 83, N Zone, Survey Ft	7-6-2011	Gateway Pacific	GJ 47 2011

Coordinates		Water Depth					Time
North	East	Depth	Unit		Rep	Gear	
682974	1179613	119	f	t	1	02VV	1311

Penetration							
Depth	Unit		Initials	Sulfide	VOA	Weather	Fines (%)
16	c	m	GJM			sunny calm	

Surficial Wood Estimate:

Contact Points _____ X 5 = _____ %

Surficial sediment characteristics:

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture
Very Wet Wet Moist Damp Dry

Color **(Circle major & underline modifying)**
Light Medium Dark Olive Gray Brown Black Other _____

Major Constituent **(Circle major & underline modifying)**
Fine Medium Coarse Gravel Sand Silt Clay _____

Minor Constituent with trace
Fine Medium Coarse Gravel Sand Silt Clay _____

Biological: _____ % **Debris:** _____ % **Oil Sheen:** None Trace (<5%) _____ %

Comments:

AMEC-Geomatrix
GJ-47-2011
QSC Form
Initials: GJM
Date: 7/5/2011 Time: 1311

AMEC Geomatrix, Inc., 3500 188th St. SW, Suite 601, Lynnwood, WA 98037, (425) 921-4000

APPENDIX C

Data Quality Review and Validation Report

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DATA QUALITY REVIEW AND VALIDATION REPORT SEDIMENT AND WATER SAMPLES, JULY 2011

Gateway Pacific Terminal

Whatcom County, Washington

Prepared for:

Pacific International Terminals, Inc.
1131 SW Klickitat Way
Seattle, Washington 98134

Prepared by:

AMEC Environment & Infrastructure, Inc.
11810 North Creek Parkway N
Bothell, Washington 98011
(425) 368-1000

December 2011

Project No. 0-915-15338-C

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TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 SUMMARY OF FINDINGS 4
- 2.1 COMPLETENESS 4
- 2.2 SENSITIVITY 4
- 2.3 ACCURACY 5
- 2.4 PRECISION 5
- 2.5 REPRESENTATIVENESS 5
- 2.6 COMPARABILITY 5

3.0 DATA QUALITY REVIEW AND VALIDATION METHODOLOGY 6

4.0 CHAIN OF CUSTODY AND SAMPLE RECEIPT CONDITION DOCUMENTATION 40

5.0 SPECIFIC DATA QUALITY REVIEW AND VALIDATION FINDINGS FOR EACH ANALYTICAL METHOD 40
- 5.1 VOLATILE ORGANIC ANALYSES 40
  - 5.1.1 Holding times 40
  - 5.1.2 Reporting Limits 41
  - 5.1.3 Initial and Continuing Calibrations 41
  - 5.1.4 Blanks 41
  - 5.1.5 Accuracy and Precision 41
- 5.2 SEMIVOLATILE ORGANIC ANALYSES 41
  - 5.2.1 Holding times 42
  - 5.2.2 Reporting Limits 42
  - 5.2.3 Initial and Continuing Calibrations 42
  - 5.2.4 Blanks 43
  - 5.2.5 Accuracy and Precision 43
- 5.3 PCBS 44
  - 5.3.1 Holding times 44
  - 5.3.2 Reporting Limits 44
  - 5.3.3 Initial and Continuing Calibrations 45
  - 5.3.4 Blanks 45
  - 5.3.5 Accuracy and Precision 45
- 5.4 PESTICIDES 46
  - 5.4.1 Holding times 46
  - 5.4.2 Reporting Limits 46
  - 5.4.3 Initial and Continuing Calibrations 46
  - 5.4.4 Blanks 46
  - 5.4.5 Accuracy and Precision 47
- 5.5 TRIBUTYLTIN 47
  - 5.5.1 Holding times 48
  - 5.5.2 Reporting Limits 48
  - 5.5.3 Initial and Continuing Calibrations 48
  - 5.5.4 Blanks 48
  - 5.5.5 Accuracy and Precision 48
- 5.6 METALS 49
  - 5.6.1 Holding times 49
  - 5.6.2 Reporting Limits 49

5.6.3 Initial and Continuing Calibrations 49
5.6.4 Blanks 49
5.6.5 Accuracy and Precision 49
5.7 CONVENTIONAL ANALYSES 50
5.7.1 Holding times 50
5.7.2 Reporting Limits 50
5.7.3 Blanks 50
5.7.4 Accuracy and Precision 51
5.8 GRAIN-SIZE DISTRIBUTION 51
6.0 REFERENCES 51
7.0 LIMITATIONS 52

TABLES

Table 1 Field Samples Submitted to Analytical Resources, Inc. 2
Table 2 Volatile Organics Data for Sediment Samples 2
Table 3 PAH Data for Sediment Samples 7
Table 4 Semivolatile Organics in Sediment Samples 12
Table 5 PCB Data for Sediment Samples 19
Table 6 Pesticides Data for Sediment Samples 23
Table 7 Metals and Tributyltin Data for Sediment Samples 31
Table 8 Conventional Sediment Quality Data 35
Table 9 Semivolatile Organic Compounds in Water Samples 38
Table 10 PCB Results for Water Samples 39
Table 11 Pesticide Results for Water Samples 39
Table 12 Metals Data for Water Samples 40

ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
%R	percent recovery
mg/kg	micrograms per kilogram
µg/L	micrograms per liter
ARI	Analytical Resources, Inc.
BEHP	bis(2-ethylhexyl) phthalate
BS	blank spikes
CCC	continuing calibration check compound
CLP	contract laboratory program
CSL	Cleanup Screening Level
DDT	dichlorodiphenyltrichloroethane
DDE	dichlorodiphenyldichloroethylene
EPA	U.S. Environmental Protection Agency
ID	sample identification
IS	internal standard
LAET	Lowest apparent effects threshold
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
mg/kg	milligrams per kilogram
MS	matrix spike
MSD	matrix-spike duplicate
PAH	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
Pesticides	organochlorine pesticides
QA	quality assurance
QC	quality control
RL	reporting limit
RPD	relative percent difference
RSD	relative standard deviation
SAPA	Sediment Sampling and Analysis Plan Appendix
SDG	sample delivery group
SIM	selected ion monitoring
SQS	Sediment Quality Standards
SVOCs	semivolatile organic compounds
TCE	trichloroethene
VOCs	volatile organic compounds
WAC	Washington Administrative Code

EPA DATA QUALIFIERS

U Analyte was not detected at or below the associated reporting limit concentration.

J The analyte was positively identified, and the associated numerical value is the approximate concentration of the analyte in the sample (due either because the concentration was below the reporting limit or because of minor deviations from certain quality control criteria).

UJ The compound or analyte was analyzed for but not detected. The associated sample detection limit is an estimated value.

NJ Analyte is tentatively identified and the associated numerical value represents an approximate concentration.

R Data validation indicates the result is not usable because of major deficiencies in quality control results. The analyte may or may not be present. Result is rejected.

REASON CODES FOR QUALIFICATIONS APPLIED

B The analyte was detected in a blank; the level in the sample is likely attributable to background contamination and has been qualified to be nondetected.

C Calibration variance.

F Variability in results for field duplicates.

M Matrix spike recoveries are outside of control limits.

N 4,4'- dichlorodiphenyltrichloroethane (DDT) breakdown to 4,4'-dichlorodiphenyldichloroethylene (DDE) exceeded 15 percent.

P Results from dual column analyses (pesticides and Aroclors) differed significantly; reported value may be biased but direction of bias cannot be determined.

S Surrogate recoveries below control limit.

Y Reporting limit elevated due to Interferences.

EXPLANATION OF DATA QUALITY INDICATORS

Data quality indicators of the validation process are defined below.

Laboratory Control Sample Recoveries

Laboratory control samples (LCSs) and laboratory control sample duplicates (LCSDs) are aliquots of analyte-free water or clean solid matrix that are spiked with the analytes of interest for an analytical method or a representative subset of those analytes. The spiked water or sand is then processed through the same extraction, concentration, cleanup, and analytical procedures as the samples they accompany. LCS recovery and precision are an indication of the ability of a laboratory to successfully perform an analytical method in an interference-free matrix.

Matrix-Spike Recoveries

Matrix spikes (MSs) and MS duplicates (MSDs) are prepared by adding known amounts of the analytes of interest for an analytical method, or a representative subset of those analytes, to an aliquot of sample. The spiked sample is then processed through the same extraction, concentration, cleanup, and analytical procedures as the unspiked samples in an analytical batch.

MS recovery and precision are an indication of the ability of a laboratory to successfully recover an analyte in the matrix of a specific sample or closely related sample matrices. It is important not to apply MS results for any specific sample to other samples without understanding how the sample matrices are related.

Blank Samples

Blank samples are aliquots of water that are used as negative controls to verify that the sample collection, storage, preparation, and analysis system does not produce false positive results. Two types of blanks were employed for this project.

- Laboratory blanks are aliquots of analyte-free water or clean solid matrix (such as Ottawa sand) that are processed by the laboratory using exactly the same procedures as the field samples. Laboratory blanks are used to monitor for contamination introduced by the laboratory during sample preparation and analysis.
- Trip blanks are aliquots of analyte-free water that originate at the laboratory and accompany bottles and samples to and from the field. Trip blanks are used to monitor possible sources of contamination of a sample that may be related to shipping and sample handling procedures. Trip blanks for this project were analyzed for EPA SW-846 Method 8260B, only.

Target analytes should not be detected in blank samples. When target analytes are detected in blanks, analyte concentrations in associated samples greater than the reporting limit (RL) but less than 5 times the concentration detected in the blank, or 10 times the concentration detected in the blank for common laboratory contaminants, will be qualified by AMEC as not detected. Analyte concentrations between the instrument detection limit or method detection limit and RL, and less than 5 times (or again, 10 times for common lab contaminants), the concentration detected in the blank will be qualified as not detected at the RL concentration.

Internal Standard Recoveries

Internal standards (ISs) are compounds that are added to a sample extract after all preparatory steps are completed and before instrumental analysis. These compounds serve as standards for qualitative analysis using relative retention time and quantitative analysis using relative response factors. Methods that use IS calibration include requirements for changes in response to the IS relative to the daily calibration.

Surrogate Spike Recoveries

Surrogate spikes are used to evaluate accuracy, method performance, and extraction efficiency in each individual sample. Surrogate compounds are compounds not normally found in environmental samples, but are similar to target analytes in chemical composition and behavior in the analytical process.

1.0 INTRODUCTION

This data validation report covers 45 sediment samples, 2 water samples, and 3 aqueous trip blanks from the Gateway Pacific Terminal in Whatcom County, Washington. AMEC collected the samples between July 2 and July 22, 2011, and submitted them to Analytical Resources, Inc. (ARI), Tukwila, Washington. A list of these samples by field sample identification (ID) and ARI sample delivery group (SDG) number is presented in Table 1. Analyses performed on these samples are listed below:

- Selected volatile organic compounds (VOCs) by U.S. Environmental Protection Agency (EPA) SW-846 Method 8260B;
- Selected semivolatile organic compounds (SVOCs) by EPA SW-846 Method 8270C;
- Polychlorinated biphenyls (PCBs) by EPA SW-846 Method 8082;
- Organochlorine pesticides by EPA SW-846 Method 8081A;
- Selected metals by EPA SW-846 Methods 6010B/7470A/7471A;
- Tributyltin by the Krone Method;
- Sulfides by EPA Method 376.2;
- Total organic carbon by the Plumb Method (1981);
- Nitrogen as ammonia by EPA Method 350.1;
- Total solids and preserved total solids by EPA Method 160.3;
- Total volatile solids by EPA Method 160.4; and
- Grain-size distribution.

Validated data for these analyses are presented in Tables 2 through 12.

Table 1 Field Samples Submitted to Analytical Resources, Inc.

ARI Sample Delivery Group			
TD03	**TD20**	**TD44**	**TE87**
GP-16-2011	GJP-1-2011	GJ-7-2011	RS-1
GP-28-2011	GJP-4-2011	GJ-8-2011	RS-2
GP-29-2011	GJP-5-2011	GJ-9-2011	
GP-30-2011	GJP-6-2011	GJP-10-2011	
GP-31-2011	GJ-12-2011	GJP-11-2011	
GP-32-2011	GJ-14-2011	GJ-17-2011	
GP-33-2011	GJ-15-2011	GJ-18-2011	
GP-34-2011	GJP-21-2011	GJP-19-2011	
	GJP-22-2011	GJP-20-2011	
	GJ-23-2011	DGJP-20-2011	
	GP-24-2011	GJ-35-2011	
	GJP-25-2011	GJ-36-2011	
	GJ-26-2011	GJP-37-2011	
	GP-27-2011	GJP-38-2011	
	GP-41-2011	GP-39-2011	
	GP-42-2011	GP-40-2011	
	GP-43-2011	GJ-44-2011	
		GJ-45-2011	
		GP-46-2011	
		GJ-47-2011	

Abbreviations
ARI: Analytical Resources, Inc.

Table 2 Volatile Organics Data for Sediment Samples

Analyte	Units	GJP-1		GJP-4		GJP-5		GJP-6		GJ-7		GJ-8	
Trichloroethene	(µg/kg)	0.90	U	0.90	U	1.00	U	1.00	U	0.90	U	1.00	U
Tetrachloroethene	(µg/kg)	0.90	U	0.90	U	1.00	U	1.00	U	0.90	U	1.00	U
Ethylbenzene	(µg/kg)	0.90	U	0.90	U	1.00	U	1.00	U	0.90	U	1.00	U
Total Xylenes	(µg/kg)	1.80	U	1.80	U	2.00	U	2.00	U	1.80	U	2.00	U

Analyte	Units	GJ-9		GJP-10		GJP-11		GJ-12		GJ-14		GJ-15	
Trichloroethene	(µg/kg)	0.90	U	0.90	U	1.00	U	1.20	U	1.30	U	1.30	U
Tetrachloroethene	(µg/kg)	0.90	U	0.90	U	1.00	U	1.20	U	1.30	U	1.30	U
Ethylbenzene	(µg/kg)	0.90	U	0.90	U	1.00	U	1.20	U	1.30	U	1.30	U
Total Xylenes	(µg/kg)	1.80	U	1.80	U	2.00	U	2.40	U	2.60	U	2.50	U

Analyte	Units	GP-16		GJ-17		GJ-18		GJP-19		GJP-20		GJP-20D	
Trichloroethene	(µg/kg)	1.50	U	1.00	U	0.90	U	1.10	U	1.10	U	1.20	U
Tetrachloroethene	(µg/kg)	1.50	U	1.00	U	0.90	U	1.10	U	1.10	U	1.20	U
Ethylbenzene	(µg/kg)	1.50	U	1.00	U	0.90	U	1.10	U	1.10	U	1.20	U
Total Xylenes	(µg/kg)	2.90	U	2.00	U	1.90	U	2.20	U	2.30	U	2.40	U

Analyte	Units	GJP-21		GJP-22		GJ-23		GP-24		GJP-25		GJ-26	
Trichloroethene	(µg/kg)	1.20	U	1.50	U	1.50	U	1.50	U	1.50	U	1.50	U
Tetrachloroethene	(µg/kg)	1.20	U	1.50	U	1.50	U	1.50	U	1.50	U	1.50	U
Ethylbenzene	(µg/kg)	1.20	U	1.50	U	1.50	U	1.50	U	1.50	U	1.50	U
Total Xylenes	(µg/kg)	2.40	U	3.00	U	3.00	U	3.00	U	2.90	U	3.00	U

Analyte	Units	GP-27		GP-28		GP-29		GP-30		GP-31		GP-32	
Trichloroethene	(µg/kg)	1.50	U	1.40	U	1.40	U	1.50	U	1.40	U	1.50	U
Tetrachloroethene	(µg/kg)	1.50	U	1.40	U	1.40	U	1.50	U	1.40	U	1.50	U
Ethylbenzene	(µg/kg)	1.50	U	1.40	U	1.40	U	1.50	U	1.40	U	1.50	U
Total Xylenes	(µg/kg)	3.00	U	2.70	U	2.90	U	3.00	U	2.80	U	2.90	U

Analyte	Units	GP-33		GP-34		GJ-35		GJ-36		GJP-37		GJP-38	
Trichloroethene	(µg/kg)	1.50	U	1.40	U	1.00	U	1.00	U	1.10	U	1.20	U
Tetrachloroethene	(µg/kg)	1.50	U	1.40	U	1.00	U	1.00	U	1.10	U	1.20	U
Ethylbenzene	(µg/kg)	1.50	U	1.40	U	1.00	U	1.00	U	1.10	U	1.20	U
Total Xylenes	(µg/kg)	2.90	U	2.80	U	2.00	U	2.10	U	2.20	U	2.40	U

Analyte	Units	GP-39		GP-40		GP-41		GP-42		GP-43		GJ-44	
Trichloroethene	(µg/kg)	1.40	U	1.40	U	1.50	U	1.40	U	1.40	U	1.00	U
Tetrachloroethene	(µg/kg)	1.40	U	1.40	U	1.50	U	1.40	U	1.40	U	1.00	U
Ethylbenzene	(µg/kg)	1.40	U	1.40	U	1.50	U	1.40	U	1.40	U	1.00	U
Total Xylenes	(µg/kg)	2.90	U	2.70	U	2.90	U	2.80	U	2.90	U	2.00	U

Analyte	Units	GJ-45		GP-46		GJ-47	
Trichloroethene	(µg/kg)	1.10	U	1.30	U	1.10	U
Tetrachloroethene	(µg/kg)	1.10	U	1.30	U	1.10	U
Ethylbenzene	(µg/kg)	1.10	U	1.30	U	1.10	U
Total Xylenes	(µg/kg)	2.20	U	2.60	U	2.20	U

Notes
1. Validation qualifier code: U = Nondetected - value shown is the laboratory reporting limit.

Abbreviations
µg/kg = micrograms per kilogram

2.0 SUMMARY OF FINDINGS

Analyses were conducted in compliance with the cited methods and with specific requirements of the *2011 Sediment Implementation Work Plan, Gateway Pacific Terminal* (Work Plan) (AMEC, 2011). Laboratory quality assurance measures were implemented and indicate acceptable accuracy and precision for analyses on samples as submitted. With limited qualifications, results are valid as reported.

It should be noted that the moisture content of the samples ranged from approximately 10 percent to over 50 percent. All results are reported on a dry weight basis, and no information is available to discriminate between sediment-phase and aqueous-phase concentrations of the various constituents. While data have not been qualified as estimated for this reason, it should be understood that reported results for the actual sediment concentrations may be biased high if appreciable levels are present in the aqueous phase.

A limited number of data points have been qualified as estimated or as nondetected with elevated reporting limits due to minor deviations from quality control limits. These qualifications do not limit the usability of the data for project purposes.

All data were evaluated for precision, accuracy, completeness, representativeness, and comparability with respect to project data quality objectives.

2.1 COMPLETENESS

Completeness is defined as the percentage of usable data in the total data population generated. No data have been rejected during validation due to quality control issues. Two reported non-detections of Aldrin (samples GJ-18-2011 and GJ-36-2011) failed to meet project requirements for sensitivity and cannot be used to demonstrate compliance with applicable standards. All other data are usable for project objectives and data completeness is greater than 99 percent.

2.2 SENSITIVITY

Method sensitivity is defined as the degree to which any compound can be detected within specific confidence criteria. Laboratory reporting limits were generally consistent with the reporting limits presented in the Work Plan and with limited exceptions demonstrated compliance with the reporting limits specified in the Work Plan. Reporting limits were also evaluated with respect to regulatory standards identified in the Work Plan, including the Washington State Sediment Management Standards, Sediment Quality Standards (SQS); the Sediment Management Standards Cleanup Screening Levels (CSLs) (WAC 173-204-520); and the lowest apparent effects threshold (LAET) values.

2.3 ACCURACY

Accuracy is the degree of agreement between a measurement and the “true” or accepted value. Accuracy is quantitatively assessed based on the percent recovery in the matrix spikes (MS), laboratory control samples (LCSs), and surrogate compounds. Accuracy is dependent on the quality of the instrument calibration as well as the efficiency of sample extraction and preparation steps. Field and laboratory blanks are evaluated to avoid false positives or bias to reported results.

Results reported by ARI below their nominal reporting limits have been qualified as estimated (J). Accuracy cannot be evaluated below the calibration range of the analysis.

Accuracy criteria of the Work Plan were satisfied with limited minor exceptions that do not affect data usability for project purposes.

2.4 PRECISION

Precision is defined as the degree of agreement between or among independent, similar, or repeated measures. Precision is expressed in terms of analytical variability. For this project, analytical variability was measured as the relative percent difference (RPD) between analytical laboratory duplicates and between the MS and MS duplicate (MSD) analyses, and sample collection variability was measured by analysis of blind field-duplicate samples.

Precision criteria as detailed in the Work Plan were satisfied with minor exceptions.

2.5 REPRESENTATIVENESS

Representativeness is a qualitative measure of the degree to which sample data accurately and precisely represent a characteristic environmental condition. The sampling and analysis approach and rationale detailed in the Work Plan were developed to ensure that results, if valid, would be representative of site conditions. The validity of the data as reported supports the representativeness objective.

2.6 COMPARABILITY

Comparability is a qualitative measure of the degree to which data from one study can be compared with data from other similar studies, reference values (such as background), reference materials, and screening values. Comparability for the project has been achieved by using standard techniques to collect and analyze representative samples and reporting analytical results in appropriate units. All analyses were conducted in accordance with established EPA or other reference methods.

3.0 DATA QUALITY REVIEW AND VALIDATION METHODOLOGY

This data quality review and validation has been performed by AMEC as specified in the Work Plan and in accordance with the requirements of the Washington State Department of Ecology *Sediment Sampling and Analysis Plan Appendix* (SAPA; Ecology, 2008).

One hundred percent of the data were reviewed for the following parameters:

- chain of custody and sample receipt records;
- completeness of data for requested analyses by specified methods;
- compliance with specified holding time requirements;
- consistency of reporting limits with those specified in the Work Plan;
- calibration and instrument performance, including instrument stability as monitored by continuing calibrations;
- presence or absence of laboratory contamination as demonstrated by laboratory and trip blanks;
- accuracy and bias as demonstrated by recovery of surrogate spikes, internal standards, blank spikes, and matrix spikes; and
- analytical precision as RPD of analyte concentration between replicate samples, such as field duplicates and laboratory duplicates, including MS and MSD samples and LCS and LCS duplicates (LCSD).

Data were evaluated with respect to reporting limits and quality objectives for each method as detailed in Tables 3 through 11 of the Work Plan.

EPA guidance documents for organic data review (EPA, 2008) and for inorganic data review (EPA, 2010) were followed as appropriate for qualification of data. These EPA guidelines were written specifically for the Contract Laboratory Program (CLP), and have been modified for the purposes of this data validation report where they differ from quality control requirements given in EPA Method SW-846 (EPA, 2008) or the Work Plan requirements. In the absence of Work Plan criteria and EPA guidance, laboratory historical control limits were applied for evaluation.

In general, it is important to recognize that no analytical data can be guaranteed to be correct, even if all quality control (QC) measures indicate acceptable results. Strict QC serves to increase confidence in data, but any reported value may potentially contain error.

Table 3 PAH Data for Sediment Samples

All concentrations are in micrograms per kilogram (µg/kg)

Analyte	GJP-1		GJP-4		GJP-5		GJP-6		GJ-7		GJ-8	GJ-9		GJP-10		GJP-11		GJ-12		GJ-14	
Total LPAH	18	U	19	U	24		16	J	12	J	7630	18	U	30		20		53		112	
Naphthalene	18	U	19	U	19	U	18	U	19	U	210	18	U	19	U	19	U	12	J	18	J
Acenaphthylene	18	U	19	U	19	U	18	U	19	U	610	18	U	19	U	19	U	19	U	20	U
Acenaphthene	18	U	19	U	19	U	18	U	19	U	130	18	U	19	U	19	U	19	U	20	U
Fluorene	18	U	19	U	19	U	18	U	19	U	580	18	U	19	U	19	U	19	U	12	J
Phenanthrene	18	U	19	U	24		16	J	12	J	5200	18	U	30		20		41		70	
Anthracene	18	U	19	U	19	U	18	U	19	U	900	18	U	19	U	19	U	19	U	12	J
2-Methylnaphthalene	18	U	19	U	11	J	18	U	19	U	67	18	U	19	U	19	U	20		28	
Total HPAH	11	J	9.4	J	173		59		50		21740	11		135		49		222		436	
Fluoranthene	18	U	19	U	36		15	J	16	J	5400	18	U	30		17	J	46		77	
Pyrene	18	U	19	U	37		14	J	15	J	4900	11	J	31		16	J	44		93	
Benz[a]anthracene	18	U	19	U	13	J	18	U	19	U	1600	18	U	12	J	19	U	20		30	
Chrysene	18	U	19	U	20		13	J	19	U	1700	18	U	15	J	19	U	32		47	
Benzofluoranthenes	11	J	9.4	J	31		17	J	19		3100	18	U	25		16	J	43		88	
Benzo[a]pyrene	18	U	19	U	17	J	18	U	19	U	1800	18	U	12	J	19	U	22		38	
Indeno[1,2,3-c,d]pyrene	18	U	19	U	9.3	J	18	U	19	U	1500	18	U	19	U	19	U	19	U	25	
Dibenzo[a,h]anthracene	4.6	U	5	U	4.7	U	4.6	U	4.7	U	340	4.5	U	4.7	U	4.8	U	4.7	U	8.3	
Benzo[g,h,i]perylene	18	U	19	U	10	J	18	U	19	U	1400	18	U	10	J	19	U	15	J	30	

Analyte	GJ-15		GP-16		GJ-17		GJ-18		GJP-19		GJP-20		GJP-20D		GJP-21		GJP-22		GJ-23		GP-24	
Total LPAH	114		61		1505		13	J	13	J	27		35		31		83		124		115	
Naphthalene	18		15	J	25		18	U	19	U	19	U	20	U	19	U	19		22		25	
Acenaphthylene	18	U	19	U	120		18	U	19	U	19	U	20	U	19	U	19	U	20	U	19	U
Acenaphthene	18	U	19	U	20		18	U	19	U	19	U	20	U	19	U	19	U	20	U	19	U
Fluorene	12	J	19	U	170		18	U	19	U	19	U	20	U	19	U	19	U	13	J	13	J
Phenanthrene	70		46		990		13	J	13	J	27		35		31		64		78		80	
Anthracene	14	J	19	U	180		18	U	19	U	19	U	20	U	19	U	19	U	11	J	10	J
2-Methylnaphthalene	29		22		11	J	18	U	19	U	13	J	14	J	15	J	32		36		41	
Total HPAH	415		256		2674		44		19		94		205		116		273		359		369	
Fluoranthene	76		50		670		14	J	19	U	23		36		30		53		69		70	
Pyrene	66		48		650		16	J	19	U	21		34		24		49		65		68	
Benz[a]anthracene	32		23		220		18	U	19	U	19	U	17	J	10	J	22		26		26	
Chrysene	58		30		230		18	U	19	U	17	J	24		16	J	33		52		44	
Benzofluoranthenes	88		56		360		14	J	19		23		43		25		55		69		80	
Benzo[a]pyrene	33		29		240		18	U	19	U	19	U	19	J	11	J	23		29		33	
Indeno[1,2,3-c,d]pyrene	24		15	J	130		18	U	19	U	19	U	14	J	19	U	14	J	21		20	
Dibenzo[a,h]anthracene	8.2		5.2		34		4.5	U	4.8	U	5	U	5.0	U	4.7	U	5.2		4.7	U	6.0	
Benzo[g,h,i]perylene	30		19	U	140		18	U	19	U	10	J	18	J	19	U	19		28		22	

Analyte	GJP-25		GJ-26		GP-27		GP-28		GP-29		GP-30		GP-31		GP-32		GP-33		GP-34		GJ-35	
Total LPAH	97		147		115		84		69		49		64		53		54		39		583	
Naphthalene	20		25		21		18	J	18	J	13	J	15	J	14	J	16	J	11	J	13	J
Acenaphthylene	19	U	20	U	19	U	20	U	20	U	20	U	20	U	20	U	19	U	20	U	31	
Acenaphthene	19	U	20	U	19	U	20	U	20	U	20	U	20	U	20	U	19	U	20	U	23	
Fluorene	12	J	15	J	14	J	12	J	20	U	20	U	20	U	20	U	19	U	20	U	42	
Phenanthrene	65		95		70		54		51		36		49		39		38		28		390	
Anthracene	19	U	12	J	10	J	20	U	20	U	20	U	20	U	20	U	19	U	20	U	84	
2-Methylnaphthalene	37		43		36		29		29		20		25		22		29		20		10	J
Total HPAH	273		444		283		269		287		145		246		198		123		147		2340	
Fluoranthene	55		87		53		50		54		34		48		38		32		30		550	
Pyrene	56		86		46		43		47		28		54		35		25		26		560	
Benz[a]anthracene	20		36		22		20		22		14	J	23		16	J	11	J	13	J	150	
Chrysene	34		53		36		30		34		20		34		25		16	J	17	J	190	
Benzofluoranthenes	54		90		60		51		60		33		43		41		27		32		340	
Benzo[a]pyrene	22		40		21		24		29		16	J	20		20		12	J	17	J	220	
Indeno[1,2,3-c,d]pyrene	12	J	23		17	J	20		16	J	20	U	11	J	10	J	19	U	20	U	130	
Dibenzo[a,h]anthracene	5.2		7.0		5.0		6.0		5.4		4.9	U	4.9	U	5.0	U	4.8	U	5.0	U	30	
Benzo[g,h,i]perylene	15	J	29		23		25		20		20	U	13	J	13	J	19	U	12	J	170	

Analyte	GJ-36		GJP-37		GJP-38		GP-39		GP-40		GP-41		GP-42		GP-43		GJ-44		GJ-45		GP-46	
Total LPAH	20		19		27		125		43		111		112		111		122		23		108	
Naphthalene	19	U	19	U	20	U	14	J	12	J	19		21		22		18	U	18	U	13	J
Acenaphthylene	19	U	19	U	20	U	19	U	19	U	18	U	19	U	19	U	11	J	18	U	19	U
Acenaphthene	19	U	19	U	20	U	19	U	19	U	18	U	19	U	19	U	18	U	18	U	19	U
Fluorene	19	U	19	U	20	U	11	J	19	U	12	J	15	J	14	J	14	J	18	U	11	J
Phenanthrene	20		19		27		80		31		71		76		65		85		23		74	
Anthracene	19	U	19	U	20	U	20		19	U	9.2	J	19	U	10	J	12	J	18	U	10	J
2-Methylnaphthalene	19	U	9	J	15	J	19		19		34		36		37		9	J	13	J	20	
Total HPAH	307		63		74		329		127		302		352		302		283		73		300	
Fluoranthene	34		13	J	22		70		27		54		74		54		66		15	J	62	
Pyrene	39		12	J	19	J	64		27		57		71		45		66		14	J	61	
Benz[a]anthracene	26		19	U	20	U	27		10	J	28		28		25		21		18	U	22	
Chrysene	33		19	U	12	J	34		16	J	36		40		45		26		14	J	31	
Benzofluoranthenes	62		28		21		58		26		64		65		66		42		20		48	
Benzo[a]pyrene	41		10	J	20	U	27		11	J	25		30		24		26		18	U	26	
Indeno[1,2,3-c,d]pyrene	28		19	U	20	U	19		19	U	15	J	17	J	15	J	17	J	18	U	19	
Dibenzo[a,h]anthracene	6.1		4.7	U	4.9	U	5.8		4.8	U	4.8		5.3		5.2		4.6	U	4.5	U	4.8	
Benzo[g,h,i]perylene	38		19	U	20	U	24		10	J	18		22		23		19		10	J	26	

Analyte	GJ-47	
Total LPAH	40	
Naphthalene	11	J
Acenaphthylene	19	U
Acenaphthene	19	U
Fluorene	19	U
Phenanthrene	29	
Anthracene	19	U
2-Methylnaphthalene	19	
Total HPAH	65	
Fluoranthene	19	
Pyrene	17	J
Benz[a]anthracene	19	U
Chrysene	10	J
Benzofluoranthenes	19	
Benzo[a]pyrene	19	U
Indeno[1,2,3-c,d]pyrene	19	U
Dibenzo[a,h]anthracene	4.7	U
Benzo[g,h,i]perylene	19	U

Notes

1. Validation qualifier code:
   J = Estimated value, below laboratory reporting limit
   U = Nondetected—Value shown is laboratory reporting limit

Abbreviations

HPAH = high-molecular-weight polycyclic aromatic hydrocarbon
LPAH = low-molecular-weight polycyclic aromatic hydrocarbon
PAH = polycyclic aromatic hydrocarbon
µg/kg = micrograms per kilogram

Table 4 Semivolatile Organics in Sediment Samples

Concentrations reported in micrograms per kilogram dry weight (µg/kg)

Analyte	GJP-1	Q	R	GJP-4	Q	R	GJP-5	Q	R	GJP-6	Q	R	GJ-7	Q	R	GJ-8	Q	R	GJ-9	Q	R
1,2-Dichlorobenzene	4.6	U		4.7	U		4.7	U		4.6	U		4.7	U		4.6	U		4.5	U	
1,3-Dichlorobenzene	4.6	U		4.7	U		4.7	U		4.6	U		4.7	U		4.6	U		4.5	U	
1,4-Dichlorobenzene	4.6	U		4.7	U		4.7	U		4.6	U		4.7	U		4.6	U		4.5	U	
1,2,4-Trichlorobenzene	4.6	U		4.7	U		4.7	U		4.6	U		4.7	U		4.6	U		4.5	U	
Hexachlorobenzene	4.6	U		4.7	U		4.7	U		4.6	U		4.7	U		4.6	U		4.5	U	
Dimethyl phthalate	4.6	U		4.7	U		4.7	U		4.6	U		4.7	U		4.6	U		4.5	U	
Diethyl phthalate	46	U		47	U		47	U		46	U		47	U		46	U		45	U	
Di-n-butyl phthalate	18	U		19	U		19	U		18	U		19	U		19	U		18	U	
Butyl benzyl phthalate	4.6	U		4.7	U		4.7	U		4.6	U		4.7	U		4.6	U		4.5	U	
Bis[2-ethylhexyl] phthalate	23	U		36	U	B	23	U		23	U		24	U		23	U		22	U	
Di-n-octyl phthalate	18	U		19	U		19	U		18	U		19	U		19	U		18	U	
Dibenzofuran	18	U		19	U		19	U		18	U		19	U		200			18	U	
Hexachlorobutadiene	4.6	U		4.7	U		4.7	U		4.6	U		4.7	U		4.6	U		4.5	U	
N-nitrosodiphenylamine	4.6	U		4.7	U		4.7	U		4.6	U		4.7	U		6.1	U	Y	4.5	U	
Phenol	160			19	U		19	U		18	U		19	U		35			18	U	
2-Methylphenol	4.6	U		4.7	U		4.7	U		4.6	U		4.7	U		8.2			4.5	U	
4-Methylphenol	36	U		37	U		37	U		37	U		38	U		22	J		36	U	
2,4-Dimethylphenol	4.6	U		4.7	U		4.7	U		4.6	U		4.7	U		7.8			4.5	U	
Pentachlorophenol	23	U		23	U		23	U		23	U		24	U		23	U		22	U	
Benzyl alcohol	4.6	U		4.7	U		4.7	U		4.6	U		4.7	U		4.6	U		4.5	U	
Benzoic acid	360	U		370	U		370	U		370	U		380	U		370	U		360	U	

Analyte	GJP-10	Q	R	GJP-11	Q	R	GJ-12	Q	R	GJ-14	Q	R	GJ-15	Q	R	GP-16	Q	R	GJ-17	Q	R
1,2-Dichlorobenzene	4.7	U		4.8	U		4.7	U		4.9	U		4.5	U		4.8	U		4.7	U	
1,3-Dichlorobenzene	4.7	U		4.8	U		4.7	U		4.9	U		4.5	U		4.8	U		4.7	U	
1,4-Dichlorobenzene	4.7	U		4.8	U		4.7	U		4.9	U		4.5	U		4.8	U		4.7	U	
1,2,4-Trichlorobenzene	4.7	U		4.8	U		4.7	U		4.9	U		4.5	U		4.8	U		4.7	U	
Hexachlorobenzene	4.7	U		4.8	U		4.7	U		4.9	U		4.5	U		4.8	U		4.7	U	
Dimethyl phthalate	4.7	U		4.8	U		4.7	U		4.9	U		4.5	U		4.8	U		4.7	U	
Diethyl phthalate	47	U		48	U		47	U		49	U		45	U		48	U		47	U	
Di-n-butyl phthalate	19	U		5	U		19	U		20	U		18	U		19	U		19	U	
Butyl benzyl phthalate	4.7	U		4.8	U		4.7	U		4.9	U		4.5	U		4.8	U		4.7	U	
Bis[2-ethylhexyl] phthalate	23	U		24	U		23	U		24	U	B	23	U		25	U		24	U	
Di-n-octyl phthalate	19	U		19	U		19	U		20	U		18	U		19	U		19	U	
Dibenzofuran	19	U		19	U		19	U		20	U		18	U		19	U		44		
Hexachlorobutadiene	4.7	U		4.8	U		4.7	U		4.9	U		4.5	U		4.8	U		4.7	U	
N-nitrosodiphenylamine	4.7	U		4.8	U		4.7	U		4.9	U		4.5	U		4.8	U		4.7	U	
Phenol	19	U		19	U		50	U	Y	20	U		18	U		15	J		11	J	
2-Methylphenol	4.7	U		4.8	U		4.7	U		4.9	U		4.5	U		4.8	U		4.7	U	
4-Methylphenol	37	U		38	U		37	U		39	U		11	J		38	U		38	U	
2,4-Dimethylphenol	4.7	U		4.8	U		4.7	U		4.9	U		4.5	U		4.8	U		4.7	U	
Pentachlorophenol	23	U		24	U		23	U		24	U		23	U		24	U		24	U	
Benzyl alcohol	4.7	U		4.8	U		26			5.3			5.2			5.6			4.7	U	
Benzoic acid	370	U		380	U		370	U		390	U		92	J		380	U		380	U	

Analyte	GJ-18	Q	R	GJP-19	Q	R	GJP-20	Q	R	GJP-20D	Q	R	GJP-21	Q	R	GJP-22	Q	R	GJ-23	Q	R
1,2-Dichlorobenzene	4.5	U		4.8	U		4.7	U		5.0	U		4.7	U		4.7	U		4.9	U	
1,3-Dichlorobenzene	4.5	U		4.8	U		4.7	U		5.0	U		4.7	U		4.7	U		4.9	U	
1,4-Dichlorobenzene	4.5	U		4.8	U		4.7	U		5.0	U		4.7	U		4.7	U		4.9	U	
1,2,4-Trichlorobenzene	4.5	U		4.8	U		4.7	U		5.0	U		4.7	U		4.7	U		4.9	U	
Hexachlorobenzene	4.5	U		4.8	U		4.7	U		5.0	U		4.7	U		4.7	U		4.9	U	
Dimethyl phthalate	4.5	U		4.8	U		4.7	U		5.0	U		4.7	U		4.7	U		4.9	U	
Diethyl phthalate	45	U		48	U		47	U		50	U		47	U		47	U		49	U	
Di-n-butyl phthalate	18	U		19	U		19	U		5	U		19	U		19	U		20	U	
Butyl benzyl phthalate	4.5	U		4.8	U		4.7	U		5.0	U		4.7	U		4.7	U		4.9	U	
Bis[2-ethylhexyl] phthalate	14	J		24	U		14	J		25	U		24	U		24	U		26	U	B
Di-n-octyl phthalate	18	U		19	U		19	U		20	U		19	U		19	U		20	U	
Dibenzofuran	18	U		19	U		19	U		20	U		19	U		19	U		20	U	
Hexachlorobutadiene	4.5	U		4.8	U		4.7	U		5.0	U		4.7	U		4.7	U		4.9	U	
N-nitrosodiphenylamine	4.5	U		4.8	U		4.7	U		5.0	U		4.7	U		4.7	U		4.9	U	
Phenol	18	U		19	U		19	U		20	U		19	U		19	U		24	U	Y
2-Methylphenol	4.5	U		4.8	U		4.7	U		5.0	U		4.7	U		4.7	U		5.5	U	Y
4-Methylphenol	36	U		38	U		38	U		40	U		38	U		38	U		39	U	
2,4-Dimethylphenol	4.5	U		4.8	U		4.7	U		5.0	U		4.7	U		4.7	U		6.5		
Pentachlorophenol	23	U		24	U		24	U		25	U		24	U		24	U		24	U	
Benzyl alcohol	4.5	U		4.8	U		4.7	U		5.0	U		4.7	U		6.2			4.9	U	
Benzoic acid	360	U		380	U		380	U		400	U		380	U		380	U		130	J	

Analyte	GP-24	Q	R	GJP-25	Q	R	GJ-26	Q	R	GP-27	Q	R	GP-28	Q	R	GP-29	Q	R	GP-30	Q	R
1,2-Dichlorobenzene	4.7	U		4.8	U		5.0	U		4.7	U		4.9	U		5.0	U		4.9	U	
1,3-Dichlorobenzene	4.7	U		4.8	U		5.0	U		4.7	U		4.9	U		5.0	U		4.9	U	
1,4-Dichlorobenzene	4.7	U		4.8	U		5.0	U		4.7	U		4.9	U		5.0	U		4.9	U	
1,2,4-Trichlorobenzene	4.7	U		4.8	U		5.0	U		4.7	U		4.9	U		5.0	U		4.9	U	
Hexachlorobenzene	4.7	U		4.8	U		5.0	U		4.7	U		4.9	U		5.0	U		4.9	U	
Dimethyl phthalate	4.7	U		4.8	U		5.0	U		4.7	U		4.9	U		5.0	U		4.9	U	
Diethyl phthalate	47	U		46	U		50	U		47	U		49	U		50	U		49	U	
Di-n-butyl phthalate	19	U		19	U		20	U		19	U		20	U		20	U		20	U	
Butyl benzyl phthalate	4.7	U		4.8	U		5.0	U		4.7	U		4.9	U		5.0	U		4.9	U	
Bis[2-ethylhexyl] phthalate	31	U	B	23	U		25	U	B	24	U		25	U		25	U		24	U	
Di-n-octyl phthalate	19	U		19	U		20	U		19	U		20	U		20	U		20	U	
Dibenzofuran	19	U		19	U		20	U		19	U		20	U		20	U		20	U	
Hexachlorobutadiene	4.7	U		4.8	U		5.0	U		4.7	U		4.9	U		5.0	U		4.9	U	
N-nitrosodiphenylamine	4.7	U		4.8	U		5.0	U		4.7	U		4.9	U		5.0	U		4.9	U	
Phenol	31	U	Y	25	U	Y	33	U	Y	25	U	Y	32			25			24		
2-Methylphenol	6.3	U	Y	5.4	U		5.8	U	Y	5.0	U	Y	4.9	U		5.0	U		4.9	U	
4-Methylphenol	22	J		14	J		14	J		38	U		18	J		40	U		14	J	
2,4-Dimethylphenol	6.2			6.0			6.4			5.8			4.9	U		5.0	U		4.9	U	
Pentachlorophenol	24	U		24	U		25	U		24	U		24	U		25	U		24	U	
Benzyl alcohol	12			9.8			12			9.8			12			14			8.7		
Benzoic acid	190	J		140	J		170	J		110	J		100	J		400	U		390	U	

Analyte	GP-31	Q	R	GP-32	Q	R	GP-33	Q	R	GP-34	Q	R	GJ-35	Q	R	GJ-36	Q	R	GJP-37	Q	R
1,2-Dichlorobenzene	4.9	U		5.0	U		4.8	U		5.0	U		4.8	U		4.7	U		4.7	U	
1,3-Dichlorobenzene	4.9	U		5.0	U		4.8	U		5.0	U		4.8	U		4.7	U		4.7	U	
1,4-Dichlorobenzene	4.9	U		5.0	U		4.8	U		5.0	U		4.8	U		4.7	U		4.7	U	
1,2,4-Trichlorobenzene	4.9	U		5.0	U		4.8	U		5.0	U		4.8	U		4.7	U		4.7	U	
Hexachlorobenzene	4.9	U		5.0	U		4.8	U		5.0	U		4.8	U		4.7	U		4.7	U	
Dimethyl phthalate	4.9	U		5.0	U		4.8	U		5.0	U		4.8	U		4.7	U		4.7	U	
Diethyl phthalate	49	U		50	U		48	U		50	U		48	U		47	U		47	U	
Di-n-butyl phthalate	20	U		20	U		19	U		20	U		19	U		19	U		19	U	
Butyl benzyl phthalate	4.9	U		5.0	U		4.8	U		5.0	U		4.8	U		4.7	U		4.7	U	
Bis[2-ethylhexyl] phthalate	24	U		25	U		24	U		25	U		24	U		17	J		23	U	
Di-n-octyl phthalate	20	U		20	U		19	U		20	U		19	U		19	U		19	U	
Dibenzofuran	20	U		20	U		19	U		20	U		15	J		19	U		19	U	
Hexachlorobutadiene	4.9	U		5.0	U		4.8	U		5.0	U		4.8	U		4.7	U		4.7	U	
N-nitrosodiphenylamine	4.9	U		5.0	U		4.8	U		5.0	U		4.8	U		4.7	U		4.7	U	
Phenol	26			17	J		16	J		16	J		19	U		9.3	J		19	U	
2-Methylphenol	4.9	U		5.0	U		4.8	U		5.0	U		4.8	U		4.7	U		4.7	U	
4-Methylphenol	39	U		40	U		39	U		40	U		38	U		37	U		37	U	
2,4-Dimethylphenol	4.9	U		5.0	U		4.8	U		5.0	U		4.8	U		4.7	U		4.7	U	
Pentachlorophenol	24	U		25	U		24	U		25	U		24	U		23	U		23	U	
Benzyl alcohol	11			7.9			13			9.8			4.8	U		4.7	U		4.7	U	
Benzoic acid	390	U		400	U		390	U		400	U		380	U		370	U		370	U	

Analyte	GJP-38	Q	R	GP-39	Q	R	GP-40	Q	R	GP-41	Q	R	GP-42	Q	R	GP-43	Q	R	GJ-44	Q	R
1,2-Dichlorobenzene	4.9	U		4.7	U		4.8	U		4.6	U		4.7	U		4.7	U		4.6	U	
1,3-Dichlorobenzene	4.9	U		4.7	U		4.8	U		4.6	U		4.7	U		4.7	U		4.6	U	
1,4-Dichlorobenzene	4.9	U		4.7	U		4.8	U		4.6	U		4.7	U		4.7	U		4.6	U	
1,2,4-Trichlorobenzene	4.9	U		4.7	U		4.8	U		4.6	U		4.7	U		4.7	U		4.6	U	
Hexachlorobenzene	4.9	U		4.7	U		4.8	U		4.6	U		4.7	U		4.7	U		4.6	U	
Dimethyl phthalate	4.9	U		4.7	U		4.8	U		4.6	U		4.7	U		4.7	U		4.6	U	
Diethyl phthalate	49	U		47	U		48	U		46	U		47	U		47	U		46	U	
Di-n-butyl phthalate	20	U		19	U		19	U		18	U		19	U		19	U		18	U	
Butyl benzyl phthalate	4.9	U		4.7	U		4.8	U		4.6	U		4.7	U		4.7	U		4.6	U	
Bis[2-ethylhexyl] phthalate	24	U		24	U		24	U		26	U	B	24	U		24	U		23	U	
Di-n-octyl phthalate	20	U		19	U		19	U		18	U		19	U		19	U		18	U	
Dibenzofuran	20	U		19	U		19	U		18	U		19	U		19	U		18	U	
Hexachlorobutadiene	4.9	U		4.7	U		4.8	U		4.6	U		4.7	U		4.7	U		4.6	U	
N-nitrosodiphenylamine	4.9	U		4.7	U		4.8	U		4.6	U		4.7	U		4.7	U		4.6	U	
Phenol	20	U		24			19			23	U	Y	24	U	Y	20	U	Y	11	J	
2-Methylphenol	4.9	U		4.7	U		4.8	U		5.0	U	Y	4.7	U		4.7	U		4.6	U	
4-Methylphenol	39	U		38	U		38	U		15	J		15	J		38	U		37	U	
2,4-Dimethylphenol	4.9	U		4.7	U		4.8	U		5.4			4.7			4.7	U		4.6	U	
Pentachlorophenol	24.0	U		24.0	U		24.0	U		23.0	U		24.0	U		24.0	U		23.0	U	
Benzyl alcohol	4.9	U		4.7	U		4.8	U		11			11			10			4.6	U	
Benzoic acid	390	U		380	U		100	J		130	J		110	J		380	U		370	U	

Analyte	GJ-45	Q	R	GP-46	Q	R	GJ-47	Q
1,2-Dichlorobenzene	4.5	U		4.6	U		4.7	U
1,3-Dichlorobenzene	4.5	U		4.6	U		4.7	U
1,4-Dichlorobenzene	4.5	U		4.6	U		4.7	U
1,2,4-Trichlorobenzene	4.5	U		4.6	U		4.7	U
Hexachlorobenzene	4.5	U		4.6	U		4.7	U
Dimethyl phthalate	4.5	U		4.6	U		4.7	U
Diethyl phthalate	45	U		46	U		47	U
Di-n-butyl phthalate	18	U		19	U		19	U
Butyl benzyl phthalate	4.5	U		4.6	U		4.7	U
Bis[2-ethylhexyl] phthalate	14	J		16	J		23	U
Di-n-octyl phthalate	18	U		19	U		19	U
Dibenzofuran	18	U		19	U		19	U
Hexachlorobutadiene	4.5	U		4.6	U		4.7	U
N-nitrosodiphenylamine	4.5	U		4.6	U		4.7	U
Phenol	18	U		11	J		19	U
2-Methylphenol	4.5	U		4.6	U		4.7	U
4-Methylphenol	36	U		37	U		37	U
2,4-Dimethylphenol	4.5	U		4.6	U		4.7	U
Pentachlorophenol	23.0	U		23.0	U		23.0	U
Benzyl alcohol	4.5	U		4.6	U		4.7	U
Benzoic acid	360	U		370	U		370	U

Notes

1. Validation qualifier code:
   J = Estimated value, below reporting limit.
   U = Nondetected—Value shown is laboratory reporting limit.
2. Reason code:
   B = Analyte detected in blank samples.
   Y = Reporting limit elevated due to interferences.

Abbreviations

Q = Qualifier Code
R = Reason Code
µg/kg = micrograms per kilogram

Table 5 PCB Data for Sediment Samples

Analyte	Units	GJP-1	Q	R	GJP-4	Q	R	GJP-5	Q	R	GJP-6	Q	R	GJ-7	Q	R	GJ-8	Q	R	GJ-9	Q	R
Aroclor 1016	(µg/kg)	3.80	U		3.80	U		4.00	U		3.80	U		3.80	U		3.70	U		3.80	U	
Aroclor 1242	(µg/kg)	3.80	U		3.80	U		4.00	U		3.80	U		3.80	U		3.70	U		3.80	U	
Aroclor 1248	(µg/kg)	5.90			3.80	U		4.00	U		3.80	U		3.80	U		3.70	U		3.80	U	
Aroclor 1254	(µg/kg)	3.80	U		3.80	U		4.00	U		3.80	U		3.80	U		3.70	U		3.80	U	
Aroclor 1260	(µg/kg)	3.80	U		3.80	U		4.00	U		3.80	U		3.80	U		3.70	U		3.80	U	
Aroclor 1221	(µg/kg)	3.80	U		3.80	U		4.00	U		3.80	U		3.80	U		3.70	U		3.80	U	
Aroclor 1232	(µg/kg)	3.80	U		3.80	U		4.00	U		3.80	U		3.80	U		3.70	U		3.80	U	
Total PCBs	(µg/kg)	5.90			3.80	U		4.00	U		3.80	U		3.80	U		3.70	U		3.80	U	
Total PCBs	(mg/kg TOC)	1.75			0.91	U		0.32	U		0.55	U		0.47	U		0.54	U		0.79	U	
TOC	(%)	0.34			0.42			1.25			0.69			0.80			0.68			0.48		

Analyte	Units	GJP-10	Q	R	GJP-11	Q	R	GJ-12	Q	R	GJ-14	Q	R	GJ-15	Q	R	GP-16	Q	R	GJ-17	Q	R
Aroclor 1016	(µg/kg)	3.80	U		3.80	U		3.90	U		3.90	U		3.90	U		3.90	U		3.80	U	
Aroclor 1242	(µg/kg)	3.80	U		3.80	U		3.90	U		7.60			5.00			8.40			3.80	U	
Aroclor 1248	(µg/kg)	3.80	U		3.80	U		3.90	U		3.90	U		3.90	U		3.90	U		3.80	U	
Aroclor 1254	(µg/kg)	3.80	U		3.80	U		3.90	U		3.90	U		3.90	U		3.90	U		3.80	U	
Aroclor 1260	(µg/kg)	3.80	U		3.80	U		3.90	U		3.90	U		3.90	U		3.90	U		3.80	U	
Aroclor 1221	(µg/kg)	3.80	U		3.80	U		3.90	U		3.90	U		3.90	U		3.90	U		3.80	U	
Aroclor 1232	(µg/kg)	3.80	U		3.80	U		5.80	U	Y	3.90	U		3.90	U		3.90	U		3.80	U	
Total PCBs	(µg/kg)	3.80	U		3.80	U		5.80	U	Y	7.60			5.00			8.40			3.80	U	
Total PCBs	(mg/kg TOC)	0.54	U		0.31	U		0.50	U	Y	0.71			0.37			0.54			0.29	U	
TOC	(%)	0.71			1.24			1.15			1.07			1.35			1.56			1.30		

Analyte	Units	GJ-18	Q	R	GJP-19	Q	R	GJP-20	Q	R	DGJP-20	Q	R	GJP-21	Q	R	GJP-22	Q	R	GJ-23	Q	R
Aroclor 1016	(µg/kg)	3.90	U		3.80	U		3.90	U		3.90	U		3.90	U		3.80	U		3.90	U	
Aroclor 1242	(µg/kg)	3.90	U		3.80	U		3.90	UJ	F	8.80	J	F	3.90			3.80	U		4.80		
Aroclor 1248	(µg/kg)	3.90	U		3.80	U		3.90	U		3.90	U		3.90	U		3.80	U		3.90	U	
Aroclor 1254	(µg/kg)	3.90	U		3.80	U		3.90	U		3.90	U		3.90	U		3.80	U		3.90	U	
Aroclor 1260	(µg/kg)	3.90	U		3.80	U		3.90	U		3.90	U		3.90	U		3.80	U		3.90	U	
Aroclor 1221	(µg/kg)	3.90	U		3.80	U		3.90	U		3.90	U		3.90	U		3.80	U		3.90	U	
Aroclor 1232	(µg/kg)	3.90	U		3.80	U		5.00	U	Y	3.90	U		3.90	U		15.00	U	Y	3.90	U	
Total PCBs	(µg/kg)	3.90	U		3.80	U		5.00	U	Y	8.80			3.90			15.00	U	Y	4.80		
Total PCBs	(mg/kg TOC)	0.37	U		0.34	U		0.44	U	Y	0.67			0.33			1.74	U	Y	0.39		
TOC	(%)	1.06			1.13			1.14			1.32			1.19			0.86			1.23		

Analyte	Units	GP-24	Q	R	GJP-25	Q	R	GJ-26	Q	R	GP-27	Q	R	GP-28	Q	R	GP-29	Q	R	GP-30	Q	R
Aroclor 1016	(µg/kg)	3.80	U		4.00	U		4.00	U		3.80	U		3.80	U		3.90	U		3.80	U	
Aroclor 1242	(µg/kg)	3.80	U		4.00	U		4.80			6.00			5.70			6.40			6.20		
Aroclor 1248	(µg/kg)	3.80	U		4.00	U		4.00	U		3.80	U		3.80	U		3.90	U		3.80	U	
Aroclor 1254	(µg/kg)	3.80	U		4.00	U		4.00	U		3.80	U		3.80	U		3.90	U		3.80	U	
Aroclor 1260	(µg/kg)	3.80	U		4.00	U		4.00	U		3.80	U		3.80	U		3.90	U		3.80	U	
Aroclor 1221	(µg/kg)	3.80	U		4.00	U		4.00	U		3.80	U		3.80	U		3.90	U		3.80	U	
Aroclor 1232	(µg/kg)	7.70	U	Y	8.00	U	Y	4.00	U		3.80	U		3.80	U		3.90	U		3.80	U	
Total PCBs	(µg/kg)	7.70	U	Y	8.00	U	Y	4.80			6.00			5.70			6.40			6.20		
Total PCBs	(mg/kg TOC)	0.58	U	Y	0.61	U	Y	0.34			0.50			0.59			0.61			0.48		
TOC	(%)	1.33			1.32			1.42			1.19			0.96			1.05			1.30		

Analyte	Units	GP-31	Q	R	GP-32	Q	R	GP-33	Q	R	GP-34	Q	R	GJ-35	Q	R	GJ-36	Q	R	GJP-37	Q	R
Aroclor 1016	(µg/kg)	3.80	U		3.90	U		3.80	U		3.90	U		3.90	U		3.80	U		3.80	U	
Aroclor 1242	(µg/kg)	6.30	J	P	8.80			5.30			5.60			3.90	U		3.80	U		3.80	U	
Aroclor 1248	(µg/kg)	3.80	U		3.90	U		3.80	U		3.90	U		3.90	U		3.80	U		3.80	U	
Aroclor 1254	(µg/kg)	3.80	U		3.90	U		3.80	U		3.90	U		3.90	U		3.80	U		3.80	U	
Aroclor 1260	(µg/kg)	3.80	U		3.90	U		3.80	U		3.90	U		3.90	U		3.80	U		3.80	U	
Aroclor 1221	(µg/kg)	3.80	U		3.90	U		3.80	U		3.90	U		3.90	U		3.80	U		3.80	U	
Aroclor 1232	(µg/kg)	3.80	U		3.90	U		3.80	U		3.90	U		3.90	U		3.80	U		3.80	U	
Total PCBs	(µg/kg)	6.30	J	P	8.80			5.30			5.60			3.90	U		3.80	U		3.80	U	
Total PCBs	(mg/kg TOC)	0.70	J	P	0.79			0.57			0.61			0.27	U		0.36	U		0.33	U	
TOC	(%)	0.90			1.12			0.94			0.92			1.46			1.07			1.16		

Analyte	Units	GJP-38	Q	R	GP-40	Q	R	GP-41	Q	R	GP-42	Q	R	GP-43	Q	R	GJ-44	Q	R	GJ-45	Q	R
Aroclor 1016	(µg/kg)	4.00	U		3..8	U		3.90	U		3.90	U		3.90	U		3.70	U		3.80	U	
Aroclor 1242	(µg/kg)	4.00	U		3..8	U		3.90	U		3.90	U		3.90	U		3.70	U		3.80	U	
Aroclor 1248	(µg/kg)	4.00	U		3..8	U		3.90	U		3.90	U		24.0			3.70	U		3.80	U	
Aroclor 1254	(µg/kg)	4.00	U		3..8	U		3.90	U		3.90	U		3.90	U		3.70	U		3.80	U	
Aroclor 1260	(µg/kg)	4.00	U		3..8	U		3.90	U		3.90	U		3.90	U		3.70	U		3.80	U	
Aroclor 1221	(µg/kg)	4.00	U		3..8	U		3.90	U		3.90	U		3.90	U		3.70	U		3.80	U	
Aroclor 1232	(µg/kg)	4.00	U		5.90	U	Y	5.90	U	Y	7.80	U	Y	3.90	U		3.70	U		3.80	U	
Total PCBs	(µg/kg)	4.00	U		5.90	U	Y	5.90	U	Y	7.80	U	Y	24.0			3.70	U		3.80	U	
Total PCBs	(mg/kg TOC)	0.37	U		0.48	U	Y	0.55	U	Y	0.60	U	Y	2.03			0.30	U		0.33	U	
TOC	(%)	1.08			1.23			1.07			1.31			1.18			1.23			1.16		

Analyte	Units	GP-46	Q	R	GJ-47	Q	R
Aroclor 1016	(µg/kg)	3.90	U		4.00	U	
Aroclor 1242	(µg/kg)	4.50			4.00	U	
Aroclor 1248	(µg/kg)	3.90	U		4.00	U	
Aroclor 1254	(µg/kg)	3.90	U		4.00	U	
Aroclor 1260	(µg/kg)	3.90	U		4.00	U	
Aroclor 1221	(µg/kg)	3.90	U		4.00	U	
Aroclor 1232	(µg/kg)	3.90	U		4.00	U	
Total PCBs	(µg/kg)	4.50			4.00	U	
Total PCBs	(mg/kg TOC)	0.35			0.32	U	
TOC	(%)	1.28			1.24		

Notes

1. Validation qualifier code:
   J = Estimated value, below reporting limit.
   U = Nondetected. Value shown is the laboratory reporting limit.
   UJ = Nondetected. Value shown is estimated reporting limit.

2. Reason code:
   P = Relative percent difference greater than 25% for dual-column results.
   Y = Reporting limit elevated due to interferences
   F = Field duplicate variability

Abbreviations

mg/kg OC = milligrams per kilogram organic carbon
PCBs = polychlorinated biphenyls
Q = Qualifier Code
TOC = total organic carbon
µg/kg = micrograms per kilogram

Table 6 Pesticides Data for Sediment Samples

Analyte	Units	GJP-1	Q	R	GJP-4	Q	R	GJP-5	Q	R	GJP-6	Q	R	GJ-7	Q	R	GJ-8	Q	R
Lindane	(µg/kg)	0.23	U		0.24	U		0.25	U		0.24	U		0.24	U		0.24	U	
Heptachlor	(µg/kg)	0.23	U		0.24	U		0.25	U		0.24	U		0.24	U		0.24	U	
Aldrin	(µg/kg)	0.23	U		0.24	U		0.25	U		0.24	U		0.24	U		0.24	U	
Dieldrin	(µg/kg)	0.47	U		0.47	U		0.50	U		0.48	U		0.47	U		0.48	U	
4,4'-DDE	(µg/kg)	0.47	U		0.47	U		0.50	U		0.48	U		0.47	U		0.48	U	
4,4'-DDD	(µg/kg)	0.47	U		0.47	U		0.50	U		0.48	U		0.47	U		0.48	U	
4,4'-DDT	(µg/kg)	0.47	U		0.47	U		0.50	U		0.48	U		0.47	U		0.48	U	
Total DDT	(µg/kg)	0.47	U		0.47	U		0.50	U		0.48	U		0.47	U		0.48	U	
trans-chlordane	(µg/kg)	0.23	U		0.24	U		0.25	U		0.46	U	Y	0.49	U	Y	0.47	U	Y
cis-chlordane	(µg/kg)	0.23	U		0.24	U		0.25	U		0.24	U		0.24	U		0.24	U	
oxy-chlordane	(µg/kg)	0.47	U		0.47	U		0.50	U		0.48	U		0.47	U		0.48	U	
cis-Nonachlor	(µg/kg)	0.47	U		0.47	U		0.50	U		0.48	U		0.47	U		0.48	U	
trans-Nonachlor	(µg/kg)	0.47	U		0.47	U		0.50	U		0.48	U		0.47	U		0.48	U	
Total Chlordane	(µg/kg)	0.47	U		0.47	U		0.50	U		0.48	U		0.49	U	Y	0.48	U	

Analyte	Units	GJ-9	Q	R	GJP-10	Q	R	GJP-11	Q	R	GJ-12	Q	R	GJ-14	Q	R	GJ-15	Q	R
Lindane	(µg/kg)	0.23	U		0.24	U		0.24	U		0.24	U		0.71	U	Y	0.24	U	
Heptachlor	(µg/kg)	0.23	U		0.24	U		0.24	U		0.24	U		0.24	U		0.24	U	
Aldrin	(µg/kg)	0.23	U		0.97	U	Y	120	U	Y	0.24	U		0.24	U		0.24	U	
Dieldrin	(µg/kg)	0.46	U		0.48	U		0.48	U		0.48	U		0.48	U		0.48	U	
4,4'-DDE	(µg/kg)	0.46	U		0.48	U		0.48	U		0.48	U		0.48	U		0.48	U	
4,4'-DDD	(µg/kg)	0.46	U		0.48	U		0.48	U		0.48	U		0.48	U		0.48	U	
4,4'-DDT	(µg/kg)	0.46	U		0.48	U		0.48	U		0.48	U		0.48	UJ	N	0.48	UJ	N
Total DDT	(µg/kg)	0.46	U		0.48	U		0.48	U		0.48	U		0.48	U		0.48	U	
trans-chlordane	(µg/kg)	0.24	U	Y	0.60	U	Y	0.24	U		0.73	U	Y	0.91	U	Y	0.59	U	Y
cis-chlordane	(µg/kg)	0.23	U		0.24	U		0.24	U		0.24	U		0.24	U		0.24	U	
oxy-chlordane	(µg/kg)	0.46	U		0.48	U		0.48	U		0.48	U		0.48	U		0.48	U	
cis-Nonachlor	(µg/kg)	0.46	U		0.48	U		0.48	U		0.48	U		0.48	U		0.48	U	
trans-Nonachlor	(µg/kg)	0.46	U		0.48	U		0.48	U		0.53			0.84			0.48	U	
Total Chlordane	(µg/kg)	0.46	U		0.60	U	Y	0.48	U		0.53			0.84			0.59	U	Y

Analyte	Units	GP-16	Q	R	GJ-17	Q	R	GJ-18	Q	R	GJP-19	Q	R	GJP-20	Q	R	DGJP-20	Q	R
Lindane	(µg/kg)	1.20	U		0.44	U	Y	0.24	U		0.24	U		0.24	U		0.25	U	
Heptachlor	(µg/kg)	1.20	U		0.24	U		0.24	U		0.24	U		0.24	U		0.25	U	
Aldrin	(µg/kg)	1.20	U		0.24	U		43	U	Y	0.24	U		0.24	U		0.25	U	
Dieldrin	(µg/kg)	1.20	UJ		0.48	U		0.48	U		0.48	U		0.48	U		0.49	U	
4,4'-DDE	(µg/kg)	2.50	U		0.48	U		0.48	U		0.48	U		0.48	U		0.49	U	
4,4'-DDD	(µg/kg)	2.50	U		0.48	U		0.48	U		0.48	U		0.48	U		0.49	U	
4,4'-DDT	(µg/kg)	2.50	U		0.48	U		0.48	U		0.48	U		0.48	U		0.49	U	
Total DDT	(µg/kg)	2.50	U		0.48	U		0.48	U		0.48	U		0.48	U		0.49	U	
trans-chlordane	(µg/kg)	1.20	U		0.66	U	Y	0.76	U	Y	0.62	U	Y	0.80	U	Y	0.69	U	Y
cis-chlordane	(µg/kg)	1.20	U		0.24	U		0.24	U		0.24	U		0.24	U		0.25	U	
oxy-chlordane	(µg/kg)	2.50	U		0.48	U		0.57	U	Y	0.48	U		0.48	U		0.49	U	
cis-Nonachlor	(µg/kg)	2.50	U		0.48	U		0.48	U		0.48	U		0.48	U		0.49	U	
trans-Nonachlor	(µg/kg)	2.50	U		0.48	U		0.48	U		0.48	U		0.56			0.65		
Total Chlordane	(µg/kg)	2.50	U		0.66	U	Y	0.76	U	Y	0.62	U	Y	0.56			0.65		

Analyte	Units	GJP-21	Q	R	GJP-22	Q	R	GJ-23	Q	R	GP-24	Q	R	GJP-25	Q	R	GJ-26	Q	R
Lindane	(µg/kg)	0.24	U		0.52	U	Y	0.54	U	Y	0.73	U	Y	0.66	U	Y	0.52	U	Y
Heptachlor	(µg/kg)	0.24	U		0.54	U		0.98	U	Y	1.40	U	Y	0.99	U	Y	1.40	U	Y
Aldrin	(µg/kg)	0.24	U		0.24	U		0.99	U		0.24	U		0.92	U	Y	0.25	U	
Dieldrin	(µg/kg)	0.48	U		0.48	U		0.49	U		0.48	U		0.50	U		0.50	U	
4,4'-DDE	(µg/kg)	0.48	U		0.48	U		0.49	U		0.48	U		0.50	U		0.50	U	
4,4'-DDD	(µg/kg)	0.48	U		0.48	U		0.49	U		0.48	U		0.50	U		0.50	U	
4,4'-DDT	(µg/kg)	0.48	U		0.48	UJ	N	0.49	U		0.48	U		0.50	U		0.50	U	
Total DDT	(µg/kg)	0.48	U		0.48	U		0.49	U		0.48	U		0.50	U		0.50	U	
trans-chlordane	(µg/kg)	0.50	U	Y	1.10	U	Y	0.77	U	Y	0.24	U		0.71	U	Y	0.87	U	Y
cis-chlordane	(µg/kg)	0.24	U		0.24	U		0.25	U		0.24	U		0.25	U		0.25	U	
oxy-chlordane	(µg/kg)	0.48	U		0.48	U		0.49	U		1.40	U	Y	0.50	U		0.50	U	
cis-Nonachlor	(µg/kg)	0.48	U		0.48	U		0.49	U		0.48	U		0.50	U		0.50	U	
trans-Nonachlor	(µg/kg)	1.70	U	Y	0.73			1.90	U	Y	1.40			1.50	J	P	1.70	J	P
Total Chlordane	(µg/kg)	1.70	U	Y	0.73			1.90	U	Y	1.40			1.50	J	P	1.70	J	P

Analyte	Units	GP-27	Q	R	GP-28	Q	R	GP-29	Q	R	GP-30	Q	R	GP-31	Q	R	GP-32	Q	R
Lindane	(µg/kg)	0.71	U	Y	1.20	UJ	M	1.20	U		1.20	U		1.20	U		1.20	U	
Heptachlor	(µg/kg)	1.60	U	Y	1.20	UJ	M	1.20	U		1.20	U		1.20	U		1.20	U	
Aldrin	(µg/kg)	1.00	U	Y	1.20	U		1.20	U		1.20	U		1.20	U		1.20	U	
Dieldrin	(µg/kg)	0.48	U		1.20	UJ		1.20	UJ		1.20	UJ		1.20	UJ		1.20	UJ	
4,4'-DDE	(µg/kg)	0.48	U		2.40	U		2.40	U		2.40	U		2.40	U		2.40	U	
4,4'-DDD	(µg/kg)	0.48	U		2.40	U		2.40	U		2.40	U		2.40	U		2.40	U	
4,4'-DDT	(µg/kg)	0.48	U		2.40	UJ	M	2.40	U		2.40	U		2.40	U		2.40	U	
Total DDT	(µg/kg)	0.48	U		2.40	U		2.40	U		2.40	U		2.40	U		2.40	U	
trans-chlordane	(µg/kg)	0.74	U	Y	1.20	U		1.20	U		1.60	U	Y	1.20	U		1.20	U	
cis-chlordane	(µg/kg)	0.24	U		1.20	U		1.20	U		1.20	U		1.20	U		1.20	U	
oxy-chlordane	(µg/kg)	1.40	U	Y	2.40	U		2.40	U		2.40	U		2.40	U		2.40	U	
cis-Nonachlor	(µg/kg)	0.48	U		2.40	U		2.40	U		2.40	U		2.40	U		2.40	U	
trans-Nonachlor	(µg/kg)	2.90	U	Y	2.40	U		2.40	U		2.40	U		2.40	U		2.40	U	
Total Chlordane	(µg/kg)	2.90	U	Y	2.40	U		2.40	U		2.40	U		2.40	U		2.40	U	

Analyte	Units	GP-33		GP-34	Q	R	GJ-35	Q	R	GJ-36	Q	R	GJP-37	Q	R	GJP-38	Q	R
Lindane	(µg/kg)	1.20	U	1.20	U		0.64	U	Y	0.24	U		0.24	U		0.25	U	
Heptachlor	(µg/kg)	1.20	U	1.20	U		0.24	U		0.24	U		0.24	U		0.25	U	
Aldrin	(µg/kg)	1.20	U	1.20	U		0.84	U	Y	360	U	Y	0.24	U		0.25	U	
Dieldrin	(µg/kg)	1.20	UJ	1.20	UJ		0.48	U		0.48	U		0.47	U		0.50	U	
4,4'-DDE	(µg/kg)	2.40	U	2.40	U		0.48	U		0.48	U		0.47	U		0.50	U	
4,4'-DDD	(µg/kg)	2.40	U	2.40	U		0.48	U		0.48	U		0.47	U		0.50	U	
4,4'-DDT	(µg/kg)	2.40	U	2.40	U		0.48	U		0.48	U		0.47	U		0.50	U	
Total DDT	(µg/kg)	2.40	U	2.40	U		0.48	U		0.48	U		0.47	U		0.50	U	
trans-chlordane	(µg/kg)	1.20	U	1.20	U		1.40	U	Y	0.54	U	Y	0.56	U	Y	0.85	U	Y
cis-chlordane	(µg/kg)	1.20	U	1.20	U		0.24	U		0.24	U		0.24	U		0.25	U	
oxy-chlordane	(µg/kg)	2.40	U	2.40	U		0.48	U		0.77	U	Y	0.47	U		0.50	U	
cis-Nonachlor	(µg/kg)	2.40	U	2.40	U		0.94	U	Y	0.48	U		0.47	U		0.50	U	
trans-Nonachlor	(µg/kg)	2.40	U	2.40	U		2.50	U	Y	0.68			0.47	U		0.50	U	
Total Chlordane	(µg/kg)	2.40	U	2.40	U		2.50	U	Y	0.68			0.56	U	Y	0.85	U	Y

Analyte	Units	GP-39	Q	R	GP-40	Q	R	GP-41	Q	R	GP-42	Q	R	GP-43	Q	R	GJ-44	Q	R
Lindane	(µg/kg)	0.25	U		0.24	U		0.63	U	Y	0.25	U		0.78	U	Y	0.24	U	
Heptachlor	(µg/kg)	0.25	U		0.24	U		1.00	U	Y	0.25	U		1.20	U	Y	0.24	U	
Aldrin	(µg/kg)	0.25	U		0.24	U		0.25	U		0.25	U		1.30	U	Y	0.24	U	
Dieldrin	(µg/kg)	0.49	U		0.49	U		0.49	U		0.49	U		0.49	U		0.47	U	
4,4'-DDE	(µg/kg)	0.49	U		0.49	U		0.49	U		0.49	U		0.49	U		0.47	U	
4,4'-DDD	(µg/kg)	0.49	U		0.49	U		0.49	U		0.49	U		0.49	U		0.47	U	
4,4'-DDT	(µg/kg)	0.49	U		0.49	U		0.49	UJ	N	0.49	U		0.49	U		0.47	U	
Total DDT	(µg/kg)	0.49	U		0.49	U		0.49	U		0.49	U		0.49	U		0.47	U	
trans-chlordane	(µg/kg)	1.40	U	Y	0.66	U	Y	0.91	U	Y	0.25	U		0.95	U	Y	0.24	U	
cis-chlordane	(µg/kg)	0.25	U		0.24	U		0.25	U		0.25	U		0.24	U		0.24	U	
oxy-chlordane	(µg/kg)	0.49	U		0.49	U		0.49	U		0.49	U		0.49	U		0.47	U	
cis-Nonachlor	(µg/kg)	0.49	U		0.49	U		0.49	U		0.49	U		0.49	U		0.47	U	
trans-Nonachlor	(µg/kg)	0.49	U		0.49	U		0.49	U		0.89	J	P	1.90			0.47	U	
Total Chlordane	(µg/kg)	1.40	U	Y	0.66	U	Y	0.91	U	Y	0.89	J	P	1.90			0.47	U	

Analyte	Units	GJ-45	Q	R	GP-46	Q	R	GJ-47	Q	R
Lindane	(µg/kg)	0.24	U		0.24	U		0.25	U	
Heptachlor	(µg/kg)	0.24	U		0.57	U	Y	0.25	U	
Aldrin	(µg/kg)	0.24	U		0.24	U		0.25	U	
Dieldrin	(µg/kg)	0.49	U		0.49	U		0.49	U	
4,4'-DDE	(µg/kg)	0.49	U		0.49	U		0.49	U	
4,4'-DDD	(µg/kg)	0.49	U		0.49	U		0.49	U	
4,4'-DDT	(µg/kg)	0.49	U		0.49	U		0.49	U	
Total DDT	(µg/kg)	0.49	U		0.49	U		0.49	U	
trans-chlordane	(µg/kg)	1.20	U	Y	0.24	U		0.74	U	Y
cis-chlordane	(µg/kg)	0.24	U		0.24	U		0.25	U	
oxy-chlordane	(µg/kg)	0.49	U		0.49	U		0.49	U	
cis-Nonachlor	(µg/kg)	0.49	U		0.49	U		0.49	U	
trans-Nonachlor	(µg/kg)	0.49	U		0.79			0.49	U	
Total Chlordane	(µg/kg)	1.20	U	Y	0.79			0.74	U	Y

Notes
1. Validation qualifier code:
J = Estimated values.
U = Nondetected. Value shown is reporting limit
UJ = Nondetected. Value shown is estimated reporting limit.
2. Reason code:
M = Matrix-spike recoveries low.
N = See report narrative
Y = Reporting limit elevated due to interferences
P = Results from dual-column analyses differed significantly

Abbreviations
Q = Qualifier Code
R = Reason Code
µg/kg = micrograms per kilogram

Table 7 Metals and Tributyltin Data for Sediment Samples

Analyte	Units	GJP-1	Q	R	GJP-4	Q	R	GJP-5	Q	R	GJP-6	Q	R	GJ-7	Q	R	GJ-8	Q	R
Antimony	(mg/kg)	6.0	UJ	M	6.0	UJ	M	7.0	UJ	M	6.0	UJ	M	6.0	UJ	M	7.0	UJ	M
Arsenic	(mg/kg)	6.0	U		6.0	U		7.0			7.0			6.0			8.0		
Cadmium	(mg/kg)	0.20	U		0.30	U		0.30	U		0.30	U		0.30	U		0.30	U	
Chromium	(mg/kg)	15			16			19			19			16			17		
Copper	(mg/kg)	6.9			6.9			9.7			9.0			6.6			9.2		
Lead	(mg/kg)	2.0	U		3.0	U		4.0			3.0			3.0	U		3.0		
Mercury	(mg/kg)	0.02	U		0.02	U		0.03			0.02	U		0.02	U		0.02	U	
Nickel	(mg/kg)	13			14			18			16			13			15		
Silver	(mg/kg)	0.40	U		0.40	U		0.40	U		0.40	U		0.40	U		0.40	U	
Zinc	(mg/kg)	23			25			33			32			23			30		
Tributyltin	(µg/kg)	3.3	U		3.4	U		3.7	U		3.6	U		3.4	U		3.5	U	

Analyte	Units	GJ-9	Q	R	GJP-10	Q	R	GJP-11	Q	R	GJ-12	Q	R	GJ-14	Q	R	GJ-15	Q	R
Antimony	(mg/kg)	6.0	UJ	M	6.0	UJ	M	7.0	UJ	M	7.0	UJ	M	10.0	UJ	M	9.0	UJ	M
Arsenic	(mg/kg)	7.0			7.0			8.0			9.0			10.0			10.0		
Cadmium	(mg/kg)	0.30	U		0.20	U		0.30	U		0.30			0.40	U		0.40		
Chromium	(mg/kg)	15			16			19			25			34			32		
Copper	(mg/kg)	6.5			7.3			9.6			15			20			19		
Lead	(mg/kg)	3.0	U		2.0	U		4.0			5.0			7.0			6.0		
Mercury	(mg/kg)	0.02	U		0.02	U		0.03			0.04			0.05			0.04		
Nickel	(mg/kg)	13			14			17			24			32			31		
Silver	(mg/kg)	0.40	U		0.40	U		0.40	U		0.40	U		0.60	U		0.50	U	
Zinc	(mg/kg)	24			26			32			44			60			57		
Tributyltin	(µg/kg)	3.2	U		3.3	U		3.6	U		3.8	UJ	S	3.8	U		3.7	U	

Analyte	Units	GP-16	Q	R	GJ-17	Q	R	GJ-18	Q	R	GJP-19	Q	R	GJP-20	Q	R	GJP-20D	Q	R
Antimony	(mg/kg)	10.0	UJ	M	6.0	UJ	M	7.0	UJ	M	7.0	UJ	M	8.0	UJ	M	8.0	UJ	M
Arsenic	(mg/kg)	10.0			8.0			8.0			8.0			10.0			10.0		
Cadmium	(mg/kg)	0.40	U		0.30	U		0.30	U		0.30	U		0.30			0.30	U	
Chromium	(mg/kg)	38			20			19			20			25			26		
Copper	(mg/kg)	23			10			9.7			11			14			16		
Lead	(mg/kg)	8.0			3.0			3.0			4.0			5.0			6.0		
Mercury	(mg/kg)	0.07			0.03	U		0.03	U		0.03			0.04			0.04		
Nickel	(mg/kg)	38			17			17			17			22			23		
Silver	(mg/kg)	0.60	U		0.40	U		0.40	U		0.40	U		0.50	U		0.50	U	
Zinc	(mg/kg)	67			35			32			34			44			45		
Tributyltin	(µg/kg)	11.0	U		3.6	U		3.6	U		3.8	U		3.7	U		3.8	U	

Analyte	Units	GJP-21	Q	R	GJP-22	Q	R	GJ-23	Q	R	GP-24	Q	R	GJP-25	Q	R	GJ-26	Q	R
Antimony	(mg/kg)	8.0	UJ	M	10.0	UJ	M	10.0	UJ	M	9.0	UJ	M	10.0	UJ	M	10.0	UJ	M
Arsenic	(mg/kg)	10.0			10.0			10.0	U		10.0			10.0			10.0		
Cadmium	(mg/kg)	0.30	U		0.40	U		0.40	U		0.40	U		0.40	U		0.40	U	
Chromium	(mg/kg)	26			33			35			36			38			37		
Copper	(mg/kg)	15			20			21			21			23			23		
Lead	(mg/kg)	5.0			7.0			8.0			8.0			8.0			8.0		
Mercury	(mg/kg)	0.04			0.05			0.05			0.06			0.06			0.05		
Nickel	(mg/kg)	25			33			34			34			35			35		
Silver	(mg/kg)	0.50	U		0.60	U		0.60	U		0.60	U		0.60	U		0.60	U	
Zinc	(mg/kg)	45			62			64			65			67			65		
Tributyltin	(µg/kg)	3.8	U		3.7	U		3.8	U		3.7	U		11.0	U		3.8	U	

Analyte	Units	GP-27	Q	R	GP-28	Q	R	GP-29	Q	R	GP-30	Q	R	GP-31	Q	R	GP-32	Q	R
Antimony	(mg/kg)	10.0	UJ	M	10.0	UJ	M	10.0	UJ	M	10.0	UJ	M	9.0	UJ	M	10.0	UJ	M
Arsenic	(mg/kg)	10.0			10.0			10.0			10.0	U		10.0			10.0		
Cadmium	(mg/kg)	0.40	U		0.40	U		0.40	U		0.40	U		0.40	U		0.40	U	
Chromium	(mg/kg)	38			36			38			38			36			37		
Copper	(mg/kg)	23			21			22			22			21			23		
Lead	(mg/kg)	8.0			8.0			8.0			8.0			8.0			8.0		
Mercury	(mg/kg)	0.05			0.06			0.06			0.06			0.06			0.06		
Nickel	(mg/kg)	37			36			37			37			37			38		
Silver	(mg/kg)	0.60	U		0.60	U		0.60	U		0.60	U		0.60	U		0.60	U	
Zinc	(mg/kg)	68			66			67			67			66			66		
Tributyltin	(µg/kg)	3.8	U		11.0	U		3.6	U		11.0	U		3.4	U		3.5	U	

Analyte	Units	GP-33	Q	R	GP-34	Q	R	GJ-35	Q	R	GJ-36	Q	R	GJP-37	Q	R	GJP-38	Q	R
Antimony	(mg/kg)	10.0	UJ	M	10.0	UJ	M	7.0	UJ	M	7.0	UJ	M	7.0	UJ	M	8.0	UJ	M
Arsenic	(mg/kg)	10.0			10.0			8.0			7.0			9.0			9.0		
Cadmium	(mg/kg)	0.40	U		0.40	U		0.30	U		0.30	U		0.30	U		0.30	U	
Chromium	(mg/kg)	36			37			21			19			21			27		
Copper	(mg/kg)	22			22			11			10			12			16		
Lead	(mg/kg)	8.0			8.0			4.0			4.0			4.0			6.0		
Mercury	(mg/kg)	0.06			0.06			0.03	U		0.03			0.03			0.04		
Nickel	(mg/kg)	37			38			17			17			19			25		
Silver	(mg/kg)	0.60	U		0.60	U		0.40	U		0.40	U		0.40	U		0.50	U	
Zinc	(mg/kg)	65			66			34			32			36			49		
Tributyltin	(µg/kg)	3.6	U		3.6	U		3.6	U		3.5	U		3.4	U		3.5	U	

Analyte	Units	GP-39	Q	R	GP-40	Q	R	GP-41	Q	R	GP-42	Q	R	GP-43	Q	R	GJ-44	Q	R
Antimony	(mg/kg)	9.0	UJ	M	9.0	UJ	M	9.0	UJ	M	10.0	UJ	M	10.0	UJ	M	7.0	UJ	M
Arsenic	(mg/kg)	12.0			11.0			11.0			10.0			10.0			9.0		
Cadmium	(mg/kg)	0.40	U		0.40	U		0.40	U		0.40	U		0.40	U		0.30	U	
Chromium	(mg/kg)	36			32			34			38			37			21		
Copper	(mg/kg)	23			19			22			22			22			11		
Lead	(mg/kg)	8.0			6.0			7.0			8.0			8.0			4.0		
Mercury	(mg/kg)	0.06			0.05			0.05			0.05			0.05			0.03		
Nickel	(mg/kg)	33			29			33			37			36			20		
Silver	(mg/kg)	0.60	U		0.50	U		0.60	U		0.60	U		0.60	U		0.40	U	
Zinc	(mg/kg)	64			59			63			69			64			35		
Tributyltin	(µg/kg)	3.6	U		3.4	U		3.7	U		3.6	U		3.6	U		3.6	U	

Analyte	Units	GJ-45	Q	R	GP-46	Q	R	GJ-47	Q	R
Antimony	(mg/kg)	7.0	UJ	M	9.0	UJ	M	7.0	UJ	M
Arsenic	(mg/kg)	10.0			10.0			9.0		
Cadmium	(mg/kg)	0.30	U		0.40	U		0.30	U	
Chromium	(mg/kg)	23			31			24		
Copper	(mg/kg)	14			19			15		
Lead	(mg/kg)	5.0			7.0			6.0		
Mercury	(mg/kg)	0.03			0.05			0.04		
Nickel	(mg/kg)	20			27			21		
Silver	(mg/kg)	0.40	U		0.50	U		0.40	U	
Zinc	(mg/kg)	40			55			43		
Tributyltin	(µg/kg)	3.5	U		3.7	U		3.6	U	

Notes

1. Validation qualifier code:
   U = Nondetected. Value shown is laboratory reporting limit.
   UJ = Nondetected. Value shown is estimated reporting limit.
2. Reason code:
   M = Recovery from matrix spikes outside of control limit.
   S = Surrogate recoveries below control limit.

Abbreviations

mg/kg = milligrams per kilogram
Q = Qualifier Code
R = Reason Code
µg/kg = micrograms per kilogram

Table 8 Conventional Sediment Quality Data

Analyte	Units	GJP-1	GJP-4		GJP-5	GJP-6	GJ-7	GJ-8
Total Solids	(%)	77.50	78.70		72.30	73.60	78.00	73.80
Preserved Total Solids	(%)	77.60	77.10		70.80	74.30	75.90	72.00
Total Volatile Solids	(%)	1.09	1.38		2.01	1.88	1.20	1.92
N-Ammonia	(mg-N/kg)	3.38	2.08		1.69	2.04	6.23	6.79
Sulfide	(mg/kg)	181	1.26	U	6	8.40	13	13.30
Total Organic Carbon	(%)	0.34	0.42		1.25	0.69	0.80	0.68

Analyte	Units	GJ-9	GJP-10	GJP-11	GJ-12	GJ-14	GJ-15
Total Solids	(%)	79.10	77.80	71.70	63.20	53.80	57.20
Preserved Total Solids	(%)	76.90	75.70	77.30	59.50	48.10	61.60
Total Volatile Solids	(%)	0.88	1.14	2.08	3.28	4.68	3.91
N-Ammonia	(mg-N/kg)	3.16	4.28	3.91	2.53	3.09	2.79
Sulfide	(mg/kg)	4	28	37.4	51	149	274
Total Organic Carbon	(%)	0.48	0.71	1.24	1.15	1.07	1.35

Analyte	Units	GP-16	GJ-17	GJ-18	GJP-19	GJP-20	GJP-20D
Total Solids	(%)	49.30	73.60	75.30	71.20	63.90	62.70
Preserved Total Solids	(%)	47.50	68.90	72.80	64.40	60.00	57.00
Total Volatile Solids	(%)	5.40	2.10	1.77	2.12	3.10	3.19
N-Ammonia	(mg-N/kg)	6.25	9.94	4.65	3.17	3.53	2.95
Sulfide	(mg/kg)	258	2	17.20	30	85.5	65
Total Organic Carbon	(%)	1.56	1.30	1.06	1.13	1.14	1.32
Analyte	**Units**	**GJP-21**	**GJP-22**	**GJ-23**	**GP-24**	**GJP-25**	**GJ-26**
Total Solids	(%)	65.40	54.00	49.00	52.40	51.00	49.80
Preserved Total Solids	(%)	61.10	47.50	44.60	50.10	48.30	47.70
Total Volatile Solids	(%)	2.96	4.83	5.04	4.84	5.07	5.15
N-Ammonia	(mg-N/kg)	1.72	2.78	3.78	3.41	5.34	3.66
Sulfide	(mg/kg)	112.00	271	307	304	340	120
Total Organic Carbon	(%)	1.19	0.86	1.23	1.33	1.32	1.42

Analyte	Units	GP-27	GP-28	GP-29	GP-30	GP-31	GP-32
Total Solids	(%)	50.60	51.60	50.70	48.40	52.10	51.40
Preserved Total Solids	(%)	48.20	49.20	47.80	45.90	48.10	43.50
Total Volatile Solids	(%)	4.97	5.17	5.20	5.48	4.98	4.97
N-Ammonia	(mg-N/kg)	3.05	5.02	4.65	5.58	5.15	4.85
Sulfide	(mg/kg)	134	253	152	322	282	99.1
Total Organic Carbon	(%)	1.19	0.96	1.05	1.30	0.90	1.12

Analyte	Units	GP-33	GP-34	GJ-35	GJ-36	GJP-37	GJP-38
Total Solids	(%)	51.50	51.40	72.50	73.90	68.20	59.40
Preserved Total Solids	(%)	47.60	48.20	66.10	70.30	60.10	57.20
Total Volatile Solids	(%)	4.88	5.04	2.01	1.95	2.52	3.68
N-Ammonia	(mg-N/kg)	6.62	5.57	3.41	6.14	3.27	3.11
Sulfide	(mg/kg)	150	69	75.9	46	43.20	83
Total Organic Carbon	(%)	0.94	0.92	1.46	1.07	1.16	1.08

Analyte	Units	GP-39	GP-40	GP-41	GP-42	GP-43	GJ-44
Total Solids	(%)	52.10	56.90	51.80	51.10	52.80	72.10
Preserved Total Solids	(%)	48.10	47.50	51.10	50.10	49.30	67.60
Total Volatile Solids	(%)	4.93	4.24	4.80	4.81	4.73	2.12
N-Ammonia	(mg-N/kg)	4.62	6.40	3.42	3.20	3.92	2.92
Sulfide	(mg/kg)	196.00	111	288.00	266	314	80
Total Organic Carbon	(%)	1.21	1.23	1.07	1.31	1.18	1.23

Analyte	Units	GJ-45	GP-46	GJ-47
Total Solids	(%)	64.50	57.50	64.90
Preserved Total Solids	(%)	59.50	44.10	64.00
Total Volatile Solids	(%)	2.84	4.19	3.16
N-Ammonia	(mg-N/kg)	5.49	3.77	3.41
Sulfide	(mg/kg)	116.00	82.8	26.5
Total Organic Carbon	(%)	1.16	1.28	1.24

Notes

1. Validation qualifier code:
   U = Nondetected. Value shown is laboratory reporting limit.

Abbreviations

mg/kg = milligrams per kilogram

mg-N/kg = milligrams Nitrogen per kilogram

Table 9 Semivolatile Organic Compounds in Water Samples

Analyte	Units	RS-1	Q	R	RS-2	Q	R
1,2,4-Trichlorobenzene	µg/L	1.0	U		1.0	U	
1,2-Dichlorobenzene	µg/L	1.0	U		1.0	U	
1,3-Dichlorobenzene	µg/L	1.0	U		1.0	U	
1,4-Dichlorobenzene	µg/L	1.0	U		1.0	U	
2,4-Dimethylphenol	µg/L	1.0	U		1.0	U	
2-Methylnaphthalene	µg/L	1.0	U		1.0	U	
2-Methylphenol	µg/L	1.0	U		1.0	U	
4-Methylphenol	µg/L	1.0	U		1.0	U	
Acenaphthene	µg/L	1.0	U		1.0	U	
Acenaphthylene	µg/L	1.0	U		1.0	U	
Anthracene	µg/L	1.0	U		1.0	U	
Benzo(a)anthracene	µg/L	1.0	U		1.0	U	
Benzo(a)pyrene	µg/L	1.0	U		1.0	U	
Benzo(g,h,i)perylene	µg/L	1.0	U		1.0	U	
Benzoic acid	µg/L	10	U		10	U	
Benzyl alcohol	µg/L	5.0	U		5.0	U	
bis(2-Ethylhexyl) phthalate	µg/L	1.0	U		1.0	U	
Butyl benzyl phthalate	µg/L	1.0	U		1.0	U	
Chrysene	µg/L	1.0	U		1.0	U	
Dibenz(a,h)anthracene	µg/L	1.0	U		1.0	U	
Dibenzofuran	µg/L	1.0	U		1.0	U	
Diethyl phthalate	µg/L	1.0	U		1.0	U	
Dimethyl phthalate	µg/L	1.0	U		1.0	U	
Di-n-Butyl phthalate	µg/L	1.0	U		1.0	U	
Di-n-Octyl phthalate	µg/L	1.0	U		1.0	U	
Fluoranthene	µg/L	1.0	U		1.0	U	
Fluorene	µg/L	1.0	U		1.0	U	
Hexachlorobenzene	µg/L	1.0	U		1.0	U	
Hexachlorobutadiene	µg/L	1.0	U		1.0	U	
Indeno(1,2,3-cd)pyrene	µg/L	1.0	U		1.0	U	
Naphthalene	µg/L	1.0	U		1.0	U	
N-Nitrosodiphenylamine	µg/L	1.0	U		1.0	U	
Pentachlorophenol	µg/L	5.0	UJ	C	5.0	UJ	C
Phenanthrene	µg/L	1.0	U		1.0	U	
Phenol	µg/L	1.0	U		1.0	U	
Pyrene	µg/L	1.0	U		1.0	U	
Total benzofluoranthenes	µg/L	1.0	U		1.0	U	

Notes
1. Validation qualifier code:
   U = Nondetected. Value shown is laboratory reporting limit.
   UJ = Nondetected. Value shown is estimated reporting limit.
2. Reason code:
   C = Calibration variance

Abbreviations
Q = Qualifier Code
R = Reason code
µg/L = micrograms per liter

Table 10 PCB Results for Water Samples

Analyte	Units	RS-1	Q	RS-2	Q
Aroclor 1016	µg/L	1.0	U	1.0	U
Aroclor 1221	µg/L	1.0	U	1.0	U
Aroclor 1232	µg/L	1.0	U	1.0	U
Aroclor 1242	µg/L	1.0	U	1.0	U
Aroclor 1248	µg/L	1.0	U	1.0	U
Aroclor 1254	µg/L	1.0	U	1.0	U
Aroclor 1260	µg/L	1.0	U	1.0	U

Notes
1. Validation qualifier code:
   U = Nondetected at the stated laboratory reporting limit.

Abbreviations
Q = Qualifier Code
µg/L = micrograms per liter

Table 11 Pesticide Results for Water Samples

Analyte	Units	RS-1	Q	RS-2	Q
4,4'-DDD	µg/L	0.10	U	0.10	U
4,4'-DDE	µg/L	0.10	U	0.10	U
4,4'-DDT	µg/L	0.10	U	0.10	U
Aldrin	µg/L	0.050	U	0.050	U
cis-Chlordane	µg/L	0.050	U	0.050	U
Dieldrin	µg/L	0.10	U	0.10	U
gamma-BHC (Lindane)	µg/L	0.050	U	0.050	U
Heptachlor	µg/L	0.050	U	0.050	U
trans-Chlordane	µg/L	0.050	U	0.050	U

Notes
1. Validation qualifier code:
   U = Nondetected at the stated laboratory reporting limit.

Abbreviations
Q = Qualifier Code
µg/L = micrograms per liter

Table 12 Metals Data for Water Samples

Analyte	Units	RS-1	Q	RS-2	Q
Antimony	mg/L	0.05	U	0.05	U
Arsenic	mg/L	0.05	U	0.05	U
Cadmium	mg/L	0.002	U	0.002	U
Chromium	mg/L	0.007		0.005	U
Copper	mg/L	0.003		0.002	U
Lead	mg/L	0.02	U	0.02	U
Nickel	mg/L	0.01	U	0.01	U
Silver	mg/L	0.003	U	0.003	U
Zinc	mg/L	0.01	U	0.01	U
Mercury		0.0001	U	0.0001	U

Notes
1. Validation qualifier code:
   U = Nondetected at the stated laboratory reporting limit.

Abbreviations
Q = Qualifier Code
mg/L = milligrams per liter

4.0 CHAIN OF CUSTODY AND SAMPLE RECEIPT CONDITION DOCUMENTATION

All samples were received at ARI in good condition at temperatures less than the EPA-recommended 6 degrees Celsius (ºC). Analysis requests for Sample GP-41-2011 were not marked on the chain of custody; however, because jars were received for the same tests as other samples, ARI conducted the full suite of analyses on the sample. No other discrepancies between sample identifications and analysis requests were noted.

5.0 SPECIFIC DATA QUALITY REVIEW AND VALIDATION FINDINGS FOR EACH ANALYTICAL METHOD

Narrative descriptions of the data validation findings and data quality limitations are provided in the following sections for each chemical category of analyses. Qualifiers added to the data during data validation are included with reason codes on the tables attached to this report.

5.1 VOLATILE ORGANIC ANALYSES

Analytical results, including data qualifiers added as part of this data quality review, are presented in Table 2.

5.1.1 Holding times

All analyses were completed within the method specified holding time.

5.1.2 Reporting Limits

All data were reported with the method reporting limit of 1 microgram per kilogram (µg/kg) adjusted to reflect a dry weight basis for each individual sample. On the dry-weight basis, reporting limits ranged between 1.0 and 2.0 µg/kg.

5.1.3 Initial and Continuing Calibrations

The instrument used for volatile organics analyses of the sediment and water samples was calibrated on June 13, 2011. All precision and accuracy criteria for the initial and continuing calibration analyses for the target analytes were satisfied.

5.1.4 Blanks

No target analytes were detected in the laboratory method blanks or trip blanks.

5.1.5 Accuracy and Precision

5.1.5.1 Laboratory Control Samples/Laboratory Control Sample Duplicates

LCS/LCSD analyses were conducted at the method-specified frequency. All recoveries and precision measurements for LCS and LCSD analyses met laboratory, method, and Work Plan requirements.

5.1.5.2 Surrogate Recoveries

All surrogate recoveries were within laboratory and Work Plan limits.

5.1.5.3 Matrix Spikes

Matrix spike analyses were conducted using samples GP-34-2011, GJ-23-2011, GJ-45-2011, and GJ-7-2011. Trichloroethene (TCE) recovery from sample GP-34-2011 at 78.8 percent was slightly below the control limit of 80 percent. The recovery from the MS was acceptable. TCE was not detected in any sample, and data were not qualified. All other recoveries and precision measurements were within specified control limits.

5.1.5.4 Field Duplicates

No target analyte volatile compounds were detected in the field-duplicate samples.

5.2 SEMIVOLATILE ORGANIC ANALYSES

Analytical results for SVOCs, including data qualifiers added part of this data quality review, are presented in Tables 3 and 4. Table 3 shows results for polycyclic aromatic hydrocarbons (PAHs), a sub-category of SVOCs. Results for other SVOCs are presented in Table 4.

5.2.1 Holding times

Samples from SDG TD03 were initially extracted within the method holding time. However, at the time of analysis, the laboratory noted that all extracts had been inadvertently contaminated. All samples from this SDG were re-extracted two days after the nominal holding time had expired. Samples had been frozen, as recommended by the SAPA, and no loss of target SVOC would be expected. No data were qualified for this minor time exceedance. All other extractions and analyses were completed within the method specified holding time.

5.2.2 Reporting Limits

In order to meet project reporting limit objectives for sediments, ARI supplemented the standard Method 8270C analyses with a selected ion monitoring (SIM) analysis of the extracts for those analytes where the standard Method 8270C could not achieve the required sensitivity. ARI reported data from both analyses. AMEC data tables attached to this report have the SIM data for the affected analytes integrated with the standard Method 8270C data for the remainder of the analytes.

All data were reported with the method reporting limits adjusted to reflect a dry weight basis for each individual sample. With limited exceptions, all analyses achieved the project-specified reporting limits for a dry-weight basis. Reporting limits are elevated for phenol, 2-methylphenol and *N*-nitrosodiphenylamine in a limited number of samples due to interferences. Reporting limits for benzoic acid, 4-methylphenol, and diethyl phthalate were above the project objectives. However, the reporting limits did remain below the applicable standards identified in Section 2.2, and ARI was able to report estimated concentrations for detections of these analytes near or below the project objectives. Reporting limits for hexachlorobutadiene, 1,2-dichlorobenzene, 1,4-dichlorobenzene, 1,2,4-trichlorobenzene, and hexachlorobenzene were below the project objectives but marginally above one or more of the Washington Sediment Management Standards identified in the Work Plan. Reporting limits for 1,2,4-trichlorobenzene and hexachlorobenzene were marginally above the Washington Sediment Quality Standards when results are expressed as carbon-normalized concentrations. These analytes were not detected in any sample.

Results for analytes detected at concentrations below the laboratory nominal reporting limit have been flagged as estimated by the laboratory.

5.2.3 Initial and Continuing Calibrations

The instrument used for SVOC analyses of the sediment samples was calibrated on July 19, 2011. The relative standard deviation (RSD) in the standard Method 8270C seven-point calibration exceeded the Work Plan limit of 15 percent RSD for diethyl phthalate (18%) and pentachlorophenol (17%). Pentachlorophenol results are reported from the SIM, analysis and the RSD for

pentachlorophenol by that method met the criterion. Diethyl phthalate was not detected in any sample. No data have been qualified for the minor initial calibration variances.

Continuing calibrations for sediment analyses met the requirements of the Work Plan and the analytical method for less than 20 percent drift for the calibration check compounds (CCCs) and less than 40 percent drift for all other analytes. ARI flagged results in the report with the qualifier “Q” for all analytes where the drift exceeded 20 percent. These included benzoic acid, fluorene, hexachlorobenzene, indeno(1,2,3-cd)pyrene, dibenz(a,h)anthracene, and benzo(g,h,i)perylene. Since in no instance did the percentage drift exceed Method 8270 or the Work Plan limits, no data have been qualified, and the “Q” flags included in ARI’s report have not been retained for the final data tables.

The instrument used for the analyses of the water samples was calibrated on May 24, 2011. The continuing calibration for the CCC pentachlorophenol demonstrated drift of 26 percent, above the control limit for 20 percent. Pentachlorophenol was not detected in either sample, but reporting limits have been qualified as estimated with potential low bias.

5.2.4 Blanks

Bis(2-ethylhexyl) phthalate (BEHP) was detected below the nominal reporting limit in the method blanks associated with samples in SDGs TD03 and TD20. Low concentrations of BEHP reported in samples GJ-23-2011, GJP-4-2011 GJ-26-2011, GP-24-2011, GP-41-2011, and GJ-14-2011 are potentially attributable to laboratory background and have been qualified to be nondetected at the level noted or at the reporting limit.

BEHP was not present in the method blank associated with the sediments in SDG TD44. Trace levels of this analyte were reported below the laboratory reporting limit (RL) in several samples in this SDG. Although results were not qualified during validation based on the method blank, the possibility that these are also attributable to laboratory background cannot be dismissed.

5.2.5 Accuracy and Precision

5.2.5.1 Laboratory Control Samples

LCS analyses were conducted at the method-specified frequency. Recoveries and precision measurements for LCS and LCSD analyses met laboratory and Work Plan criteria.

5.2.5.2 Surrogate Recoveries

All surrogate recoveries for both the sediment and water samples were within laboratory and Work Plan limits.

5.2.5.3 Matrix Spikes

MS analyses were conducted using samples GP-29-2011, GJP-1-2011, GJ-9-2011, and GJ-7-2011 for standard Method 8270 and from sample GJ-9-2011 for SIM analysis. Recoveries of 2,4-dimethylphenol were elevated in the GJP-29-2011 (>200%) and GJ-9-2011 (>180%) MS and MSD sets. This analyte was not detected in any of the associated field samples and results have not been qualified. Benzoic acid recoveries from the MS/MSD from GJ-9-2011 (18.9% and 16.9%) were below Work Plan limits (40%). Benzoic acid was detected in trace levels in a limited number of sediments; data are qualified as estimated (J) as below the reporting limit, and no further qualification is necessary.

Recoveries and precision for all other MS/MSD samples met Work Plan objectives.

5.2.5.4 Field Duplicates

Field-duplicate samples GJP-20-2011 and DGJP-20-2011 contained low levels of PAHs. Results were generally comparable, agreeing within the absolute value of the reporting limit. BEHP was reported at a trace level below the RL in GJP 20-2011 but not in the field duplicate.

5.2.5.5 Sample Dilutions

Levels of several PAHs in sample GJ-8-2011 were above the instrument calibration range during the initial analysis of the sample. Results of initial analyses for these analytes are flagged with the “E” qualifier on the ARI report forms. ARI subsequently diluted and reanalyzed the sample. Results of the reanalysis for the affected analytes from this dilution are valid and are incorporated into the final data tables with no qualifications.

5.3 PCBs

Analytical results for PCBs, including data qualifiers added as part of the data quality review, are presented in Table 5.

5.3.1 Holding times

All analyses were completed within the method-specified holding time.

5.3.2 Reporting Limits

All data were reported with the reporting limits below the project requirements and below applicable standards identified in the Work Plan. Aroclor 1232 reporting limits were slightly elevated in some samples due to interferences (flagged on the ARI report with a “Y”), but in all cases the reporting limit remained below the project objective and applicable standards.

5.3.3 Initial and Continuing Calibrations

The instrument used for PCB analyses of the sediment samples was initially calibrated on June 20, 2011, and that for water samples on June 27, 2011. All precision and accuracy criteria for the initial and continuing calibration analyses for the target analytes were satisfied. All calibrations and analyses were conducted on a dual column instrument.

5.3.4 Blanks

No PCBs were detected in the laboratory method blanks or the trip blanks.

5.3.5 Accuracy and Precision

5.3.5.1 Laboratory Control Samples

LCS analyses were conducted at the method-specified frequency. All recoveries and precision measurements met laboratory, method, and Work Plan requirements.

5.3.5.2 Surrogate Recoveries

With one exception, surrogate recoveries were within Work Plan limits. One surrogate, tetrachlorometaxylene (TMX), was recovered below the limit for the LCS accompanying the samples in SDG TD03. Recovery of other surrogate in the LCS was acceptable, and recoveries of both surrogates from all samples in the SDG were acceptable; therefore no data were qualified.

Recoveries of one surrogate in samples GP-46-2011 (46%), GP-43-2011 (49.5%), GP-41-2011 (42.5%), and GJP-43-2011 (43.2%), and both surrogates in sample GJP-25-2011 (40.2% and 44.5%), were slightly below the laboratory limits of 42 percent and 50 percent but above the Work Plan limit of 40 percent. Aroclor 1242 was detected in sample GP-46-2011 and Aroclor 1248 in sample GP-43-2011. No PCBs were detected in the other samples. Results have not been qualified since Work Plan criteria were satisfied.

5.3.5.3 Matrix Spikes

Matrix spike analyses were conducted using samples GP-29-201, GJP-5-2011, and GJ-18-2011. All recoveries and precision criteria were satisfied.

5.3.5.4 Dual Column Analyses

All samples were analyzed on two gas chromatographic columns. If results for detected PCBs vary by greater than 25 percent relative difference, interferences are likely present and the quantitative value is flagged by the laboratory with the qualifier “P.” The result for Aroclor 1242 in sample GP-31-2011 is qualified as estimated due to variability between results from the two columns. The “P” qualifier was also applied to results for total PCBs, since Aroclor 1242 is one of the constituents that comprise total PCBs.

5.3.5.5 Field Duplicates

Aroclor 1242 was detected in one of the field-duplicate samples but not the other. The difference between the reporting limit (3.9 µg/kg) in sample GJP-20-2011 and the detection in its duplicate sample DGJP-20-2011 (8.8 µg/kg) slightly exceeds the control limit of plus or minus the RL for variability at low levels. Results in the duplicates are qualified as UJ (estimated reporting limit for the primary sample) and J (estimated value for the field duplicate).

5.4 PESTICIDES

5.4.1 Holding times

All analyses were completed within the method-specified holding time.

5.4.2 Reporting Limits

With the exception of Aldrin in samples GJP-11-2011 (<120 µg/kg), GJ-18-2011 (<43 µg/kg), and GJ-36-2011 (<360 µg/kg), all pesticide data were reported with limits below applicable standards identified in the Work Plan. Samples in SDG TD03 were reported with limits approximately two times the project objectives. Samples in SDG TD20 and SDG TD44 met the project objectives with a limited number of exceptions where interferences were noted that led to somewhat elevated reporting limits. Reporting limits exceeded the U.S. Army Corps of Engineers Dredged Material Management program screening levels for Aldrin in samples GJP-11-2011 (<120 µg/kg), GJ-18-2011 (<43 µg/kg), and GJ-36-2011 (<360 µg/kg); Heptachlor in GP-27-2011 (<1.6 µg/kg); and total Chlordane in sample GP-27-2011 (<2.9 µg/kg).

ARI flagged reporting limits affected by interferences with a “Y” qualifier.

5.4.3 Initial and Continuing Calibrations

The dual-column instrument used for pesticide analyses of the sediment and water samples was calibrated on June 13, 2011, July 7, 2011, and July 25, 2011. With limited exceptions, all precision and accuracy criteria for the initial and continuing calibration analyses for the target analytes were satisfied. The 4,4’-DDT breakdown to DDE in the standard exceeded the Work Plan criterion prior to the analyses of GJ-14-2011, GJ-15-2011, GJP-22-2011, and GP-41-2011. 4.4’-DDT was not detected in any sample, but the reporting limits have been qualified as estimated in the affected samples (UJ).

5.4.4 Blanks

No target pesticides were detected in the laboratory method blanks.

5.4.5 Accuracy and Precision

5.4.5.1 Laboratory Control Samples/Laboratory Control Sample Duplicates

LCS/LCSD analyses were conducted at the method-specified frequency. All recoveries and precision measurements for LCS and LCSD analyses met laboratory, method, and Work Plan requirements.

5.4.5.2 Dual Column Results for Detected Pesticides

Measurements for detected pesticides on the two gas chromatographic columns used agreed within 25 percent RPD with limited exceptions. Nonachlor measurements on the two columns were near the reporting limit, but results differed by greater than 25 percent for samples GJP-25-2011, GJ-26-2011, and GP-42-2011. Results are qualified as estimated (J) with the ARI flag “P” appended.

5.4.5.3 Surrogate Recoveries

Recoveries of one of the two pesticide surrogates for the method blank, LCS, and LCSD associated with SDG TD20 were above the upper laboratory control limit but within the Work Plan limits. No pesticides were detected in the associated samples, and no data have been qualified. All other pesticide surrogate recoveries were acceptable.

5.4.5.4 Matrix Spikes

Matrix spike analyses were conducted using samples GP-28-2011, GJP-4-2011, and GJP-10-2011. Recoveries of Lindane (39.6%/38.6%), heptachlor (31.6%/26.9%), and 4,4’-DDT (30.1%/29.9%) from sample GP-28-2011 spikes fell below the Work Plan limit. These pesticides were not detected in the sample, but reporting limits for these in GP-28-2011 are flagged as estimated with potential low bias (UJ).

5.4.5.5 Field Duplicates

Trans-nonachlor was detected in the field-duplicate samples GLP-20-2011 and DGJP-20-2011 at levels slightly above the reporting limit (0.56 µg.kg and 0.65 µg/kg, respectively). The agreement is within the criterion of plus or minus the RL for low-level detections.

5.5 TRIBUTYLTIN

EPA has not published a method for tributyltin, but the Krone method (Krone et al.,1988) for Puget Sound sediments has become the industry standard. This method involves extraction followed by derivatization and then analysis by gas chromatography with a selective detector. ARI analyzed the samples using gas chromatography/mass spectrometry with selected ion monitoring (SIM).

Quality control criteria are not published for the method and were not specified in the Work Plan. Data review and evaluation were based on the laboratory’s historical control limits for accuracy and

precision. Analytical results, including qualifiers assigned as part of this data quality review, are presented in Table 7.

5.5.1 Holding times

All samples were extracted and analyzed within holding times applicable to semivolatile organics.

5.5.2 Reporting Limits

All data were reported with reporting limits of approximately 4 µg/kg.

5.5.3 Initial and Continuing Calibrations

The instrument used for tributyltin analyses of the samples was calibrated on June 22 and July 14, 2011. ARI criteria of less than 20 percent RSD for the initial calibration and less than 20 percent drift for continuing calibration checks were satisfied for all analyses.

5.5.4 Blanks

No tributyltin was detected in the laboratory method blanks.

5.5.5 Accuracy and Precision

5.5.5.1 Laboratory Control Samples

LCS analyses were conducted with each analytical batch. All recoveries met laboratory requirements.

5.5.5.2 Surrogate Recoveries

ARI spiked all samples with two surrogates and applied historical control limits. Recoveries of one surrogate from several samples, including samples GJ-15-2011, GJ-14-2011, GP-43-2011, GP-42-2011, GJP-1-2011, GP-26-2011, and GJ-23-2011, were slightly below the laboratory control limit of 28 percent recovery. Recoveries of both surrogates were below the limit for sample GJ-12-2011. ARI diluted and reanalyzed the samples to minimize the effect of interferences, and surrogate recoveries improved. ARI reported data with the RLs from the initial analyses. The reporting limit for sample GJ-12-2011 may be slightly biased low and is qualified as estimated.

5.5.5.3 Matrix Spikes

Matrix spike analyses were conducted using samples GJP-1-2011, GP-28-2011, and GJ-7-2011. All recoveries were greater than the laboratory's historical control limit of 40 percent.

5.5.5.4 Internal Standards

ARI reported that the internal standard areas were outside of control limits for samples GP-16-2011, GP-30-2011, and GP-28-2011. The samples were diluted to minimize interferences and reanalyzed,

and the internal standard areas for the reanalyses were acceptable. ARI reported results from the dilutions. Reporting limits were adjusted accordingly, and no further qualifications were warranted.

5.5.5.5 Field Duplicates

Tributyltin was not detected in the field-duplicate samples.

5.6 METALS

Analytical results for metals, including qualifiers assigned as part of this data quality review, are presented in Table 7.

5.6.1 Holding times

All analyses were completed within the method-specified holding time.

5.6.2 Reporting Limits

Reporting limits were generally consistent with project objectives. While adjustments for moisture content raised reporting limits for some samples slightly above those presented in the Work Plan, all data were reported with limits below applicable standards.

5.6.3 Initial and Continuing Calibrations

All calibrations met Work Plan requirements for accuracy and stability.

5.6.4 Blanks

No target analytes were detected in the laboratory method blanks or continuing calibration blanks associated with these samples.

5.6.5 Accuracy and Precision

5.6.5.1 Laboratory Control Samples

Recoveries from the LCSs met Work Plan criteria.

5.6.5.2 Matrix Spikes

Matrix spike samples were prepared from samples GP-34-2011, GP-23-2011, and GJ-45-2011. Antimony recoveries were consistent (21 to 28%) but below the Work Plan lower limit of 75 percent. Since recoveries from the blank spikes were all near 100 percent, this indicates a matrix effect specific to the site samples. Antimony was not detected with reporting limits more than an order of magnitude below applicable standards. Data are considered usable with reporting limits qualified as estimated (UJ).

Recoveries of all other metals were within Work Plan limits.

5.6.5.3 Laboratory Duplicate Analyses

Laboratory duplicates were prepared from the same samples as used for matrix spike analyses. All detected analytes present at 5 times the reporting limit or greater agreed within 20 percent RSD.

5.6.5.4 Field Duplicates

Field-duplicate samples GJP-20-2011 and DGJP-20-2011 demonstrated acceptable precision for metals measurements. Results for detected metals are provided below:

Metal	GJP-20-2011 (mg/kg)	DGJP-20-2011 (mg/kg)	RPD
Arsenic	10	10	0%
Chromium	24.6	26.4	9%
Cadmium	0.3	0.3 U	NA
Copper	14.4	15.5	11%
Lead	5	6	7%
Mercury	0.04	0.04	0%
Nickel	22	23	3%
Zinc	44	45	2%

Abbreviations
mg/kg: milligrams per kilogram
NA: Not applicable. No qualifications applied; results agree within 5 times the RL.
U: Non-detected at laboratory reporting limit.

5.7 CONVENTIONAL ANALYSES

Sediment samples were analyzed for total solids, preserved total solids, total volatile solids, nitrogen as ammonia, sulfide, and total organic carbon following standard methods. Results, including qualifiers assigned as part of this data quality review, are presented in Table 8. Results for nitrogen as ammonia and sulfides were reported on a wet weight basis for the sediments. Concentrations of pore water may be calculated using the reported percent moisture data for the samples.

5.7.1 Holding times

All analyses were completed within the method-specified holding times.

5.7.2 Reporting Limits

All data were reported with the reporting limits consistent with the Work Plan objectives.

5.7.3 Blanks

No target analytes were detected in the laboratory method blanks or the trip blanks.

5.7.4 Accuracy and Precision

5.7.4.1 Laboratory Control Samples/Standard Reference Materials

ARI analyzed LCSs for sulfide and total organic carbon and standard reference materials for nitrogen as ammonia and total organic carbon. All recoveries were within Work Plan limits.

5.7.4.2 Matrix Spikes

Matrix spike analyses for ammonia, sulfide, and total organic carbon were conducted using samples GJ-45-2011, GJ-23-2011, and GP-35-2011. All recoveries were within Work Plan limits.

5.7.4.3 Laboratory Duplicates

Samples GJ-45-2011, GJ-23-2011, and GP-35-2011 were prepared and analyzed as laboratory duplicates for all conventional parameters. All results between the duplicates agreed within 10 percent relative difference.

5.7.4.4 Field Duplicates

Results for field duplicates, as shown below, demonstrated acceptable precision for sediment samples.

	GJP-20-2011	DGP-20-2011	RPD
Total solids, %	63.9	62.7	2%
Preserved total solids, %	60	57	5%
Total volatile solids, %	3.1	3.19	3%
N-Ammonia, mg-N/kg	3.53	2.95	18%
Sulfide, mg/kg	85.5	65.2	27%
Total Organic Carbon, Plumb	1.14	1.32	15%

Abbreviations
mg-N/kg = milligrams of nitrogen per kilogram

5.8 GRAIN-SIZE DISTRIBUTION

ARI noted that organic matter was not removed prior to grain-size analysis, and reported values should be interpreted as “apparent” grain-size distribution.

Samples GLP-38-2011, GJP-22-2011, and GP-33-2011 were analyzed in triplicate for grain-size distribution. Precision of less than 5 percent RSD was achieved for all size fraction measurements.

6.0 REFERENCES

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7.0 LIMITATIONS

This report was prepared exclusively for Pacific International Terminals, Inc., by AMEC. The quality of information, conclusions, and estimates contained herein are consistent with the level of effort involved in AMEC services and based on: (i) information available at the time of preparation, (ii) data supplied by outside sources, and (iii) the assumptions, conditions, and qualifications set forth in this report. This Data Validation/Review Report is intended to be used by Pacific International Terminals, Inc., for the Gateway Pacific Terminal only, subject to the terms and conditions of its contract with AMEC. Any other use of, or reliance on, this report by any third party is at that party's sole risk.

APPENDIX D

Complete Laboratory Analytical Results

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TABLE D-1

SEDIMENT CONVENTIONALS[1,2]

Gateway Pacific Terminal
Whatcom County, Washington

Station ID	Total Solids (%)	Total Volatile Solids (%)	N-Ammonia (mg-N/kg)	Sulfide (mg/kg)	Total Organic Carbon (%)	Total Fines[3] (%)
SQS	NA	NA	NA	NA	NA	NA
SL	NA	NA	NA	NA	NA	NA
GJP-1	**77.5**	**1.09**	**3.38**	**181**	**0.338**	**5**
GJP-4	**78.7**	**1.38**	**2.08**	1.26 U	**0.419**	**7.4**
GJP-5	**72.3**	**2.01**	**1.69**	**6.24**	**1.25**	**24.2**
GJP-6	**73.6**	**1.88**	**2.04**	**8.4**	**0.686**	**19.8**
GJ-7	**78**	**1.2**	**6.23**	**13.2**	**0.803**	**8.1**
GJ-8	**73.8**	**1.92**	**6.79**	**13.3**	**0.684**	**17.5**
GJ-9	**79.1**	**0.88**	**3.16**	**4.47**	**0.479**	**4.1**
GJP-10	**77.8**	**1.14**	**4.28**	**27.9**	**0.706**	**10.6**
GJP-11	**71.7**	**2.08**	**3.91**	**37.4**	**1.24**	**22**
GJ-12	**63.2**	**3.28**	**2.53**	**50.5**	**1.15**	**35.2**
GJ-14	**53.8**	**4.68**	**3.09**	**149**	**1.07**	**65.3**
GJ-15	**57.2**	**3.91**	**2.79**	**274**	**1.35**	**60**
GP-16	**49.3**	**5.4**	**6.25**	**258**	**1.56**	**76.1**
GJ-17	**73.6**	**2.1**	**9.94**	**1.8**	**1.3**	**21.3**
GJ-18	**75.3**	**1.77**	**4.65**	**17.2**	**1.06**	**19.9**
GJP-19	**71.2**	**2.12**	**3.17**	**30**	**1.13**	**24.8**
GJP-20	**63.9**	**3.1**	**3.53**	**85.5**	**1.14**	**44.1**
GJP-20D	**62.7**	**3.19**	**2.95**	**65.2**	**1.32**	**45.3**
GJP-21	**65.4**	**2.96**	**1.72**	**112**	**1.19**	**41.6**
GJP-22	**54**	**4.83**	**2.78**	**271**	**0.864**	**71.1**
GJ-23	**49**	**5.04**	**3.78**	**307**	**1.23**	**71.5**
GP-24	**52.4**	**4.84**	**3.41**	**304**	**1.33**	**74.5**
GJP-25	**51**	**5.07**	**5.34**	**340**	**1.32**	**77.2**
GJ-26	**49.8**	**5.15**	**3.66**	**120**	**1.42**	**76.9**
GP-27	**50.6**	**4.97**	**3.05**	**134**	**1.19**	**74.6**
GP-28	**51.6**	**5.17**	**5.02**	**253**	**0.964**	**69.5**
GP-29	**50.7**	**5.2**	**4.65**	**152**	**1.05**	**72.2**
GP-30	**48.4**	**5.48**	**5.58**	**322**	**1.3**	**74.8**
GP-31	**52.1**	**4.98**	**5.15**	**282**	**0.896**	**70.9**
GP-32	**51.4**	**4.97**	**4.85**	**99.1**	**1.12**	**75.9**
GP-33	**51.5**	**4.88**	**6.62**	**150**	**0.936**	**75.5**
GP-34	**51.4**	**5.04**	**5.57**	**69**	**0.917**	**74.1**
GJ-35	**72.5**	**2.01**	**3.41**	**75.9**	**1.46**	**21.9**
GJ-36	**73.9**	**1.95**	**6.14**	**45.8**	**1.07**	**21.1**
GJP-37	**68.2**	**2.52**	**3.27**	**43.2**	**1.16**	**29.9**
GJP-38	**59.4**	**3.68**	**3.11**	**82.5**	**1.08**	**47.3**
GP-39	**52.1**	**4.93**	**4.62**	**196**	**1.21**	**75.5**
GP-40	**56.9**	**4.24**	**6.4**	**111**	**1.23**	**57.3**
GP-41	**51.8**	**4.8**	**3.42**	**288**	**1.07**	**73.9**

TABLE D-1

SEDIMENT CONVENTIONALS[1,2]

Gateway Pacific Terminal
Whatcom County, Washington

Station ID	Total Solids (%)	Total Volatile Solids (%)	N-Ammonia (mg-N/kg)	Sulfide (mg/kg)	Total Organic Carbon (%)	Total Fines[3] (%)
SQS	NA	NA	NA	NA	NA	NA
SL	NA	NA	NA	NA	NA	NA
GP-42	**51.1**	**4.81**	**3.2**	**266**	**1.31**	**71.2**
GP-43	**52.8**	**4.73**	**3.92**	**314**	**1.18**	**72**
GJ-44	**72.1**	**2.12**	**2.92**	**80.3**	**1.23**	**23.3**
GJ-45	**64.5**	**2.84**	**5.49**	**116**	**1.16**	**34.9**
GP-46	**57.5**	**4.19**	**3.77**	**82.8**	**1.28**	**54.9**
GJ-47	**64.9**	**3.16**	**3.41**	**26.5**	**1.24**	**36.3**

Notes
1. **Bold** indicates value was detected above laboratory reporting limit.
2. EPA qualifier:
   U = Analyte was not detected at or below the associated laboratory reporting limit.
3. Fraction of sediment particles with a diameter less than 63 µm (clay and silt).

Abbreviations

EPA:	U.S. Environmental Protection Agency
DMMP:	Dredged Material Management Program
mg/kg:	milligrams per kilogram
mg-N/kg:	milligrams nitrogen per kilogram
NA:	not available
SL:	DMMP Screening Levels
SQS:	Washington Marine Sediment Quality Standard
µm:	micrometers

TABLE D-2

SEDIMENT METALS AND ORGANOMETALS[1,2]

Gateway Pacific Terminal
Whatcom County, Washington

Station ID	Antimony (mg/kg)	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Silver (mg/kg)	Zinc (mg/kg)	Tributyltin (µg/kg)
SQS	NA	**57**	**5.1**	**260**	**390**	**450**	**0.41**	NA	**6.1**	**410**	NA
SL	**150**	**57**	**5.1**	**260**	**390**	**450**	**0.41**	**140**	**6.1**	**410**	**73**
GJP-1	6 UJ M	6 U	0.2 U	**15.1**	**6.9**	2 U	0.02 U	**13**	0.4 U	**23**	3.3 U
GJP-4	6 UJ M	6 U	0.3 U	**15.6**	**6.9**	3 U	0.02 U	**14**	0.4 U	**25**	3.4 U
GJP-5	7 UJ M	**7**	0.3 U	**18.6**	**9.7**	**4**	**0.03**	**18**	0.4 U	**33**	3.7 U
GJP-6	6 UJ M	**7**	0.3 U	**18.8**	**9**	**3**	0.02 U	**16**	0.4 U	**32**	3.6 U
GJ-7	6 UJ M	**6**	0.3 U	**15.5**	**6.6**	3 U	0.02 U	**13**	0.4 U	**23**	3.4 U
GJ-8	7 UJ M	**8**	0.3 U	**17.2**	**9.2**	**3**	0.02 U	**15**	0.4 U	**30**	3.5 U
GJ-9	6 UJ M	**7**	0.3 U	**14.8**	**6.5**	3 U	0.02 U	**13**	0.4 U	**24**	3.2 U
GJP-10	6 UJ M	**7**	0.2 U	**15.8**	**7.3**	2 U	0.02 U	**14**	0.4 U	**26**	3.3 U
GJP-11	7 UJ M	**8**	0.3 U	**18.9**	**9.6**	**4**	**0.03**	**17**	0.4 U	**32**	3.6 U
GJ-12	7 UJ M	**9**	**0.3**	**24.6**	**15**	**5**	**0.04**	**24**	0.4 U	**44**	3.8 UJ S
GJ-14	10 UJ M	**10**	0.4 U	**34**	**20.2**	**7**	**0.05**	**32**	0.6 U	**60**	3.8 U
GJ-15	9 UJ M	**10**	**0.4**	**31.5**	**19**	**6**	**0.04**	**31**	0.5 U	**57**	3.7 U
GP-16	10 UJ M	**10**	0.4 U	**38**	**22.5**	**8**	**0.07**	**38**	0.6 U	**67**	11 U
GJ-17	6 UJ M	**8**	0.3 U	**20.3**	**10**	**3**	0.03 U	**17**	0.4 U	**35**	3.6 U
GJ-18	7 UJ M	**8**	0.3 U	**18.6**	**9.7**	**3**	0.03 U	**17**	0.4 U	**32**	3.6 U
GJP-19	7 UJ M	**8**	0.3 U	**19.5**	**10.5**	**4**	**0.03**	**17**	0.4 U	**34**	3.8 U
GJP-20	8 UJ M	**10**	**0.3**	**24.6**	**14.4**	**5**	**0.04**	**22**	0.5 U	**44**	3.7 U
GJP-20D	8 UJ M	**10**	0.3 U	**26.4**	**15.5**	**6**	**0.04**	**23**	0.5 U	**45**	3.8 U
GJP-21	8 UJ M	**10**	0.3 U	**26.4**	**14.6**	**5**	**0.04**	**25**	0.5 U	**45**	3.8 U
GJP-22	10 UJ M	**10**	0.4 U	**33**	**19.9**	**7**	**0.05**	**33**	0.6 U	**62**	3.7 U
GJ-23	10 UJ M	10 U	0.4 U	**35**	**21.4**	**8**	**0.05**	**34**	0.6 U	**64**	3.8 U
GP-24	9 UJ M	**10**	0.4 U	**35.8**	**21.3**	**8**	**0.06**	**34**	0.6 U	**65**	3.7 U
GJP-25	10 UJ M	**10**	0.4 U	**38**	**22.7**	**8**	**0.06**	**35**	0.6 U	**67**	11 U
GJ-26	10 UJ M	**10**	0.4 U	**37**	**22.6**	**8**	**0.05**	**35**	0.6 U	**65**	3.8 U
GP-27	10 UJ M	**10**	0.4 U	**38**	**23.1**	**8**	**0.05**	**37**	0.6 U	**68**	3.8 U
GP-28	10 UJ M	**10**	0.4 U	**36**	**21.3**	**8**	**0.06**	**36**	0.6 U	**66**	11 U
GP-29	10 UJ M	**10**	0.4 U	**38**	**21.9**	**8**	**0.06**	**37**	0.6 U	**67**	3.6 U
GP-30	10 UJ M	10 U	0.4 U	**38**	**22.1**	**8**	**0.06**	**37**	0.6 U	**67**	11 U
GP-31	9 UJ M	**10**	0.4 U	**35.6**	**21.3**	**8**	**0.06**	**37**	0.6 U	**66**	3.4 U
GP-32	10 UJ M	**10**	0.4 U	**37**	**22.5**	**8**	**0.06**	**38**	0.6 U	**66**	3.5 U

TABLE D-2

SEDIMENT METALS AND ORGANOMETALS[1,2]

Gateway Pacific Terminal
Whatcom County, Washington

Station ID	Antimony (mg/kg)	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Silver (mg/kg)	Zinc (mg/kg)	Tributyltin (µg/kg)
SQS	NA	**57**	**5.1**	**260**	**390**	**450**	**0.41**	NA	**6.1**	**410**	NA
SL	**150**	**57**	**5.1**	**260**	**390**	**450**	**0.41**	**140**	**6.1**	**410**	**73**
GP-33	10 UJ M	**10**	0.4 U	**36**	**21.7**	**8**	**0.06**	**37**	0.6 U	**65**	3.6 U
GP-34	10 UJ M	**10**	0.4 U	**37**	**22.1**	**8**	**0.06**	**38**	0.6 U	**66**	3.6 U
GJ-35	7 UJ M	**8**	0.3 U	**21**	**10.5**	**4**	0.03 U	**17**	0.4 U	**34**	3.6 U
GJ-36	7 UJ M	**7**	0.3 U	**18.8**	**10.1**	**4**	**0.03**	**17**	0.4 U	**32**	3.5 U
GJP-37	7 UJ M	**9**	0.3 U	**21.4**	**12.3**	**4**	**0.03**	**19**	0.4 U	**36**	3.4 U
GJP-38	8 UJ M	**9**	0.3 U	**27.4**	**16.1**	**6**	**0.04**	**25**	0.5 U	**49**	3.5 U
GP-39	9 UJ M	**12**	0.4 U	**35.6**	**22.5**	**8**	**0.06**	**33**	0.6 U	**64**	3.6 U
GP-40	9 UJ M	**11**	0.4 U	**32.2**	**18.9**	**6**	**0.05**	**29**	0.5 U	**59**	3.4 U
GP-41	9 UJ M	**11**	0.4 U	**33.8**	**21.7**	**7**	**0.05**	**33**	0.6 U	**63**	3.7 U
GP-42	10 UJ M	**10**	0.4 U	**38**	**22**	**8**	**0.05**	**37**	0.6 U	**69**	3.6 U
GP-43	10 UJ M	**10**	0.4 U	**37**	**21.6**	**8**	**0.05**	**36**	0.6 U	**64**	3.6 U
GJ-44	7 UJ M	**9**	0.3 U	**21**	**10.7**	**4**	**0.03**	**20**	0.4 U	**35**	3.6 U
GJ-45	7 UJ M	**10**	0.3 U	**22.7**	**13.5**	**5**	**0.03**	**20**	0.4 U	**40**	3.5 U
GP-46	9 UJ M	**10**	0.4 U	**30.7**	**18.7**	**7**	**0.05**	**27**	0.5 U	**55**	3.7 U
GJ-47	7 UJ M	**9**	0.3 U	**23.8**	**14.6**	**6**	**0.04**	**21**	0.4 U	**43**	3.6 U

Notes
1. **Bold** indicates value was detected above reporting level.
2. EPA qualifier:
   M = Matrix spike recoveries are outside of control limits.
   S = Surrogate recoveries below control limit.
   U = Analyte was not detected at or below the associated reporting limit concentration.
   UJ = The compound or analyte was analyzed for but not detected. The associated sample detection limit is an estimated value.

Abbreviations

DMMP:	Dredged Material Management Program	SL:	DMMP Screening Level
mg/kg:	milligrams per kilogram	SQS:	Washington Marine Sediment Quality Standard
NA:	not available	µg/kg:	micrograms per kilogram

TABLE D-3

SEDIMENT CHLORINATED PESTICIDES[1,2,3]
Gateway Pacific Terminal
Whatcom County, Washington

Station ID	Lindane (µg/kg)	Heptachlor (µg/kg)	Aldrin (µg/kg)	Dieldrin (µg/kg)	4,4'-DDE (µg/kg)	4,4'-DDD (µg/kg)	4,4'-DDT (µg/kg)	Total DDT (µg/kg)	trans-Chlordane (µg/kg)	cis-Chlordane (µg/kg)	oxy Chlordane (µg/kg)	cis-Nonachlor (µg/kg)	trans-Nonachlor (µg/kg)	Total Chlordane (µg/kg)
SQS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SL	**10**	**1.5**	**9.5**	**1.9**	**9**	**16**	**12**	**6.9**	NA	NA	NA	NA	NA	**2.8**
GJP-1	0.23 U	0.23 U	0.23 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.23 U	0.23 U	0.47 U	0.47 U	0.47 U	0.47 U
GJP-4	0.24 U	0.24 U	0.24 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.24 U	0.24 U	0.47 U	0.47 U	0.47 U	0.47 U
GJP-5	0.25 U	0.25 U	0.25 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.25 U	0.25 U	0.5 U	0.5 U	0.5 U	0.5 U
GJP-6	0.24 U	0.24 U	0.24 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.46 U Y	0.24 U	0.48 U	0.48 U	0.48 U	0.48 U
GJ-7	0.24 U	0.24 U	0.24 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.49 U Y	0.24 U	0.47 U	0.47 U	0.47 U	0.49 U Y
GJ-8	0.24 U	0.24 U	0.24 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.47 U Y	0.24 U	0.48 U	0.48 U	0.48 U	0.48 U
GJ-9	0.23 U	0.23 U	0.23 U	0.46 U	0.46 U	0.46 U	0.46 U	0.46 U	0.24 U Y	0.23 U	0.46 U	0.46 U	0.46 U	0.46 U
GJP-10	0.24 U	0.24 U	0.97 U Y	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.6 U Y	0.24 U	0.48 U	0.48 U	0.48 U	0.6 U Y
GJP-11	0.24 U	0.24 U	120 U Y	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.24 U	0.24 U	0.48 U	0.48 U	0.48 U	0.48 U
GJ-12	0.24 U	0.24 U	0.24 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.73 U Y	0.24 U	0.48 U	0.48 U	**0.53**	**0.53**
GJ-14	0.71 U Y	0.24 U	0.24 U	0.48 U	0.48 U	0.48 U	0.48 UJ N	0.48 U	0.91 U Y	0.24 U	0.48 U	0.48 U	**0.84**	**0.84**
GJ-15	0.24 U	0.24 U	0.24 U	0.48 U	0.48 U	0.48 U	0.48 UJ N	0.48 U	0.59 U Y	0.24 U	0.48 U	0.48 U	0.48 U	0.59 U Y
GP-16	1.2 U	1.2 U	1.2 U	1.2 UJ	2.5 U	2.5 U	2.5 U	2.5 U	1.2 U	1.2 U	2.5 U	2.5 U	2.5 U	2.5 U
GJ-17	0.44 U Y	0.24 U	0.24 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.66 U Y	0.24 U	0.48 U	0.48 U	0.48 U	0.66 U Y
GJ-18	0.24 U	0.24 U	43 U Y	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.76 U Y	0.24 U	0.57 U Y	0.48 U	0.48 U	0.76 U Y
GJP-19	0.24 U	0.24 U	0.24 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.62 U Y	0.24 U	0.48 U	0.48 U	0.48 U	0.62 U Y
GJP-20	0.24 U	0.24 U	0.24 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.8 U Y	0.24 U	0.48 U	0.48 U	**0.56**	**0.56**
GJP-20D	0.25 U	0.25 U	0.25 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.69 U Y	0.25 U	0.49 U	0.49 U	**0.65**	**0.65**
GJP-21	0.24 U	0.24 U	0.24 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.5 U Y	0.24 U	0.48 U	0.48 U	1.7 U Y	1.7 U Y
GJP-22	0.52 U Y	0.54 U	0.24 U	0.48 U	0.48 U	0.48 U	0.48 UJ N	0.48 U	1.1 U Y	0.24 U	0.48 U	0.48 U	**0.73**	**0.73**
GJ-23	0.54 U Y	0.98 U Y	0.99 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.77 U Y	0.25 U	0.49 U	0.49 U	1.9 U Y	1.9 U Y
GP-24	0.73 U Y	1.4 U Y	0.24 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.24 U	0.24 U	1.4 U Y	0.48 U	**1.4**	**1.4**
GJP-25	0.66 U Y	0.99 U Y	0.92 U Y	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.71 U Y	0.25 U	0.5 U	0.5 U	**1.5 J P**	**1.5 J P**
GJ-26	0.52 U Y	1.4 U Y	0.25 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.87 U Y	0.25 U	0.5 U	0.5 U	**1.7 J P**	**1.7 J P**
GP-27	0.71 U Y	1.6 U Y	1 U Y	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.74 U Y	0.24 U	1.4 U Y	0.48 U	2.9 U Y	2.9 U Y
GP-28	1.2 UJ M	1.2 UJ M	1.2 U	1.2 UJ	2.4 U	2.4 U	2.4 UJ M	2.4 U	1.2 U	1.2 U	2.4 U	2.4 U	2.4 U	2.4 U
GP-29	1.2 U	1.2 U	1.2 U	1.2 UJ	2.4 U	2.4 U	2.4 U	2.4 U	1.2 U	1.2 U	2.4 U	2.4 U	2.4 U	2.4 U
GP-30	1.2 U	1.2 U	1.2 U	1.2 UJ	2.4 U	2.4 U	2.4 U	2.4 U	1.6 U Y	1.2 U	2.4 U	2.4 U	2.4 U	2.4 U
GP-31	1.2 U	1.2 U	1.2 U	1.2 UJ	2.4 U	2.4 U	2.4 U	2.4 U	1.2 U	1.2 U	2.4 U	2.4 U	2.4 U	2.4 U
GP-32	1.2 U	1.2 U	1.2 U	1.2 UJ	2.4 U	2.4 U	2.4 U	2.4 U	1.2 U	1.2 U	2.4 U	2.4 U	2.4 U	2.4 U
GP-33	1.2 U	1.2 U	1.2 U	1.2 UJ	2.4 U	2.4 U	2.4 U	2.4 U	1.2 U	1.2 U	2.4 U	2.4 U	2.4 U	2.4 U
GP-34	1.2 U	1.2 U	1.2 U	1.2 UJ	2.4 U	2.4 U	2.4 U	2.4 U	1.2 U	1.2 U	2.4 U	2.4 U	2.4 U	2.4 U
GJ-35	0.64 U Y	0.24 U	0.843 U Y	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	1.4 U Y	0.24 U	0.48 U	0.94 U Y	2.5 U Y	2.5 U Y
GJ-36	0.24 U	0.24 U	360 U Y	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.54 U Y	0.24 U	0.77 U Y	0.48 U	**0.68**	**0.68**
GJP-37	0.24 U	0.24 U	0.24 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.56 U Y	0.24 U	0.47 U	0.47 U	0.47 U	0.56 U Y
GJP-38	0.25 U	0.25 U	0.25 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.85 U Y	0.25 U	0.5 U	0.5 U	0.5 U	0.85 U Y
GP-39	0.25 U	0.25 U	0.25 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	1.4 U Y	0.25 U	0.49 U	0.49 U	0.49 U	1.4 U Y
GP-40	0.24 U	0.24 U	0.24 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.66 U Y	0.24 U	0.49 U	0.49 U	0.49 U	0.66 U Y
GP-41	0.63 U Y	1 U Y	0.25 U	0.49 U	0.49 U	0.49 U	0.49 UJ N	0.49 U	0.91 U Y	0.25 U	0.49 U	0.49 U	0.49 U	0.91 U Y

TABLE D-3

SEDIMENT CHLORINATED PESTICIDES[1,2,3]
Gateway Pacific Terminal
Whatcom County, Washington

Station ID	Lindane (µg/kg)	Heptachlor (µg/kg)	Aldrin (µg/kg)	Dieldrin (µg/kg)	4,4'-DDE (µg/kg)	4,4'-DDD (µg/kg)	4,4'-DDT (µg/kg)	Total DDT (µg/kg)	trans-Chlordane (µg/kg)	cis-Chlordane (µg/kg)	oxy Chlordane (µg/kg)	cis-Nonachlor (µg/kg)	trans-Nonachlor (µg/kg)	Total Chlordane (µg/kg)
SQS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SL	**10**	**1.5**	**9.5**	**1.9**	**9**	**16**	**12**	**6.9**	NA	NA	NA	NA	NA	**2.8**
GP-42	0.25 U	0.25 U	0.25 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.25 U	0.25 U	0.49 U	0.49 U	**0.89 J P**	**0.89 J P**
GP-43	0.78 U Y	1.2 U Y	1.3 U Y	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.95 U Y	0.24 U	0.49 U	0.49 U	**1.9**	**1.9**
GJ-44	0.24 U	0.24 U	0.24 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.24 U	0.24 U	0.47 U	0.47 U	0.47 U	0.47 U
GJ-45	0.24 U	0.24 U	0.24 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	1.2 U Y	0.24 U	0.49 U	0.49 U	0.49 U	1.2 U Y
GP-46	0.24 U	0.57 U Y	0.24 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.24 U	0.24 U	0.49 U	0.49 U	**0.79**	**0.79**
GJ-47	0.25 U	0.25 U	0.25 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.74 U Y	0.25 U	0.49 U	0.49 U	0.49 U	0.74 U Y

Notes
1. **Bold** indicates value was detected above reporting level.
2. Shaded cell indicates reporting limit exceeds the SQS or SL value.
3. EPA qualifiers:
   P = Results from dual-column analyses (pesticides and Aroclors) differed significantly; reported value may be biased.
   U = Analyte was not detected at or below the associated reporting limit concentration.
   UJ = The compound or analyte was analyzed for but not detected. The associated sample reporting limit is an estimated value.
   UY = Analyte was analyzed for but not detected at the associated sample reporting limit. Reporting limit is elevated due to interferences.
   J = Result is approximate concentration.
   N = DDT breakdown to DDE exceeded 15%.
   M = Matrix spike recoveries are outside control limits.

Abbreviations

EPA:	U.S. Environmental Protection Agency
DMMP:	Dredged Material Management Program
NA:	not available
SL:	DMMP Screening Level
SQS:	Washington Marine Sediment Quality Standard
µg/kg:	micrograms per kilogram

TABLE D-4

SEDIMENT SEMIVOLATILE ORGANIC COMPOUNDS [1,2,3]
(DRY-WEIGHT CONCENTRATIONS)

Gateway Pacific Terminal
Whatcom County, Washington

Station ID	1,2-Dichloro-benzene (µg/kg)	1,3-Dichloro-benzene (µg/kg)	1,4-Dichloro-benzene (µg/kg)	1,2,4-Trichloro-benzene (µg/kg)	Hexachloro-benzene (µg/kg)	Dimethyl phthalate (µg/kg)	Diethyl phthalate (µg/kg)	Di-n-butyl phthalate (µg/kg)	Butyl benzyl phthalate (µg/kg)	Bis [2-ethylhexyl] phthalate (µg/kg)
SQS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SL	**35**	NA	**110**	**31**	**22**	**71**	**200**	**1,400**	**63**	**1,300**
GJP-1	4.6 U	4.6 U	4.6 U	4.6 U	4.6 U	4.6 U	46 U	18 U	4.6 U	23 U
GJP-4	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	47 U	19 U	4.7 U	36 U B
GJP-5	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	47 U	19 U	4.7 U	23 U
GJP-6	4.6 U	4.6 U	4.6 U	4.6 U	4.6 U	4.6 U	46 U	18 U	4.6 U	23 U
GJ-7	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	47 U	19 U	4.7 U	24 U
GJ-8	4.6 U	4.6 U	4.6 U	4.6 U	4.6 U	4.6 U	46 U	19 U	4.6 U	23 U
GJ-9	4.5 U	4.5 U	4.5 U	4.5 U	4.5 U	4.5 U	45 U	18 U	4.5 U	22 U
GJP-10	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	47 U	19 U	4.7 U	23 U
GJP-11	4.8 U	4.8 U	4.8 U	4.8 U	4.8 U	4.8 U	48 U	4.8 U	4.8 U	24 U
GJ-12	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	47 U	19 U	4.7 U	23 U
GJ-14	4.9 U	4.9 U	4.9 U	4.9 U	4.9 U	4.9 U	49 U	20 U	4.9 U	24 U B
GJ-15	4.5 U	4.5 U	4.5 U	4.5 U	4.5 U	4.5 U	45 U	18 U	4.5 U	23 U
GP-16	4.8 U	4.8 U	4.8 U	4.8 U	4.8 U	4.8 U	48 U	19 U	4.8 U	25 U
GJ-17	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	47 U	19 U	4.7 U	24 U
GJ-18	4.5 U	4.5 U	4.5 U	4.5 U	4.5 U	4.5 U	45 U	18 U	4.5 U	**14 J**
GJP-19	4.8 U	4.8 U	4.8 U	4.8 U	4.8 U	4.8 U	48 U	19 U	4.8 U	24 U
GJP-20	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	47 U	19 U	4.7 U	**14 J**
GJP-20D	5 U	5 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	25 U
GJP-21	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	47 U	19 U	4.7 U	24 U
GJP-22	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	47 U	19 U	4.7 U	24 U
GJ-23	4.9 U	4.9 U	4.9 U	4.9 U	4.9 U	4.9 U	49 U	20 U	4.9 U	26 U B
GP-24	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	47 U	19 U	4.7 U	31 U B
GJP-25	4.8 U	4.8 U	4.8 U	4.8 U	4.8 U	4.8 U	46 U	19 U	4.8 U	23 U
GJ-26	5 U	5 U	5 U	5 U	5 U	5 U	50 U	20 U	5 U	25 U B

TABLE D-4

SEDIMENT SEMIVOLATILE ORGANIC COMPOUNDS [1,2,3]
(DRY-WEIGHT CONCENTRATIONS)
Gateway Pacific Terminal
Whatcom County, Washington

Station ID	1,2-Dichloro-benzene (µg/kg)	1,3-Dichloro-benzene (µg/kg)	1,4-Dichloro-benzene (µg/kg)	1,2,4-Trichloro-benzene (µg/kg)	Hexachloro-benzene (µg/kg)	Dimethyl phthalate (µg/kg)	Diethyl phthalate (µg/kg)	Di-n-butyl phthalate (µg/kg)	Butyl benzyl phthalate (µg/kg)	Bis [2-ethylhexyl] phthalate (µg/kg)
SQS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SL	**35**	NA	**110**	**31**	**22**	**71**	**200**	**1,400**	**63**	**1,300**
GP-27	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	47 U	19 U	4.7 U	24 U
GP-28	4.9 U	4.9 U	4.9 U	4.9 U	4.9 U	4.9 U	49 U	20 U	4.9 U	25 U
GP-29	5 U	5 U	5 U	5 U	5 U	5 U	50 U	20 U	5 U	25 U
GP-30	4.9 U	4.9 U	4.9 U	4.9 U	4.9 U	4.9 U	49 U	20 U	4.9 U	24 U
GP-31	4.9 U	4.9 U	4.9 U	4.9 U	4.9 U	4.9 U	49 U	20 U	4.9 U	24 U
GP-32	5 U	5 U	5 U	5 U	5 U	5 U	50 U	20 U	5 U	25 U
GP-33	4.8 U	4.8 U	4.8 U	4.8 U	4.8 U	4.8 U	48 U	19 U	4.8 U	24 U
GP-34	5 U	5 U	5 U	5 U	5 U	5 U	50 U	20 U	5 U	25 U
GJ-35	4.8 U	4.8 U	4.8 U	4.8 U	4.8 U	4.8 U	48 U	19 U	4.8 U	24 U
GJ-36	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	47 U	19 U	4.7 U	**17 J**
GJP-37	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	47 U	19 U	4.7 U	23 U
GJP-38	4.9 U	4.9 U	4.9 U	4.9 U	4.9 U	4.9 U	49 U	20 U	4.9 U	24 U
GP-39	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	47 U	19 U	4.7 U	24 U
GP-40	4.8 U	4.8 U	4.8 U	4.8 U	4.8 U	4.8 U	48 U	19 U	4.8 U	24 U
GP-41	4.6 U	4.6 U	4.6 U	4.6 U	4.6 U	4.6 U	46 U	18 U	4.6 U	26 U B
GP-42	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	47 U	19 U	4.7 U	24 U
GP-43	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	47 U	19 U	4.7 U	24 U
GJ-44	4.6 U	4.6 U	4.6 U	4.6 U	4.6 U	4.6 U	46 U	18 U	4.6 U	23 U
GJ-45	4.5 U	4.5 U	4.5 U	4.5 U	4.5 U	4.5 U	45 U	18 U	4.5 U	**14 J**

TABLE D-4

SEDIMENT SEMIVOLATILE ORGANIC COMPOUNDS [1,2,3]
(DRY-WEIGHT CONCENTRATIONS)
Gateway Pacific Terminal
Whatcom County, Washington

Station ID	1,2-Dichloro-benzene (µg/kg)	1,3-Dichloro-benzene (µg/kg)	1,4-Dichloro-benzene (µg/kg)	1,2,4-Trichloro-benzene (µg/kg)	Hexachloro-benzene (µg/kg)	Dimethyl phthalate (µg/kg)	Diethyl phthalate (µg/kg)	Di-n-butyl phthalate (µg/kg)	Butyl benzyl phthalate (µg/kg)	Bis [2-ethylhexyl] phthalate (µg/kg)
SQS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SL	**35**	NA	**110**	**31**	**22**	**71**	**200**	**1,400**	**63**	**1,300**
GP-46	4.6 U	4.6 U	4.6 U	4.6 U	4.6 U	4.6 U	46 U	19 U	4.6 U	**16 J**
GJ-47	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	47 U	19 U	4.7 U	23 U

TABLE D-4

SEDIMENT SEMIVOLATILE ORGANIC COMPOUNDS [1,2,3]
(DRY-WEIGHT CONCENTRATIONS)

Gateway Pacific Terminal
Whatcom County, Washington

Station ID	Di-n-octyl phthalate (µg/kg)	Dibenzo-furan (µg/kg)	Hexachloro-butadiene (µg/kg)	N-nitrosodi-phenylamine (µg/kg)	Phenol (µg/kg)	2-Methyl-phenol (µg/kg)	4-Methyl-phenol (µg/kg)	2,4-Dimethyl-phenol (µg/kg)	Pentachloro-phenol (µg/kg)	Benzyl alcohol (µg/kg)	Benzoic acid (µg/kg)
SQS	NA	NA	NA	NA	**420**	**63**	**670**	**29**	**360**	**57**	**650**
SL	**6,200**	**540**	**11**	**28**	**420**	**63**	**670**	**29**	**400**	**57**	**650**
GJP-1	18 U	18 U	4.6 U	4.6 U	**160**	4.6 U	36 U	4.6 U	23 U	4.6 U	360 U
GJP-4	19 U	19 U	4.7 U	4.7 U	19 U	4.7 U	37 U	4.7 U	23 U	4.7 U	370 U
GJP-5	19 U	19 U	4.7 U	4.7 U	19 U	4.7 U	37 U	4.7 U	23 U	4.7 U	370 U
GJP-6	18 U	18 U	4.6 U	4.6 U	18 U	4.6 U	37 U	4.6 U	23 U	4.6 U	370 U
GJ-7	19 U	19 U	4.7 U	4.7 U	19 U	4.7 U	38 U	4.7 U	24 U	4.7 U	380 U
GJ-8	19 U	**200**	4.6 U	6.1 U Y	**35**	**8.2**	**22 J**	**7.8**	23 U	4.6 U	370 U
GJ-9	18 U	18 U	4.5 U	4.5 U	18 U	4.5 U	36 U	4.5 U	22 U	4.5 U	360 U
GJP-10	19 U	19 U	4.7 U	4.7 U	19 U	4.7 U	37 U	4.7 U	23 U	4.7 U	370 U
GJP-11	19 U	19 U	4.8 U	4.8 U	19 U	4.8 U	38 U	4.8 U	24 U	4.8 U	380 U
GJ-12	19 U	19 U	4.7 U	4.7 U	50 U Y	4.7 U	37 U	4.7 U	23 U	**26**	370 U
GJ-14	20 U	20 U	4.9 U	4.9 U	20 U	4.9 U	39 U	4.9 U	24 U	**5.3**	390 U
GJ-15	18 U	18 U	4.5 U	4.5 U	18 U	4.5 U	**11 J**	4.5 U	23 U	**5.2**	**92 J**
GP-16	19 U	19 U	4.8 U	4.8 U	**15 J**	4.8 U	38 U	4.8 U	24 U	**5.6**	380 U
GJ-17	19 U	**44**	4.7 U	4.7 U	**11 J**	4.7 U	38 U	4.7 U	24 U	4.7 U	380 U
GJ-18	18 U	18 U	4.5 U	4.5 U	18 U	4.5 U	36 U	4.5 U	23 U	4.5 U	360 U
GJP-19	19 U	19 U	4.8 U	4.8 U	19 U	4.8 U	38 U	4.8 U	24 U	4.8 U	380 U
GJP-20	19 U	19 U	4.7 U	4.7 U	19 U	4.7 U	38 U	4.7 U	24 U	4.7 U	380 U
GJP-20D	20 U	20 U	5 U	5 U	20 U	5 U	40 U	5 U	25 U	5 U	400 U
GJP-21	19 U	19 U	4.7 U	4.7 U	19 U	4.7 U	38 U	4.7 U	24 U	4.7 U	380 U
GJP-22	19 U	19 U	4.7 U	4.7 U	19 U	4.7 U	38 U	4.7 U	24 U	**6.2**	380 U
GJ-23	20 U	20 U	4.9 U	4.9 U	24 U Y	5.5 U Y	39 U	**6.5**	24 U	4.9 U	**130 J**
GP-24	19 U	19 U	4.7 U	4.7 U	31 U Y	6.3 U Y	**22 J**	**6.2**	24 U	**12**	**190 J**
GJP-25	19 U	19 U	4.8 U	4.8 U	25 U Y	5.4 U	**14 J**	**6**	24 U	**9.8**	**140 J**
GJ-26	20 U	20 U	5 U	5 U	33 U Y	5.8 U Y	**14 J**	**6.4**	25 U	**12**	**170 J**

TABLE D-4

SEDIMENT SEMIVOLATILE ORGANIC COMPOUNDS [1,2,3]
(DRY-WEIGHT CONCENTRATIONS)

Gateway Pacific Terminal
Whatcom County, Washington

Station ID	Di-n-octyl phthalate (µg/kg)	Dibenzo-furan (µg/kg)	Hexachloro-butadiene (µg/kg)	N-nitrosodi-phenylamine (µg/kg)	Phenol (µg/kg)	2-Methyl-phenol (µg/kg)	4-Methyl-phenol (µg/kg)	2,4-Dimethyl-phenol (µg/kg)	Pentachloro-phenol (µg/kg)	Benzyl alcohol (µg/kg)	Benzoic acid (µg/kg)
SQS	NA	NA	NA	NA	**420**	**63**	**670**	**29**	**360**	**57**	**650**
SL	**6,200**	**540**	**11**	**28**	**420**	**63**	**670**	**29**	**400**	**57**	**650**
GP-27	19 U	19 U	4.7 U	4.7 U	25 U Y	5 U Y	38 U	**5.8**	24 U	**9.8**	**110 J**
GP-28	20 U	20 U	4.9 U	4.9 U	**32**	4.9 U	**18 J**	4.9 U	24 U	**12**	**100 J**
GP-29	20 U	20 U	5 U	5 U	**25**	5 U	40 U	5 U	25 U	**14**	400 U
GP-30	20 U	20 U	4.9 U	4.9 U	**24**	4.9 U	**14 J**	4.9 U	24 U	**8.7**	390 U
GP-31	20 U	20 U	4.9 U	4.9 U	**26**	4.9 U	39 U	4.9 U	24 U	**11**	390 U
GP-32	20 U	20 U	5 U	5 U	**17 J**	5 U	40 U	5 U	25 U	**7.9**	400 U
GP-33	19 U	19 U	4.8 U	4.8 U	**16 J**	4.8 U	39 U	4.8 U	24 U	**13**	390 U
GP-34	20 U	20 U	5 U	5 U	**16 J**	5 U	40 U	5 U	25 U	**9.8**	400 U
GJ-35	19 U	**15 J**	4.8 U	4.8 U	19 U	4.8 U	38 U	4.8 U	24 U	4.8 U	380 U
GJ-36	19 U	19 U	4.7 U	4.7 U	**9.3 J**	4.7 U	37 U	4.7 U	23 U	4.7 U	370 U
GJP-37	19 U	19 U	4.7 U	4.7 U	19 U	4.7 U	37 U	4.7 U	23 U	4.7 U	370 U
GJP-38	20 U	20 U	4.9 U	4.9 U	20 U	4.9 U	39 U	4.9 U	24 U	4.9 U	390 U
GP-39	19 U	19 U	4.7 U	4.7 U	**24**	4.7 U	38 U	4.7 U	24 U	4.7 U	380 U
GP-40	19 U	19 U	4.8 U	4.8 U	**19**	4.8 U	38 U	4.8 U	24 U	4.8 U	**100 J**
GP-41	18 U	18 U	4.6 U	4.6 U	23 U Y	5 U Y	**15 J**	**5.4**	23 U	**11**	**130 J**
GP-42	19 U	19 U	4.7 U	4.7 U	24 U Y	4.7 U	**15 J**	**4.7**	24 U	**11**	**110 J**
GP-43	19 U	19 U	4.7 U	4.7 U	20 U Y	4.7 U	38 U	4.7 U	24 U	**10**	380 U
GJ-44	18 U	18 U	4.6 U	4.6 U	**11 J**	4.6 U	37 U	4.6 U	23 U	4.6 U	370 U
GJ-45	18 U	18 U	4.5 U	4.5 U	18 U	4.5 U	36 U	4.5 U	23 U	4.5 U	360 U

TABLE D-4

SEDIMENT SEMIVOLATILE ORGANIC COMPOUNDS [1,2,3]
(DRY-WEIGHT CONCENTRATIONS)

Gateway Pacific Terminal
Whatcom County, Washington

Station ID	Di-n-octyl phthalate (µg/kg)	Dibenzo-furan (µg/kg)	Hexachloro-butadiene (µg/kg)	N-nitrosodi-phenylamine (µg/kg)	Phenol (µg/kg)	2-Methyl-phenol (µg/kg)	4-Methyl-phenol (µg/kg)	2,4-Dimethyl-phenol (µg/kg)	Pentachloro-phenol (µg/kg)	Benzyl alcohol (µg/kg)	Benzoic acid (µg/kg)
SQS	NA	NA	NA	NA	**420**	**63**	**670**	**29**	**360**	**57**	**650**
SL	**6,200**	**540**	**11**	**28**	**420**	**63**	**670**	**29**	**400**	**57**	**650**
GP-46	19 U	19 U	4.6 U	4.6 U	**11 J**	4.6 U	37 U	4.6 U	23 U	4.6 U	370 U
GJ-47	19 U	19 U	4.7 U	4.7 U	19 U	4.7 U	37 U	4.7 U	23 U	4.7 U	370 U

Notes
1. **Bold** indicates value was detected above reporting level.
2. Shaded cell indicates reporting limit exceeds the SQS or SL value.
3. EPA qualifiers:
   UB = The analyte was detected in a blank; the concentration reported in the sample is likely attributable to background contamination and has been qualified to be nondetected.
   J = The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample either because the concentration was below the reporting limit or because of minor deviations from certain quality-control criteria.
   U = Analyte was not detected at or below the associated reporting limit concentration.
   UY = Analyte was analyzed for but not detected at the associated sample reporting limit. Reporting limit is elevated due to interferences.

Abbreviations
DMMP: Dredged Material Management Program
mg/kg OC: milligrams per kilogram organic carbon
NA: not available
RRF: relative response factor
RSD: relative standard deviation
SL: DMMP Screening Level (µg/kg dry weight)
SQS: Washington Marine Sediment Quality Standard (µg/kg dry weight)
SVOCs: semivolatile organic compounds
µg/kg: micrograms per kilogram

TABLE D-5

SEDIMENT SEMIVOLATILE ORGANIC COMPOUNDS [1,2,3,4]
(CARBON-NORMALIZED CONCENTRATIONS)
Gateway Pacific Terminal
Whatcom County, Washington

Station ID	1,2-Dichloro-benzene (mg/kg OC)	1,3-Dichloro-benzene (mg/kg OC)	1,4-Dichloro-benzene (mg/kg OC)	1,2,4-Trichloro-benzene (mg/kg OC)	Hexachloro-benzene (mg/kg OC)	Dimethyl phthalate (mg/kg OC)	Diethyl phthalate (mg/kg OC)
SQS	**2.3**	**NA**	**3.1**	**0.81**	**0.38**	**53**	**61**
GJP-1	1.36 U	1.36 U	1.36 U	1.36 U	1.36 U	1.36 U	13.61 U
GJP-4	1.12 U	1.12 U	1.12 U	1.12 U	1.12 U	1.12 U	11.22 U
GJP-5	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	3.76 U
GJP-6	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	6.71 U
GJ-7	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	5.85 U
GJ-8	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	6.73 U
GJ-9	0.94 U	0.94 U	0.94 U	0.94 U	0.94 U	0.94 U	9.39 U
GJP-10	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	6.66 U
GJP-11	0.39 U	0.39 U	0.39 U	0.39 U	0.39 U	0.39 U	3.87 U
GJ-12	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	4.09 U
GJ-14	0.46 U	0.46 U	0.46 U	0.46 U	0.46 U	0.46 U	4.58 U
GJ-15	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	3.33 U
GP-16	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U	3.08 U
GJ-17	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	3.62 U
GJ-18	0.42 U	0.42 U	0.42 U	0.42 U	0.42 U	0.42 U	4.25 U
GJP-19	0.42 U	0.42 U	0.42 U	0.42 U	0.42 U	0.42 U	4.25 U
GJP-20	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	4.12 U
GJP-20D	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	3.79 U
GJP-21	0.39 U	0.39 U	0.39 U	0.39 U	0.39 U	0.39 U	3.95 U
GJP-22	0.54 U	0.54 U	0.54 U	0.54 U	0.54 U	0.54 U	5.44 U
GJ-23	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	3.98 U
GP-24	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	3.53 U
GJP-25	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	3.48 U
GJ-26	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	3.52 U
GP-27	0.39 U	0.39 U	0.39 U	0.39 U	0.39 U	0.39 U	3.95 U
GP-28	0.51 U	0.51 U	0.51 U	0.51 U	0.51 U	0.51 U	5.08 U
GP-29	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	4.76 U
GP-30	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	3.77 U
GP-31	0.55 U	0.55 U	0.55 U	0.55 U	0.55 U	0.55 U	5.47 U
GP-32	0.45 U	0.45 U	0.45 U	0.45 U	0.45 U	0.45 U	4.46 U
GP-33	0.51 U	0.51 U	0.51 U	0.51 U	0.51 U	0.51 U	5.13 U
GP-34	0.55 U	0.55 U	0.55 U	0.55 U	0.55 U	0.55 U	5.45 U
GJ-35	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	3.29 U
GJ-36	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U	4.39 U

TABLE D-5

SEDIMENT SEMIVOLATILE ORGANIC COMPOUNDS [1,2,3,4]
(CARBON-NORMALIZED CONCENTRATIONS)
Gateway Pacific Terminal
Whatcom County, Washington

Station ID	1,2-Dichloro-benzene (mg/kg OC)	1,3-Dichloro-benzene (mg/kg OC)	1,4-Dichloro-benzene (mg/kg OC)	1,2,4-Trichloro-benzene (mg/kg OC)	Hexachloro-benzene (mg/kg OC)	Dimethyl phthalate (mg/kg OC)	Diethyl phthalate (mg/kg OC)
SQS	**2.3**	**NA**	**3.1**	**0.81**	**0.38**	**53**	**61**
GJP-37	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	4.05 U
GJP-38	0.45 U	0.45 U	0.45 U	0.45 U	0.45 U	0.45 U	4.54 U
GP-39	0.39 U	0.39 U	0.39 U	0.39 U	0.39 U	0.39 U	3.88 U
GP-40	0.39 U	0.39 U	0.39 U	0.39 U	0.39 U	0.39 U	3.90 U
GP-41	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	4.30 U
GP-42	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	3.59 U
GP-43	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	3.98 U
GJ-44	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	3.74 U
GJ-45	0.39 U	0.39 U	0.39 U	0.39 U	0.39 U	0.39 U	3.88 U
GP-46	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	3.59 U
GJ-47	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	3.79 U

TABLE D-5

SEDIMENT SEMIVOLATILE ORGANIC COMPOUNDS [1,2,3,4]
(CARBON-NORMALIZED CONCENTRATIONS)
Gateway Pacific Terminal
Whatcom County, Washington

Station ID	Di-n-butyl phthalate (mg/kg OC)	Butyl benzyl phthalate (mg/kg OC)	Bis[2-ethylhexyl] phthalate (mg/kg OC)	Di-n-octyl phthalate (mg/kg OC)	Dibenzofuran (mg/kg OC)	Hexachloro-butadiene (mg/kg OC)	N-nitroso-diphenylamine (mg/kg OC)
SQS	**220**	**4.9**	**47**	**58**	**15**	**3.9**	**11**
GJP-1	5.33 U	1.36 U	6.80 U	5.33 U	5.33 U	1.36 U	1.36 U
GJP-4	4.53 U	1.12 U	8.59 U B	4.53 U	4.53 U	1.12 U	1.12 U
GJP-5	1.52 U	0.38 U	1.84 U	1.52 U	1.52 U	0.38 U	0.38 U
GJP-6	2.62 U	0.67 U	3.35 U	2.62 U	2.62 U	0.67 U	0.67 U
GJ-7	2.37 U	0.59 U	2.99 U	2.37 U	2.37 U	0.59 U	0.59 U
GJ-8	2.78 U	0.67 U	3.36 U	2.78 U	**29.2**	0.67 U	0.89 U Y
GJ-9	3.76 U	0.94 U	4.59 U	3.76 U	3.76 U	0.94 U	0.94 U
GJP-10	2.69 U	0.67 U	3.26 U	2.69 U	2.69 U	0.67 U	0.67 U
GJP-11	0.39 U	0.39 U	1.94 U	1.53 U	1.53 U	0.39 U	0.39 U
GJ-12	1.65 U	0.41 U	2.00 U	1.65 U	1.65 U	0.41 U	0.41 U
GJ-14	1.87 U	0.46 U	2.24 U B	1.87 U	1.87 U	0.46 U	0.46 U
GJ-15	1.33 U	0.33 U	1.70 U	1.33 U	1.33 U	0.33 U	0.33 U
GP-16	1.22 U	0.31 U	1.60 U	1.22 U	1.22 U	0.31 U	0.31 U
GJ-17	1.46 U	0.36 U	1.85 U	1.46 U	**3.4**	0.36 U	0.36 U
GJ-18	1.70 U	0.42 U	**1.32 J**	1.70 U	1.70 U	0.42 U	0.42 U
GJP-19	1.68 U	0.42 U	2.12 U	1.68 U	1.68 U	0.42 U	0.42 U
GJP-20	1.67 U	0.41 U	**1.23 J**	1.67 U	1.67 U	0.41 U	0.41 U
GJP-20D	0.38 U	0.38 U	1.89 U	1.52 U	1.52 U	0.38 U	0.38 U
GJP-21	1.60 U	0.39 U	2.02 U	1.60 U	1.60 U	0.39 U	0.39 U
GJP-22	2.20 U	0.54 U	2.78 U	2.20 U	2.20 U	0.54 U	0.54 U
GJ-23	1.63 U	0.40 U	2.11 U B	1.63 U	1.63 U	0.40 U	0.40 U
GP-24	1.43 U	0.35 U	2.33 U B	1.43 U	1.43 U	0.35 U	0.35 U
GJP-25	1.44 U	0.36 U	1.74 U	1.44 U	1.44 U	0.36 U	0.36 U
GJ-26	1.41 U	0.35 U	1.76 U B	1.41 U	1.41 U	0.35 U	0.35 U
GP-27	1.60 U	0.39 U	2.02 U	1.60 U	1.60 U	0.39 U	0.39 U
GP-28	2.07 U	0.51 U	2.59 U	2.07 U	2.07 U	0.51 U	0.51 U
GP-29	1.90 U	0.48 U	2.38 U	1.90 U	1.90 U	0.48 U	0.48 U
GP-30	1.54 U	0.38 U	1.85 U	1.54 U	1.54 U	0.38 U	0.38 U
GP-31	2.23 U	0.55 U	2.68 U	2.23 U	2.23 U	0.55 U	0.55 U
GP-32	1.79 U	0.45 U	2.23 U	1.79 U	1.79 U	0.45 U	0.45 U
GP-33	2.03 U	0.51 U	2.56 U	2.03 U	2.03 U	0.51 U	0.51 U
GP-34	2.18 U	0.55 U	2.73 U	2.18 U	2.18 U	0.55 U	0.55 U
GJ-35	1.30 U	0.33 U	1.64 U	1.30 U	**1.03 J**	0.33 U	0.33 U
GJ-36	1.78 U	0.44 U	**1.59 J**	1.78 U	1.78 U	0.44 U	0.44 U

TABLE D-5

SEDIMENT SEMIVOLATILE ORGANIC COMPOUNDS [1,2,3,4]
(CARBON-NORMALIZED CONCENTRATIONS)

Gateway Pacific Terminal
Whatcom County, Washington

Station ID	Di-n-butyl phthalate (mg/kg OC)	Butyl benzyl phthalate (mg/kg OC)	Bis[2-ethylhexyl] phthalate (mg/kg OC)	Di-n-octyl phthalate (mg/kg OC)	Dibenzofuran (mg/kg OC)	Hexachloro-butadiene (mg/kg OC)	N-nitroso-diphenylamine (mg/kg OC)
SQS	**220**	**4.9**	**47**	**58**	**15**	**3.9**	**11**
GJP-37	1.64 U	0.41 U	1.98 U	1.64 U	1.64 U	0.41 U	0.41 U
GJP-38	1.85 U	0.45 U	2.22 U	1.85 U	1.85 U	0.45 U	0.45 U
GP-39	1.57 U	0.39 U	1.98 U	1.57 U	1.57 U	0.39 U	0.39 U
GP-40	1.54 U	0.39 U	1.95 U	1.54 U	1.54 U	0.39 U	0.39 U
GP-41	1.68 U	0.43 U	2.43 U B	1.68 U	1.68 U	0.43 U	0.43 U
GP-42	1.45 U	0.36 U	1.83 U	1.45 U	1.45 U	0.36 U	0.36 U
GP-43	1.61 U	0.40 U	2.03 U	1.61 U	1.61 U	0.40 U	0.40 U
GJ-44	1.46 U	0.37 U	1.87 U	1.46 U	1.46 U	0.37 U	0.37 U
GJ-45	1.55 U	0.39 U	**1.21 J**	1.55 U	1.55 U	0.39 U	0.39 U
GP-46	1.48 U	0.36 U	**1.25 J**	1.48 U	1.48 U	0.36 U	0.36 U
GJ-47	1.53 U	0.38 U	1.85 U	1.53 U	1.53 U	0.38 U	0.38 U

Notes
1. **Bold** indicates value was detected above reporting level.
2. Shaded cell indicates reporting limit exceeds the applicable SQS criterion.
3. Shaded cell indicates detected concentration exceeds the applicable SQS criterion.
4. EPA qualifiers:
   UB = The analyte was detected in a blank; the level in the sample is likely attributable to background contamination and has been qualified to be nondetected.
   J = The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample either because the concentration was below the reporting limit or because of minor deviations from certain quality-control criteria.
   U = Analyte was not detected at or below the associated reporting limit concentration.
   UY = Analyte was analyzed for but not detected at the associated sample reporting limit. Reporting limit is elevated due to interferences.

Abbreviations
mg/kg OC: milligrams per kilogram organic carbon
NA: not available
SQS: Washington Marine Sediment Quality Standard (µg/kg dry weight)
SVOCs: semivolatile organic compounds

TABLE D-6

SEDIMENT POLYCYCLIC AROMATIC HYDROCARBONS [1,2,3]
(DRY-WEIGHT CONCENTRATIONS)
Gateway Pacific Terminal
Whatcom County, Washington

Station ID	Total LPAH (µg/kg)	Naphthalene (µg/kg)	Acenaphthylene (µg/kg)	Acenaphthene (µg/kg)	Fluorene (µg/kg)	Phenanthrene (µg/kg)	Anthracene (µg/kg)	2-Methyl-naphthalene (µg/kg)
SL	**5,200**	**2,100**	**560**	**500**	**540**	**1,500**	**960**	**670**
GJP-1	18 U	18 U	18 U	18 U	18 U	18 U	18 U	18 U
GJP-4	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U
GJP-5	**24**	19 U	19 U	19 U	19 U	**24**	19 U	**11 J**
GJP-6	**16 J**	18 U	18 U	18 U	18 U	**16 J**	18 U	18 U
GJ-7	**12 J**	19 U	19 U	19 U	19 U	**12 J**	19 U	19 U
GJ-8	**7,630**	**210**	**610**	**130**	**580**	**5,200**	**900**	**67**
GJ-9	18 U	18 U	18 U	18 U	18 U	18 U	18 U	18 U
GJP-10	**30**	19 U	19 U	19 U	19 U	**30**	19 U	19 U
GJP-11	**20**	19 U	19 U	19 U	19 U	**20**	19 U	19 U
GJ-12	**53**	**12 J**	19 U	19 U	19 U	**41**	19 U	**20**
GJ-14	**112**	**18 J**	20 U	20 U	**12 J**	**70**	**12 J**	**28**
GJ-15	**114**	**18**	18 U	18 U	**12 J**	**70**	**14 J**	**29**
GP-16	**61**	**15 J**	19 U	19 U	19 U	**46**	19 U	**22**
GJ-17	**1,505**	**25**	**120**	**20**	**170**	**990**	**180**	**11 J**
GJ-18	**13 J**	18 U	18 U	18 U	18 U	**13 J**	18 U	18 U
GJP-19	**13 J**	19 U	19 U	19 U	19 U	**13 J**	19 U	19 U
GJP-20	**27**	19 U	19 U	19 U	19 U	**27**	19 U	**13 J**
GJP-20D	**35**	20 U	20 U	20 U	20 U	**35**	20 U	**14 J**
GJP-21	**31**	19 U	19 U	19 U	19 U	**31**	19 U	**15 J**
GJP-22	**83**	**19**	19 U	19 U	19 U	**64**	19 U	**32**
GJ-23	**124**	**22**	20 U	20 U	**13 J**	**78**	**11 J**	**36**
GP-24	**115**	**25**	19 U	19 U	**13 J**	**80**	**10 J**	**41**
GJP-25	**97**	**20**	19 U	19 U	**12 J**	**65**	19 U	**37**
GJ-26	**147**	**25**	20 U	20 U	**15 J**	**95**	**12 J**	**43**
GP-27	**115**	**21**	19 U	19 U	**14 J**	**70**	**10 J**	**36**
GP-28	**84**	**18 J**	20 U	20 U	**12 J**	**54**	20 U	**29**
GP-29	**69**	**18 J**	20 U	20 U	20 U	**51**	20 U	**29**
GP-30	**49**	**13 J**	20 U	20 U	20 U	**36**	20 U	**20**
GP-31	**64**	**15 J**	20 U	20 U	20 U	**49**	20 U	**25**
GP-32	**53**	**14 J**	20 U	20 U	20 U	**39**	20 U	**22**
GP-33	**54**	**16 J**	19 U	19 U	19 U	**38**	19 U	**29**

TABLE D-6

SEDIMENT POLYCYCLIC AROMATIC HYDROCARBONS [1,2,3]
(DRY-WEIGHT CONCENTRATIONS)
Gateway Pacific Terminal
Whatcom County, Washington

Station ID	Total LPAH (µg/kg)	Naphthalene (µg/kg)	Acenaphthylene (µg/kg)	Acenaphthene (µg/kg)	Fluorene (µg/kg)	Phenanthrene (µg/kg)	Anthracene (µg/kg)	2-Methyl-naphthalene (µg/kg)
SL	**5,200**	**2,100**	**560**	**500**	**540**	**1,500**	**960**	**670**
GP-34	**39**	**11 J**	20 U	20 U	20 U	**28**	20 U	**20**
GJ-35	**583**	**13 J**	**31**	**23**	**42**	**390**	**84**	**10 J**
GJ-36	**20**	19 U	19 U	19 U	19 U	**20**	19 U	19 U
GJP-37	**19**	19 U	19 U	19 U	19 U	**19**	19 U	**9.3 J**
GJP-38	**27**	20 U	20 U	20 U	20 U	**27**	20 U	**15 J**
GP-39	**125**	**14 J**	19 U	19 U	**11 J**	**80**	**20**	**19**
GP-40	**43**	**12 J**	19 U	19 U	19 U	**31**	19 U	**19**
GP-41	**111**	**19**	18 U	18 U	**12 J**	**71**	**9.2 J**	**34**
GP-42	**112**	**21**	19 U	19 U	**15 J**	**76**	19 U	**36**
GP-43	**111**	**22**	19 U	19 U	**14 J**	**65**	**10 J**	**37**
GJ-44	**122**	18 U	**11 J**	18 U	**14 J**	**85**	**12 J**	**9.2 J**
GJ-45	**23**	18 U	18 U	18 U	18 U	**23**	18 U	**13 J**
GP-46	**108**	**13 J**	19 U	19 U	**11 J**	**74**	**10 J**	**20**
GJ-47	**40**	**11 J**	19 U	19 U	19 U	**29**	19 U	**19**

TABLE D-6

SEDIMENT POLYCYCLIC AROMATIC HYDROCARBONS [1,2,3]
(DRY-WEIGHT CONCENTRATIONS)
Gateway Pacific Terminal
Whatcom County, Washington

Station ID	Total HPAH (µg/kg)	Fluoranthene (µg/kg)	Pyrene (µg/kg)	Benz[a]-anthracene (µg/kg)	Chrysene (µg/kg)	Benzo-fluoranthenes (µg/kg)	Benzo-[a]pyrene (µg/kg)	Indeno-[1,2,3-c,d]-pyrene (µg/kg)	Dibenzo-[a,h]-anthracene (µg/kg)	Benzo-[g,h,i]-perylene (µg/kg)
SL	**12,000**	**1,700**	**2,600**	**1,300**	**1,400**	**3,200**	**1,600**	**600**	**230**	**670**
GJP-1	**11 J**	18 U	18 U	18 U	18 U	**11 J**	18 U	18 U	4.6 U	18 U
GJP-4	**9.4 J**	19 U	19 U	19 U	19 U	**9.4 J**	19 U	19 U	4.7 U	19 U
GJP-5	**173**	**36**	**37**	**13 J**	**20**	**31**	**17 J**	**9.3 J**	4.7 U	**10 J**
GJP-6	**59**	**15 J**	**14 J**	18 U	**13 J**	**17 J**	18 U	18 U	4.6 U	18 U
GJ-7	**50**	**16 J**	**15 J**	19 U	19 U	**19**	19 U	19 U	4.7 U	19 U
GJ-8	**21,740**	**5,400**	**4,900**	**1,600**	**1,700**	**3,100**	**1,800**	**1,500**	**340**	**1,400**
GJ-9	**11**	18 U	**11 J**	18 U	18 U	18 U	18 U	18 U	4.5 U	18 U
GJP-10	**135**	**30**	**31**	**12 J**	**15 J**	**25**	**12 J**	19 U	4.7 U	**10 J**
GJP-11	**49**	**17 J**	**16 J**	19 U	19 U	**16 J**	19 U	19 U	4.8 U	19 U
GJ-12	**222**	**46**	**44**	**20**	**32**	**43**	**22**	19 U	4.7 U	**15 J**
GJ-14	**436**	**77**	**93**	**30**	**47**	**88**	**38**	**25**	**8**	**30**
GJ-15	**415**	**76**	**66**	**32**	**58**	**88**	**33**	**24**	**8**	**30**
GP-16	**256**	**50**	**48**	**23**	**30**	**56**	**29**	**15 J**	**5**	19 U
GJ-17	**2,674**	**670**	**650**	**220**	**230**	**360**	**240**	**130**	**34**	**140**
GJ-18	**44**	**14 J**	**16 J**	18 U	18 U	**14 J**	18 U	18 U	4.5 U	18 U
GJP-19	**19**	19 U	19 U	19 U	19 U	**19**	19 U	19 U	4.8 U	19 U
GJP-20	**94**	**23**	**21**	19 U	**17 J**	**23**	19 U	19 U	4.7 U	**9.5 J**
GJP-20D	**205**	**36**	**34**	**17 J**	**24**	**43**	**19 J**	**14 J**	5 U	**18 J**
GJP-21	**116**	**30**	**24**	**10 J**	**16 J**	**25**	**11 J**	19 U	4.7 U	19 U
GJP-22	**273**	**53**	**49**	**22**	**33**	**55**	**23**	**14 J**	**5**	**19**
GJ-23	**359**	**69**	**65**	**26**	**52**	**69**	**29**	**21**	4.7 U	**28**
GP-24	**369**	**70**	**68**	**26**	**44**	**80**	**33**	**20**	**6**	**22**
GJP-25	**273**	**55**	**56**	**20**	**34**	**54**	**22**	**12 J**	**5**	**15 J**
GJ-26	**444**	**87**	**86**	**36**	**53**	**90**	**40**	**23**	**7**	**29**
GP-27	**283**	**53**	**46**	**22**	**36**	**60**	**21**	**17 J**	**5**	**23**
GP-28	**269**	**50**	**43**	**20**	**30**	**51**	**24**	**20**	**6**	**25**
GP-29	**287**	**54**	**47**	**22**	**34**	**60**	**29**	**16 J**	**5**	**20**
GP-30	**145**	**34**	**28**	**14 J**	**20**	**33**	**16 J**	20 U	4.9 U	20 U
GP-31	**246**	**48**	**54**	**23**	**34**	**43**	**20**	**11 J**	4.9 U	**13 J**
GP-32	**198**	**38**	**35**	**16 J**	**25**	**41**	**20**	**10 J**	5 U	**13 J**
GP-33	**123**	**32**	**25**	**11 J**	**16 J**	**27**	**12 J**	19 U	4.8 U	19 U

TABLE D-6

SEDIMENT POLYCYCLIC AROMATIC HYDROCARBONS [1,2,3]
(DRY-WEIGHT CONCENTRATIONS)
Gateway Pacific Terminal
Whatcom County, Washington

Station ID	Total HPAH (µg/kg)	Fluoranthene (µg/kg)	Pyrene (µg/kg)	Benz[a]-anthracene (µg/kg)	Chrysene (µg/kg)	Benzo-fluoranthenes (µg/kg)	Benzo-[a]pyrene (µg/kg)	Indeno-[1,2,3-c,d]-pyrene (µg/kg)	Dibenzo-[a,h]-anthracene (µg/kg)	Benzo-[g,h,i]-perylene (µg/kg)
SL	**12,000**	**1,700**	**2,600**	**1,300**	**1,400**	**3,200**	**1,600**	**600**	**230**	**670**
GP-34	**147**	**30**	**26**	**13 J**	**17 J**	**32**	**17 J**	20 U	5 U	**12 J**
GJ-35	**2,340**	**550**	**560**	**150**	**190**	**340**	**220**	**130**	**30**	**170**
GJ-36	**307**	**34**	**39**	**26**	**33**	**62**	**41**	**28**	**6**	**38**
GJP-37	**63**	**13 J**	**12 J**	19 U	19 U	**28**	**10 J**	19 U	4.7 U	19 U
GJP-38	**74**	**22**	**19 J**	20 U	**12 J**	**21**	20 U	20 U	4.9 U	20 U
GP-39	**329**	**70**	**64**	**27**	**34**	**58**	**27**	**19**	**6**	**24**
GP-40	**127**	**27**	**27**	**10 J**	**16 J**	**26**	**11 J**	19 U	4.8 U	**10 J**
GP-41	**302**	**54**	**57**	**28**	**36**	**64**	**25**	**15 J**	**5**	**18**
GP-42	**352**	**74**	**71**	**28**	**40**	**65**	**30**	**17 J**	**5**	**22**
GP-43	**302**	**54**	**45**	**25**	**45**	**66**	**24**	**15 J**	**5**	**23**
GJ-44	**283**	**66**	**66**	**21**	**26**	**42**	**26**	**17 J**	4.6 U	**19**
GJ-45	**73**	**15 J**	**14 J**	18 U	**14 J**	**20**	18 U	18 U	4.5 U	**10 J**
GP-46	**300**	**62**	**61**	**22**	**31**	**48**	**26**	**19**	**5**	**26**
GJ-47	**65**	**19**	**17 J**	19 U	**10 J**	**19**	19 U	19 U	4.7 U	19 U

Notes
1. **Bold** indicates value was detected above reporting level.
2. Shaded cell indicates detected concentration exceeds SQS or SL value.
3. EPA qualifiers:
   J = The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample either because the concentration was below the reporting limit or because of minor deviations from certain quality-control criteria.
   U = Analyte was not detected at or below the reporting limit concentration.

Abbreviations

EPA:	U.S. Environmental Protection Agency	PAHs:	
DMMP:	Dredged Material Management Program	SL:	polycyclic aromatic hydrocarbons
HPAH:	high-molecular-weight polycyclic aromatic hydrocarbon	µg/kg:	DMMP Screening Level (µg/kg dry weight)
LPAH:	low-molecular-weight polycyclic aromatic hydrocarbon		micrograms per kilogram

TABLE D-7

SEDIMENT POLYCYCLIC AROMATIC HYDROCARBONS [1,2,3]
(CARBON-NORMALIZED CONCENTRATIONS)
Gateway Pacific Terminal
Whatcom County, Washington

Station ID	Total LPAH (mg/kg OC)	Naphthalene (mg/kg OC)	Acenaph-thylene (mg/kg OC)	Acenaph-thene (mg/kg OC)	Fluorene (mg/kg OC)	Phenan-threne (mg/kg OC)	Anthracene (mg/kg OC)	2-Methyl-naphthalene (mg/kg OC)	Total HPAH (mg/kg OC)
SQS	**370**	**99**	**66**	**16**	**23**	**100**	**220**	**38**	**960**
GJP-1	5.3 U	5.3 U	5.3 U	5.3 U	5.3 U	5.3 U	5.3 U	5.3 U	**3.3 J**
GJP-4	4.5 U	4.5 U	4.5 U	4.5 U	4.5 U	4.5 U	4.5 U	4.5 U	**2.2 J**
GJP-5	**1.9**	1.5 U	1.5 U	1.5 U	1.5 U	**1.9**	1.5 U	**0.9 J**	**13.9**
GJP-6	**2.3 J**	2.6 U	2.6 U	2.6 U	2.6 U	**2.3 J**	2.6 U	2.6 U	**8.6**
GJ-7	**1.5 J**	2.4 U	2.4 U	2.4 U	2.4 U	**1.5 J**	2.4 U	2.4 U	**6.2**
GJ-8	**1,116**	**31**	**89**	**19**	**85**	**760**	**132**	**10**	**3,178**
GJ-9	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	**2.3**
GJP-10	**4.3**	2.7 U	2.7 U	2.7 U	2.7 U	**4.3**	2.7 U	2.7 U	**19.1**
GJP-11	**1.6**	1.5 U	1.5 U	1.5 U	1.5 U	**1.6**	1.5 U	1.5 U	**4.0**
GJ-12	**4.6**	**1.0 J**	1.7 U	1.7 U	1.7 U	**3.6**	1.7 U	**1.7**	**19.3**
GJ-14	**10.5**	**1.7 J**	1.9 U	1.9 U	**1.1 J**	**6.5**	**1.1 J**	**2.6**	**40.8**
GJ-15	**8.4**	**1.3**	1.3 U	1.3 U	**0.9 J**	**5.2**	**1.0 J**	**2.2**	**30.8**
GP-16	**3.9**	**1.0 J**	1.2 U	1.2 U	1.2 U	**3.0**	1.2 U	**1.4**	**16.4**
GJ-17	**115.8**	**1.9**	**9.2**	**1.5**	**13.1**	**76.2**	**13.9**	**0.9 J**	**205.7**
GJ-18	**1.2 J**	1.7 U	1.7 U	1.7 U	1.7 U	**1.2 J**	1.7 U	1.7 U	**4.2**
GJP-19	**1.2 J**	1.7 U	1.7 U	1.7 U	1.7 U	**1.2 J**	1.7 U	1.7 U	**1.7**
GJP-20	**2.4**	1.7 U	1.7 U	1.7 U	1.7 U	**2.4**	1.7 U	**1.1 J**	**8.2**
GJP-20D	**2.7**	1.5 U	1.5 U	1.5 U	1.5 U	**2.7**	1.5 U	**1.1 J**	**15.5**
GJP-21	**2.6**	1.6 U	1.6 U	1.6 U	1.6 U	**2.6**	1.6 U	**1.3 J**	**9.8**
GJP-22	**9.6**	**2.2**	2.2 U	2.2 U	2.2 U	**7.4**	2.2 U	**3.7**	**31.6**
GJ-23	**10.1**	**1.8**	1.6 U	1.6 U	**1.1 J**	**6.3**	**0.9 J**	**2.9**	**29.2**
GP-24	**8.7**	**1.9**	1.4 U	1.4 U	**1.0 J**	**6.0**	**0.8 J**	**3.1**	**27.7**
GJP-25	**7.4**	**1.5**	1.4 U	1.4 U	**0.9 J**	**4.9**	1.4 U	**2.8**	**20.7**
GJ-26	**10.4**	**1.8**	1.4 U	1.4 U	**1.1 J**	**6.7**	**0.9 J**	**3.0**	**31.3**
GP-27	**9.7**	**1.8**	1.6 U	1.6 U	**1.2 J**	**5.9**	**0.8 J**	**3.0**	**23.8**
GP-28	**8.7**	**1.9 J**	2.1 U	2.1 U	**1.2 J**	**5.6**	2.0 U	**3.0**	**27.9**
GP-29	**6.6**	**1.7 J**	1.9 U	1.9 U	1.9 U	**4.9**	1.9 U	**2.8**	**27.4**
GP-30	**3.8**	**1.0 J**	1.5 U	1.5 U	1.5 U	**2.8**	1.5 U	**1.5**	**11.2**
GP-31	**7.1**	**1.7 J**	2.2 U	2.2 U	2.2 U	**5.5**	2.2 U	**2.8**	**27.5**
GP-32	**4.7**	**1.3 J**	1.8 U	1.8 U	1.8 U	**3.5**	1.8 U	**2.0**	**17.7**

TABLE D-7

SEDIMENT POLYCYCLIC AROMATIC HYDROCARBONS [1,2,3]
(CARBON-NORMALIZED CONCENTRATIONS)
Gateway Pacific Terminal
Whatcom County, Washington

Station ID	Total LPAH (mg/kg OC)	Naphthalene (mg/kg OC)	Acenaph-thylene (mg/kg OC)	Acenaph-thene (mg/kg OC)	Fluorene (mg/kg OC)	Phenan-threne (mg/kg OC)	Anthracene (mg/kg OC)	2-Methyl-naphthalene (mg/kg OC)	Total HPAH (mg/kg OC)
SQS	**370**	**99**	**66**	**16**	**23**	**100**	**220**	**38**	**960**
GP-33	**5.8**	**1.7 J**	2.0 U	2.0 U	2.0 U	**4.1**	2.0 U	**3.1**	**13.1**
GP-34	**4.3**	**1.2 J**	2.2 U	2.2 U	2.2 U	**3.1**	2.2 U	**2.2**	**16.0**
GJ-35	**39.9**	**0.9 J**	**2.1**	**1.6**	**2.9**	**26.7**	**5.8**	**0.7 J**	**160.3**
GJ-36	**1.9**	1.8 U	1.8 U	1.8 U	1.8 U	**1.9**	1.8 U	1.8 U	**28.7**
GJP-37	**1.6**	1.6 U	1.6 U	1.6 U	1.6 U	**1.6**	1.6 U	**0.8 J**	**5.4**
GJP-38	**2.5**	1.9 U	1.9 U	1.8 U	1.9 U	**2.5**	1.9 U	**1.4 J**	**6.9**
GP-39	**10.3**	**1.2 J**	1.6 U	1.6 U	**0.9 J**	**6.6**	**1.7**	**1.6**	**27.2**
GP-40	**3.5**	**1.0 J**	1.5 U	1.5 U	1.5 U	**2.5**	1.5 U	**1.5**	**10.3**
GP-41	**10.4**	**1.8**	1.7 U	1.7 U	**1.1 J**	**6.6**	**0.9 J**	**3.2**	**28.2**
GP-42	**8.6**	**1.6**	1.5 U	1.5 U	**1.2 J**	**5.8**	1.5 U	**2.8**	**26.9**
GP-43	**9.4**	**1.9**	1.6 U	1.6 U	**1.2 J**	**5.5**	**0.6 J**	**3.1**	**25.6**
GJ-44	**9.9**	1.5 U	**0.9 J**	1.5 U	**1.1 J**	**6.9**	**1.0 J**	**0.8 J**	**23.0**
GJ-45	**2.0**	1.6 U	1.6 U	1.6 U	1.6 U	**2.0**	1.6 U	**1.1 J**	**6.3**
GP-46	**8.4**	**1.0 J**	1.5 U	1.5 U	**0.9 J**	**5.8**	**0.8 J**	**1.6**	**23.4**
GJ-47	**3.2**	**0.9 J**	1.5 U	1.5 U	1.5 U	**2.3**	1.5 U	**1.5**	**5.2**

TABLE D-7

SEDIMENT POLYCYCLIC AROMATIC HYDROCARBONS [1,2,3]
(CARBON-NORMALIZED CONCENTRATIONS)
Gateway Pacific Terminal
Whatcom County, Washington

Station ID	Fluoran-thene (mg/kg OC)	Pyrene (mg/kg OC)	Benz[a]-anthracene (mg/kg OC)	Chrysene (mg/kg OC)	Benzo-fluoranthenes (mg/kg OC)	Benzo[a]-pyrene (mg/kg OC)	Indeno-[1,2,3-c,d] pyrene (mg/kg OC)	Dibenzo-[a,h] anthracene (mg/kg OC)	Benzo-[g,h,i] perylene (mg/kg OC)
SQS	**160**	**1,000**	**110**	**110**	**230**	**99**	**34**	**12**	**31**
GJP-1	5.3 U	5.3 U	5.3 U	5.3 U	**3.3 J**	5.3 U	5.3 U	1.4 U	5.3 U
GJP-4	4.5 U	4.5 U	4.5 U	4.5 U	**2.2 J**	4.5 U	4.5 U	1.1 U	4.5 U
GJP-5	**2.9**	**3.0**	**1.0 J**	**1.6**	**2.5**	**1.4 J**	**0.7 J**	0.4 U	**0.8 J**
GJP-6	**2.2 J**	**2.0 J**	2.6 U	**1.9 J**	**2.5 J**	2.6 U	2.6 U	0.7 U	2.6 U
GJ-7	**2.0 J**	**1.9 J**	2.4 U	2.4 U	**2.4**	2.4 U	2.4 U	0.6 U	2.4 U
GJ-8	**789**	**716**	**234**	**249**	**453**	**263**	**219**	**50**	**205**
GJ-9	3.8 U	**2.3 J**	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	0.9 U	3.8 U
GJP-10	**4.3**	**4.4**	**1.7 J**	**2.1 J**	**3.5**	**1.7 J**	2.7 U	0.7 U	**1.4 J**
GJP-11	**1.4 J**	**1.3 J**	1.5 U	1.5 U	**1.3 J**	1.5 U	1.5 U	0.4 U	1.5 U
GJ-12	**4.0**	**3.8**	**1.7**	**2.8**	**3.7**	**1.9**	1.7 U	0.4 U	**1.3 J**
GJ-14	**7.2**	**8.7**	**2.8**	**4.4**	**8.2**	**3.6**	**2.3**	**0.8**	**2.8**
GJ-15	**5.6**	**4.9**	**2.4**	**4.3**	**6.5**	**2.4**	**1.8**	**0.6**	**2.2**
GP-16	**3.2**	**3.1**	**1.5**	**1.9**	**3.6**	**1.9**	**1.0 J**	**0.3**	1.2 U
GJ-17	**51.5**	**50.0**	**16.9**	**17.7**	**27.7**	**18.5**	**10.0**	**2.6**	**10.8**
GJ-18	**1.3 J**	**1.5 J**	1.7 U	1.7 U	**1.3 J**	1.7 U	1.7 U	0.4 U	1.7 U
GJP-19	1.7 U	1.7 U	1.7 U	1.7 U	**1.7**	1.7 U	1.7 U	0.4 U	1.7 U
GJP-20	**2.0**	**1.8**	1.7 U	**1.5 J**	**2.0**	1.7 U	1.7 U	0.4 U	**0.8 J**
GJP-20D	**2.7**	**2.6**	**1.3 J**	**1.8**	**3.3**	**1.4 J**	**1.1 J**	0.4 U	**1.4 J**
GJP-21	**2.5**	**2.0**	**0.8 J**	**1.3 J**	**2.1**	**0.9 J**	1.6 U	0.4 U	1.6 U
GJP-22	**6.1**	**5.7**	**2.6**	**3.8**	**6.4**	**2.7**	**1.6 J**	**0.6**	**2.2**
GJ-23	**5.6**	**5.3**	**2.1**	**4.2**	**5.6**	**2.4**	**1.7**	0.4 U	**2.3**
GP-24	**5.3**	**5.1**	**2.0**	**3.3**	**6.0**	**2.5**	**1.5**	**0.5**	**1.7**
GJP-25	**4.2**	**4.2**	**1.5**	**2.6**	**4.1**	**1.7**	**0.9 J**	**0.4**	**1.1 J**
GJ-26	**6.1**	**6.1**	**2.5**	**3.7**	**6.3**	**2.8**	**1.6**	**0.5**	**2.0**
GP-27	**4.5**	**3.9**	**1.9**	**3.0**	**5.0**	**1.8**	**1.4 J**	**0.4**	**1.9**
GP-28	**5.2**	**4.5**	**2.1**	**3.1**	**5.3**	**2.5**	**2.1**	**0.6**	**2.6**
GP-29	**5.1**	**4.5**	**2.1**	**3.2**	**5.7**	**2.8**	**1.5 J**	**0.5**	**1.9**
GP-30	**2.6**	**2.2**	**1.1 J**	**1.5**	**2.5**	**1.2 J**	1.5 U	0.4 U	1.5 U
GP-31	**5.4**	**6.0**	**2.6**	**3.8**	**4.8**	**2.2**	**1.2 J**	0.6 U	**1.5 J**
GP-32	**3.4**	**3.1**	**1.4 J**	**2.2**	**3.7**	**1.8**	**0.9 J**	0.5 U	**1.2 J**

TABLE D-7

SEDIMENT POLYCYCLIC AROMATIC HYDROCARBONS [1,2,3]
(CARBON-NORMALIZED CONCENTRATIONS)

Gateway Pacific Terminal
Whatcom County, Washington

Station ID	Fluoran-thene (mg/kg OC)	Pyrene (mg/kg OC)	Benz[a]-anthracene (mg/kg OC)	Chrysene (mg/kg OC)	Benzo-fluoranthenes (mg/kg OC)	Benzo[a]-pyrene (mg/kg OC)	Indeno-[1,2,3-c,d] pyrene (mg/kg OC)	Dibenzo-[a,h] anthracene (mg/kg OC)	Benzo-[g,h,i] perylene (mg/kg OC)
SQS	**160**	**1,000**	**110**	**110**	**230**	**99**	**34**	**12**	**31**
GP-33	**3.4**	**2.7**	**1.2 J**	**1.7 J**	**2.9**	**1.3 J**	2.0 U	0.5 U	2.0 U
GP-34	**3.3**	**2.8**	**1.4 J**	**1.9 J**	**3.5**	**1.9 J**	2.2 U	0.6 U	**1.3 J**
GJ-35	**37.7**	**38.4**	**10.3**	**13.0**	**23.3**	**15.1**	**8.9**	**2.1**	**11.6**
GJ-36	**3.2**	**3.6**	**2.4**	**3.1**	**5.8**	**3.8**	**2.6**	**0.6**	**3.6**
GJP-37	**1.1 J**	**1.0 J**	1.6 U	1.6 U	**2.4**	**0.9 J**	1.6 U	0.4 U	1.6 U
GJP-38	**2.0**	**1.8 J**	1.9 U	**1.1 J**	**1.9**	1.9 U	1.9 U	0.5 U	1.9 U
GP-39	**5.8**	**5.3**	**2.2**	**2.8**	**4.8**	**2.2**	**1.6**	**0.5**	**2.0**
GP-40	**2.2**	**2.2**	**0.8 J**	**1.3 J**	**2.1**	**0.9 J**	1.5 U	0.4 U	**0.8 J**
GP-41	**5.1**	**5.3**	**2.6**	**3.4**	**6.0**	**2.3**	**1.4 J**	**0.5**	**1.7**
GP-42	**5.7**	**5.4**	**2.1**	**3.1**	**5.0**	**2.3**	**1.3 J**	**0.4**	**1.7**
GP-43	**4.6**	**3.8**	**2.1**	**3.8**	**5.6**	**2.0**	**1.3 J**	**0.4**	**2.0**
GJ-44	**5.4**	**5.4**	**1.7**	**2.1**	**3.4**	**2.1**	**1.4 J**	0.4 U	**1.5**
GJ-45	**1.3 J**	**1.2 J**	1.6 U	**1.2 J**	**1.7**	1.6 U	1.6 U	0.4 U	**0.9 J**
GP-46	**4.8**	**4.8**	**1.7**	**2.4**	**3.8**	**2.0**	**1.5**	**0.4**	**2.0**
GJ-47	**1.5**	**1.4 J**	1.5 U	**0.8 J**	**1.5**	1.5 U	1.5 U	0.4 U	1.5 U

Notes
1. **Bold** indicates value was detected above reporting level.
2. Shaded cell indicates detected concentration exceeds SQS or SL value.
3. EPA qualifiers:
   J = The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample either because the concentration was below the reporting limit or because of minor deviations from certain quality-control criteria.
   U = Analyte was not detected at or below the associated reporting limit concentration.

Abbreviations

EPA:	U.S. Environmental Protection Agency	SQS:	Washington Marine Sediment Quality Standard (µg/kg dry weight)
HPAH:	high-molecular-weight polycyclic aromatic hydrocarbon	mg/kg OC:	milligrams per kilogram of organic carbon
LPAH:	low-molecular-weight polycyclic aromatic hydrocarbon		
PAHs:	polycyclic aromatic hydrocarbons		

TABLE D-8

SEDIMENT POLYCHLORINATED BIPHENYLS[1,2]

Gateway Pacific Terminal

Whatcom County, Washington

Station ID	Aroclor 1016 (µg/kg)	Aroclor 1242 (µg/kg)	Aroclor 1248 (µg/kg)	Aroclor 1254 (µg/kg)	Aroclor 1260 (µg/kg)	Aroclor 1221 (µg/kg)	Aroclor 1232 (µg/kg)	Total PCBs (µg/kg)	Total PCBs (mg/kg OC)
SQS	NA	NA	NA	NA	NA	NA	NA	NA	**12**
SL	NA	NA	NA	NA	NA	NA	NA	**130**	NA
GJP-1	3.8 U	3.8 U	**5.90**	3.8 U	3.8 U	3.8 U	3.8 U	**5.90**	**1.75**
GJP-4	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	0.91 U
GJP-5	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	0.32 U
GJP-6	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	0.55 U
GJ-7	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	0.47 U
GJ-8	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	0.54 U
GJ-9	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	0.79 U
GJP-10	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	0.54 U
GJP-11	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	0.31 U
GJ-12	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	5.8 U Y	5.8 U Y	0.5 U Y
GJ-14	3.9 U	**7.6**	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	**7.6**	**0.71**
GJ-15	3.9 U	**5**	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	**5.0**	**0.37**
GP-16	3.9 U	**8.4**	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	**8.4**	**0.54**
GJ-17	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	0.29 U
GJ-18	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	0.37 U
GJP-19	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	0.34 U
GJP-20	3.9 U	3.9 UJ F	3.9 U	3.9 U	3.9 U	3.9 U	5 U Y	5 U Y	0.44 U Y
GJP-20D	3.9 U	**8.8 J F**	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	**8.8**	**0.67**
GJP-21	3.9 U	**3.9**	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	**3.9**	**0.33**
GJP-22	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	15 U Y	15 U Y	1.74 U Y
GJ-23	3.9 U	**4.8**	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	**4.8**	**0.39**
GP-24	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	7.7 U Y	7.7 U Y	0.58 U Y
GJP-25	4 U	4 U	4 U	4 U	4 U	4 U	8 U Y	8 U Y	0.61 U Y
GJ-26	4 U	**4.8**	4 U	4 U	4 U	4 U	4 U	**4.8**	**0.34**
GP-27	3.8 U	**6**	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	**6**	**0.50**
GP-28	3.8 U	**5.7**	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	**5.7**	**0.59**
GP-29	3.9 U	**6.4**	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	**6.4**	**0.61**
GP-30	3.8 U	**6.2**	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	**6.2**	**0.48**
GP-31	3.8 U	**6.3 J P**	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	**6.3 J P**	**0.7 J P**
GP-32	3.9 U	**8.8**	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	**8.8**	**0.79**
GP-33	3.8 U	**5.3**	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	**5.3**	**0.57**
GP-34	3.9 U	**5.6**	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	**5.6**	**0.61**
GJ-35	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	0.27 U
GJ-36	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	0.36 U
GJP-37	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	0.33 U
GJP-38	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	0.37 U
GP-39	4 U	**4.5**	4 U	4 U	4 U	4 U	4 U	**4.5**	**0.37**

TABLE D-8

SEDIMENT POLYCHLORINATED BIPHENYLS[1,2]

Gateway Pacific Terminal
Whatcom County, Washington

Station ID	Aroclor 1016 (µg/kg)	Aroclor 1242 (µg/kg)	Aroclor 1248 (µg/kg)	Aroclor 1254 (µg/kg)	Aroclor 1260 (µg/kg)	Aroclor 1221 (µg/kg)	Aroclor 1232 (µg/kg)	Total PCBs (µg/kg)	Total PCBs (mg/kg OC)
SQS	NA	NA	NA	NA	NA	NA	NA	NA	**12**
SL	NA	NA	NA	NA	NA	NA	NA	**130**	NA
GP-40	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	5.9 U Y	5.9 U Y	0.48 U Y
GP-41	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	5.9 U Y	5.9 U Y	0.55 U Y
GP-42	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	7.8 U Y	7.8 U Y	0.6 U Y
GP-43	3.9 U	3.9 U	**24**	3.9 U	3.9 U	3.9 U	3.9 U	**24**	**2.03**
GJ-44	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	0.3 U
GJ-45	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	0.33 U
GP-46	3.9 U	**4.5**	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	**4.5**	**0.35**
GJ-47	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	0.32 U

Notes
1. **Bold** indicates value was detected above reporting level.
2. EPA Data qualifiers:
   P = Results from dual-column analyses differed significantly; reported value may be biased.
   U = Analyte was not detected at or below the associated reporting limit concentration.
   J = The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample either because the concentration was below the reporting limit or because of minor deviations from certain quality-control criteria.
   UJ = Analyte was analyzed for but not detected. The associated sample reporting limit is an estimated value.
   UY = Analyte was not detected. Reporting limit is elevated due to interferences.
   F = Variability in results for field duplicates.

Abbreviations

EPA:	U.S. Environmental Protection Agency	PCBs:	polychlorinated biphenyls
DMMP:	Dredged Material Management Program	SL:	DMMP Screening Level
mg/kg OC:	milligrams per kilogram organic carbon	SQS:	Washington Marine Sediment Quality Standard
NA:	not available	µg/kg:	micrograms per kilogram

TABLE D-9

SEDIMENT VOLATILE ORGANIC COMPOUNDS[1]
(DRY-WEIGHT CONCENTRATIONS)

Gateway Pacific Terminal
Whatcom County, Washington

Station ID	Trichloroethene (µg/kg)	Tetrachloroethene (µg/kg)	Ethylbenzene (µg/kg)	Total Xylenes (µg/kg)
SQS	NA	NA	NA	NA
SL	**160**	**57**	**10**	**40**
GJP-1	0.9 U	0.9 U	0.9 U	1.8 U
GJP-4	0.9 U	0.9 U	0.9 U	1.8 U
GJP-5	1 U	1 U	1 U	2 U
GJP-6	1 U	1 U	1 U	2 U
GJ-7	0.9 U	0.9 U	0.9 U	1.8 U
GJ-8	1 U	1 U	1 U	2 U
GJ-9	0.9 U	0.9 U	0.9 U	1.8 U
GJP-10	0.9 U	0.9 U	0.9 U	1.8 U
GJP-11	1 U	1 U	1 U	2 U
GJ-12	1.2 U	1.2 U	1.2 U	2.4 U
GJ-14	1.3 U	1.3 U	1.3 U	2.6 U
GJ-15	1.3 U	1.3 U	1.3 U	2.5 U
GP-16	1.5 U	1.5 U	1.5 U	2.9 U
GJ-17	1 U	1 U	1 U	2 U
GJ-18	0.9 U	0.9 U	0.9 U	1.9 U
GJP-19	1.1 U	1.1 U	1.1 U	2.2 U
GJP-20	1.1 U	1.1 U	1.1 U	2.3 U
GJP-20D	1.2 U	1.2 U	1.2 U	2.4 U
GJP-21	1.2 U	1.2 U	1.2 U	2.4 U
GJP-22	1.5 U	1.5 U	1.5 U	3 U
GJ-23	1.5 U	1.5 U	1.5 U	3 U
GP-24	1.5 U	1.5 U	1.5 U	3 U
GJP-25	1.5 U	1.5 U	1.5 U	2.9 U
GJ-26	1.5 U	1.5 U	1.5 U	3 U
GP-27	1.5 U	1.5 U	1.5 U	3 U
GP-28	1.4 U	1.4 U	1.4 U	2.7 U
GP-29	1.4 U	1.4 U	1.4 U	2.9 U
GP-30	1.5 U	1.5 U	1.5 U	3 U
GP-31	1.4 U	1.4 U	1.4 U	2.8 U
GP-32	1.5 U	1.5 U	1.5 U	2.9 U
GP-33	1.5 U	1.5 U	1.5 U	2.9 U
GP-34	1.4 U	1.4 U	1.4 U	2.8 U
GJ-35	1 U	1 U	1 U	2 U
GJ-36	1 U	1 U	1 U	2.1 U
GJP-37	1.1 U	1.1 U	1.1 U	2.2 U
GJP-38	1.2 U	1.2 U	1.2 U	2.4 U
GP-39	1.4 U	1.4 U	1.4 U	2.9 U
GP-40	1.4 U	1.4 U	1.4 U	2.7 U
GP-41	1.5 U	1.5 U	1.5 U	2.9 U

TABLE D-9

SEDIMENT VOLATILE ORGANIC COMPOUNDS[1]
(DRY-WEIGHT CONCENTRATIONS)

Gateway Pacific Terminal
Whatcom County, Washington

Station ID	Trichloroethene (µg/kg)	Tetrachloroethene (µg/kg)	Ethylbenzene (µg/kg)	Total Xylenes (µg/kg)
SQS	NA	NA	NA	NA
SL	**160**	**57**	**10**	**40**
GP-42	1.4 U	1.4 U	1.4 U	2.8 U
GP-43	1.4 U	1.4 U	1.4 U	2.9 U
GJ-44	1 U	1 U	1 U	2 U
GJ-45	1.1 U	1.1 U	1.1 U	2.2 U
GP-46	1.3 U	1.3 U	1.3 U	2.6 U
GJ-47	1.1 U	1.1 U	1.1 U	2.2 U

Notes
1. EPA Data qualifier:
   U = Analyte was not detected at or below the associated reporting limit concentration shown.

Abbreviations

EPA:	U.S. Environmental Protection Agency
DMMP:	Dredged Material Management Program
NA:	not available
SL:	DMMP Screening Level
SQS:	Washington Marine Sediment Quality Standard
µg/kg:	micrograms per kilogram

APPENDIX E

Results of Biological Testing of Sediment

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Attorney-Client Work Product

RESULTS OF BIOLOGICAL TESTING OF SEDIMENT

SEPTEMBER 2011
REVISED OCTOBER 6, 2011

PREPARED FOR:
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1.0 INTRODUCTION

NewFields conducted biological toxicity testing with sediment samples collected by AMEC. Sediments were evaluated for biological effects following guidance provided by the Washington State Department of Ecology (WDOE) Sediment Management Standards (SMS) under the Washington Administrative Code (WAC) 173-204-315. This report presents the results of the toxicity testing portion sediment investigation.

2.0 METHODS

This section summarizes the test methods followed for this biological characterization. Test methods followed guidance provided by the Puget Sound Estuary Program (PSEP 1995), the WDOE Sampling and Analysis Plan Appendix (SAPA; Ecology 2008), and the various updates presented during the Annual Sediment Management Review meetings (SMARM). Sediment toxicity was evaluated using three standard PSEP bioassays; the 10-day amphipod test, the 20-day juvenile polychaete survival and growth test, and the 48 to 96-hour benthic larval test.

2.1 SAMPLE AND ANIMAL RECEIPT

Forty-five test sediments were collected July 2 - 6, 2011 and were received at NewFields on July 3, 5, and 7, 2011; one sample was identified for testing, GJ-8-2011. Reference sediment from Carr Inlet (CI-01) was collected by NewFields personnel on July 27, 2011, and was received on the same day. Sediment samples were stored in a walk-in cold room at 4 ± 2ºC in the dark. The test sediment was not sieved prior to testing. All tests were conducted within the eight week holding time.

Amphipods (*Eohaustorius estuarius*) were supplied by Northwestern Aquatic Sciences in Newport, Oregon. Animals were held in native sediment at 15°C prior to test initiation. Juvenile polychaete worms (*Neanthes arenaceodentata*) were obtained from Aquatic Toxicology Support in Bremerton, Washington. Juvenile polychaetes were held in seawater at 20°C (*Neanthes* were cultured in water-only and were not held in sediment prior to testing). *Mytilus galloprovincialis* (mussel) broodstock were provided by Taylor Shellfish in Shelton, Washington. Broodstock were held in unfiltered seawater at 16°C prior to spawning.

Native *E. estuarius* sediment from Yaquina Bay, Oregon was provided by Northwestern Aquatic Sciences for use as control sediment treatments for the amphipod and juvenile polychaete tests.

2.2 SAMPLE GRAIN SIZE AND REFERENCE COMPARISON

Sediment grain size is one of the characteristics used in selecting the appropriate reference sediment(s) to compare the chemical and biological responses of project sediments to. The percent fines value is defined as the amount of sediment that passes through a 62.5-µm sieve, expressed as a percentage of the total sample analyzed. This is also the sum of the silt and clay fraction of sediment. Conventional grain-size analyses were performed on the project sediments by Analytical Resources, Inc. The percent-fines determination of the project sediments are summarized in Table 1.

Table 1. Sample and Reference Grain Size Comparison.

Treatment	Percent Fines[1]	Treatment Compared To:
CI-01 (Reference)	6.0	
GJ-8-2011	17.5	CI-01 (Reference)

[1] Percent fines provided by Analytical Resources Inc.

2.3 10-DAY AMPHIPOD BIOASSAY

The 10-day acute toxicity test with *E. estuarius* was initiated on August 5, 2011. To prepare the test exposures, approximately 175 mL of sediment was placed in clean, acid and solvent-rinsed 1-L glass jars, which were then filled with 775 mL of 0.45-µm filtered seawater at 30 ppt. Seven replicate chambers were prepared for the test treatment, the reference sediment, and the native control sediment. The control and reference sediments were tested with the test treatments. Five replicates were used to evaluate sediment toxicity while the remaining two replicates were designated as sacrificial surrogate chambers. One surrogate chamber was sacrificed at test initiation to measure porewater and overlying ammonia and sulfides. The remaining surrogate chamber was used for measuring daily water quality throughout the test, as well as porewater and overlying ammonia and sulfides at test termination. Total ammonia as nitrogen was monitored using an Orion meter fitted with an ammonia ion-specific probe. Total sulfides as S^{2-} were monitored using a HACH DR-2800 Spectrophotometer.

Test chambers were placed in randomly assigned positions in a 15°C water bath and allowed to equilibrate overnight. Trickle-flow aeration was provided to prevent dissolved oxygen concentrations from dropping below acceptable levels.

Immediately prior to test initiation, water quality parameters were measured in the surrogate chamber for each treatment. Dissolved oxygen (DO), temperature, pH, and salinity were then monitored in the surrogate chambers daily until test termination. Target test parameters were:

Dissolved Oxygen:	≥5.0 mg/L
pH:	7.8 ± 0.5 units
Temperature:	15 ± 1°C
Salinity:	28 ± 2‰

The tests were initiated by randomly allocating 20 *E. estuarius* into each test chamber, ensuring that each of the amphipods successfully buried into the sediment. Amphipods that did not bury within approximately one hour were replaced with healthy amphipods. The 10-day amphipod bioassay was conducted as a static test with no feeding during the exposure period. At test termination, sediment from each test chamber was sieved through a 0.5-mm screen and all recovered amphipods transferred into a Petri dish. The number of surviving and dead amphipods was then determined under a dissecting microscope.

A 4-day water only reference-toxicant test with ammonium chloride was conducted concurrently with the sediment test to determine if animals utilized in this test were healthy and of similar sensitivity to prior tests.

2.4 20-DAY JUVENILE POLYCHAETE BIOASSAY

The 20-day chronic toxicity test with *N. arenaceodentata* was initiated on August 9, 2011. Test exposures were prepared with approximately 175 mL of sediment placed in clean, acid and solvent-rinsed 1-L glass jars, which were then filled with 775 mL of 0.45-µm filtered seawater at 28 ppt. Seven replicate chambers were prepared for the test treatment, the reference sediment, and control sediment. Five replicates were used to evaluate sediment toxicity while the remaining two replicates were designated as sacrificial surrogate chambers. One surrogate chamber was sacrificed at test initiation to measure overlying and interstitial ammonia and sulfides. The remaining surrogate chamber was used for measuring daily water quality throughout the test, as well as overlying and interstitial ammonia and sulfides at test termination. Total ammonia as nitrogen was monitored using an Orion meter fitted with an ammonia ion-specific probe. Total sulfides as S^{2-} were monitored using a HACH DR-2800 Spectrophotometer.

Test chambers were placed in randomly assigned positions in a water bath at 20°C and allowed to equilibrate overnight. Trickle-flow aeration was provided to prevent dissolved oxygen concentrations from dropping below acceptable levels.

Immediately prior to test initiation, water quality parameters were measured. Dissolved oxygen, temperature, pH, and salinity were then monitored in the surrogates daily until test termination. Target test parameters were:

Dissolved Oxygen:	≥ 6.0 mg/L
pH:	8.0 ± 0.5 units
Temperature:	20 ± 1°C
Salinity:	28 ± 2‰

The juvenile polychaete test was initiated by randomly allocating five *N. arenaceodentata* into each test chamber, and observing whether each of the worms successfully buried into the sediment. Worms that did not bury within approximately one hour were replaced with healthy worms. The 20-day test was conducted as a static-renewal test, with exchanges of 300 mL of water occurring every third day. *N. arenaceodentata* were fed every other day with 40 mg of TetraMarin® (approximately 8 mg dry weight per worm). At test termination, sediment from each test chamber was sieved through a 0.5-mm screen and all recovered worms transferred into a Petri dish. The number of surviving and dead worms was determined. All surviving worms were then transferred to pre-weighed, aluminum foil weigh-boats, and then dried in a drying oven at 60°C for approximately 24 hours. Each weigh-boat was removed, cooled in a dessicator, and then weighed on a microbalance to 0.01 mg. Each of the weigh boats was then heated to 550°C for 2 hours in order to determine the ashed weight. Ash-free dry weights (AFDW) were calculated to correct for the influence of sediment grain size differences between treatments. The ashed boats were weighed to 0.01 mg and the ashed weight was subtracted from the dry weight to calculate the AFDW. Both dry weight and AFDW were used to determine individual worm weight and growth rates.

A 4-day water only reference-toxicant test with ammonium chloride was conducted concurrently with the sediment test to determine if animals utilized in this test were healthy and of similar sensitivity to prior tests.

2.5 Larval Developmental Bioassay

Test sediment was evaluated using the larval benthic toxicity test with the mussel *Mytilus galloprovincialis*. The mussel larval test was initiated on August 8, 2011. The control and reference sediment were tested with the test treatment. To prepare the test exposures, 18 g (±1 g) of test sediment was placed in clean, acid and solvent-rinsed 1-L glass jars, which were then filled to 900 mL with 0.45-µm filtered seawater. Six replicate chambers were prepared for the test treatment and reference sediment. The six sea water control chambers contained filtered seawater without sediment. Five of the replicates were used to evaluate the test; the sixth replicate was used as a water quality surrogate. Each chamber was shaken for 10 seconds and then placed in predetermined randomly-assigned positions in a water bath at 16°C.

To collect gametes for each test, mussels were placed in clean seawater and acclimated at 16°C for approximately 20 minutes. The water bath temperature was then increased over a period of 15 minutes to 20°C. Mussels were held at 20°C and monitored for spawning individuals. Spawning females and males were removed from the water bath and placed in individual containers with seawater. These individuals were allowed to spawn until sufficient gametes were available to initiate the test. After the spawning period, eggs were transferred to

fresh seawater and filtered through a 0.5 mm Nitex® mesh screen to remove large debris, feces, and excess gonadal matter. A composite was made of the sperm and diluted with fresh seawater. The fertilization process was initiated by adding sperm to the isolated egg containers. Egg-sperm solutions were periodically homogenized with a perforated plunger during the fertilization process and sub-samples observed under the microscope for egg and sperm viability. Approximately one to one and a half hours after fertilization, embryo solutions were checked for fertilization rate. Only those embryo stocks with >90% fertilization were used to initiate the tests. Embryo solutions were rinsed free of excess sperm and then combined to create one embryo stock solution. Density of the embryo stock solution was determined by counting the number of embryos in a subsample of homogenized stock solution. This was used to determine the volume of embryo stock solution to deliver approximately 27,000 embryos to each test chamber.

The test was initiated four hours after sediments were shaken and within two hours of egg fertilization. To initiate the test, an aliquot of the embryo stock solution was placed into each test chamber using a volumetric pipettor, targeting stocking density of 20-40 embryos/mL. Embryos were held in suspension during initiation using a perforated plunger. The actual stocking density was 32.8 embryos/mL.

Dissolved oxygen, temperature, pH, and salinity were monitored in water quality surrogates to prevent loss or transfer of larvae by adhesion to water-quality probes. Ammonia and sulfides in the overlying water were measured on Day 0 and Day 2. Total ammonia as nitrogen was monitored using an Orion meter fitted with an ammonia ion-specific probe. Total sulfides as S^{-2} were monitored using a HACH DR-2800 Spectrophotometer. Target test parameters were as follows:

Dissolved Oxygen:	≥ 5.0mg/L
pH:	7.8 ± 0.5 units
Temperature:	16 ± 1°C
Salinity:	28 ± 1‰

The development test was conducted as a static test without aeration. The test was terminated approximately 50 hours after initiation, when 90% of the control larvae had achieved the prodissoconch I stage. At termination, the overlying seawater was decanted into a clean 1-L jar and mixed with a perforated plunger. From this container, a 10 mL subsample was transferred to a scintillation vial and preserved in 5% buffered formalin. Larvae were subsequently stained with a dilute solution of Rose Bengal in 70% alcohol to help visualization of larvae. The number of normal and abnormal larvae was enumerated on an inverted microscope. Normal larvae included all D-shaped prodissoconch I stage larvae. Abnormal larvae included abnormally shaped prodissoconch I larvae and all early stage larvae.

In order to evaluate the potential effects of developing larvae becoming buried or entrained in fine sediment or flocculent material, an additional larval endpoint was evaluated. Following termination for the standard PSEP test, the sediment in the test chamber was resuspended by pouring the decanted water back from that replicate back into the test chamber, mixing the sediment and water briefly with a perforated plunger, and allowing settlement overnight. Water quality was measured (Day 4) and a second subsample was collected following the standard PSEP procedure (decanting the overlying seawater into a clean 1-L jar, mixing with a perforated plunger, and collecting a 10-mL subsample). The resuspension test was terminated approximately 70 hours after initiation. The numbers of normal and abnormal larvae were enumerated using an inverted microscope. Normal larvae included all D-shaped prodissoconch I stage larvae. Abnormal larvae included abnormally shaped prodissoconch I larvae and all early stage larvae.

A 4-day water only reference-toxicant test with ammonium chloride was conducted concurrently with the sediment test to determine if animals utilized in this test were healthy and of similar sensitivity to prior tests.

2.6 DATA ANALYSIS AND QA/QC

All water quality and endpoint data were entered into Excel spreadsheets. Water quality parameters were summarized by calculating the mean, minimum, and maximum values for each test treatment. Endpoint data were calculated for each replicate and the mean values and standard deviations were determined for each test treatment.

All hand-entered data was reviewed for data entry errors, which were corrected prior to summary calculations. A minimum of 10% of all calculations and data sorting were reviewed for errors. Review counts were conducted on any apparent outliers.

For the larval test, the normalized combined mortality and abnormality endpoint was used to evaluate the test sediment. This was based on the number of normal larvae in each treatment and reference sample divided by the mean number of normal larvae in the control replicates, as defined in Ecology (2005).

For SMS suitability determinations, comparisons were made according to SAPA and Fox et al. (1998). Data reported as percent mortality or survival were transformed using an arcsine square root transformation prior to statistical analysis. All data were tested for normality using the Wilk-Shapiro test and equality of variance using Levene's test. Determinations of statistical significance were based on one-tailed Student's t-tests with an alpha of 0.05. A comparison of the larval endpoint relative to the reference was made using an alpha level of 0.10. For samples failing to meet assumptions of normality, a Mann-Whitney test was conducted to determine significance. For those samples failing to meet the assumptions of normality and equality of variance, a t-test on rankits was used.

3.0 RESULTS

The results of the sediment testing, including a summary of test results and water quality observations are presented in this section. Data for each of the replicates, as well as laboratory bench sheets are provided Appendix A and statistical analyses are provided in Appendix B.

3.1 10-DAY AMPHIPOD BIOASSAY

The bioassay test with *E. estuarius* was validated with 3% mortality in the native sediment control, which met the SMS performance criteria of ≤10% mortality. This indicates that the test conditions were suitable for adequate amphipod survival. Mean mortality in the reference treatment (CI-01) was 5%, which met the SMS performance criteria (<25% mortality) and indicated that the reference sediments were acceptable for comparison to sediment management standards (SMS). Mean mortality in the test treatment was 8% (Table 2).

The LC_{50} for the ammonia reference-toxicant test (unionized) was 1.76 mg NH_3/L and was within two standard deviations of the laboratory mean (1.55; range 0.54 – 2.56 mg NH_3/L). This indicates that the population of test organisms used in this test were of similar sensitivity to those previously tested at the NewFields laboratory. The No Observed Effect Concentrations (NOEC) of ammonia were 144.9 mg NH_3+NH_4^+/L (total) and 1.15 mg NH_3/L (unionized). These concentrations were well above the measurements in the interstitial water or the overlying water, indicating that ammonia should not have been a contributing factor to any reduced test organism response observed in these treatments.

Summaries of water quality measurements, ammonia and sulfide concentrations, and test conditions are presented in Tables 3, 4, and 5. Dissolved oxygen, salinity and pH measurements were within acceptable limits throughout the test. Temperatures were slightly elevated Days 7 through Day 10; however, due to the low mortality observed in the test treatments, this deviation would not be expected to affect the test results.

Both of the treatments had ammonia levels below the threshold concentration of 30 mg/L total ammonia (Barton 2002). Initial sulfide concentrations in interstitial water were below 0.3 mg/L and would not be expected to contribute to toxicity.

Table 2. Test Results for *Eohaustorius estuarius*.

Treatment	Replicate	Number Initiated	Number Surviving	Percentage Survival	Mean Percentage		Standard Deviation
					Survival	Mortality	
Control	1	20	20	100	97	3	2.7
	2	20	19	95			
	3	20	19	95			
	4	20	20	100			
	5	20	19	95			
CI-01	1	20	18	90	95	5	3.5
	2	20	19	95			
	3	20	19	95			
	4	20	20	100			
	5	20	19	95			
GJ-8-2011	1	20	17	85	92	8	5.7
	2	20	20	100			
	3	20	18	90			
	4	20	18	90			
	5	20	19	95			

Table 3. Water Quality Summary for *Eohaustorius estuarius*.

Treatment	Dissolved Oxygen (mg/L)			Temperature (°C)			Salinity (ppt)			pH (units)		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Control	8.0	7.5	8.3	15.7	14.2	19.5	30	30	30	8.0	7.6	8.1
CI-01	8.0	7.5	8.4	15.7	14.2	19.5	30	30	30	7.9	7.7	8.0
GJ-8-2011	8.0	7.5	8.3	15.8	14.2	19.5	30	29	30	8.1	8.0	8.2

Table 4. Ammonia and Sulfide Summary for *Eohaustorius estuarius*.

Treatment	Overlying Ammonia (mg/L Total)		Interstitial Ammonia (mg/L Total)		Overlying Sulfides (mg/L Total)		Interstitial Sulfides (mg/L Total)	
	Day 0	Day 10	Day 0	Day 10	Day 0	Day 10	Day 0	Day 10
Control	< 0.5	< 0.5	< 0.5	< 0.5	0.004	0.000	0.022	0.003
CI-01	< 0.5	< 0.5	1.87	< 0.5	0.047	0.000	0.288	ND
GJ-8-2011	1.47	< 0.5	14.9	1.26	0.025	0.003	0.127	0.000

ND – no data; insufficient volume for analysis.

Table 5. Test Condition Summary for *Eohaustorius estuarius*.

Test Conditions: PSEP *E. estuarius* (SMS)		
Sample Identification	GJ-8-2011, CI-01, and Control	
Date sampled	July 6, 2011 and July 27, 2011	
Date received at NewFields Northwest	July 7, 2011 and July 27, 2011	
Test dates	August 5-15, 2011	
Sample storage conditions	4°C, dark	
Days of holding Recommended: ≤8 weeks (56 days)	30 days	
Source of control sediment	Yaquina Bay, Oregon	
Test Species	***E. estuarius***	
Supplier	Northwestern Aquatic Sciences, Newport, OR	
Date acquired	August 3, 2011	
Acclimation/holding time	2 days	
Age class	Subadult, 3-5 mm	
Test Procedures	PSEP 1995 with SMARM revisions	
Regulatory Program	SMS	
Test location	NewFields Northwest Laboratory	
Test type/duration	10-Day static	
Control water	North Hood Canal, sand filtered	
Test temperature	Recommended: 15 ± 1 °C	Achieved: 14.2 – 19.5 °C
Test Salinity	Recommended: Ambient Chosen: 30 ± 1 ppt	Achieved: 29 – 30 ppt
Test dissolved oxygen	Recommended: > 5.0 mg/L (60% Sat @ 15°C, 30ppt)	Achieved: 7.5 – 8.4 mg/L
Test pH	Recommended: 7 – 9	Achieved: 7.6 – 8.2
SMS control performance standard	Recommended: Control ≤ 10% mortality	Achieved: 3%, Pass
SMS reference performance standard	Recommended: Reference mortality < 25%	Achieved: 5%, Pass
Reference Toxicant LC_{50} (unionized ammonia)	1.76 mg NH_3/L	
Mean; Acceptable Range	1.55 mg NH_3/L ; 0.54 – 2.56 mg NH_3/L	
Test Lighting	Continuous, UV exposure	
Test chamber	1-Liter Glass Chamber	
Replicates/treatment	5 + 2 surrogates (one used for WQ measurements throughout the test)	
Organisms/replicate	20	
Exposure volume	175 mL sediment/ 775 mL water	
Feeding	None	
Water renewal	None	
Deviations from Test Protocol	Deviations in temperature	

3.2 20-DAY JUVENILE POLYCHAETE BIOASSAY

No mortality was observed in the *N. arenaceodentata* control sediment and mean individual growth (MIG) in the control sediment was 0.611 mg/ind/day. These values fall within the test acceptability criteria of <10% mean mortality and ≥0.38 mg/ind/day mean individual growth (Kendall 1996), indicating that the test conditions were suitable for adequate polychaete survival and growth. A summary of the test results for all samples is shown in Table 6. Summaries of water quality measurements, ammonia and sulfide concentrations, and test conditions are presented in Tables 7, 8, and 9.

The LC_{50} for the ammonia reference-toxicant test (unionized) was 1.55 mg NH_3/L and was within two standard deviations of the laboratory mean (1.58; range 0.55 – 2.60 mg NH_3/L). This indicates that the population of test organisms used in this test were of similar sensitivity to those previously tested at the NewFields laboratory. The No Observed Effect Concentrations (NOEC) of ammonia were 102 mg NH_3+NH_4^+/L (total) and 1.19 mg NH_3/L (unionized). These concentrations were well above the measurements in the interstitial water or the overlying water, indicating that ammonia should not have been a contributing factor to any reduced test organism response observed in these treatments.

Mean individual growth for the reference treatment was 0.565 mg/ind/day, meeting the recommended SMS performance standards (Ecology 2008) of greater than 80% of the Control, and mortality (4%) was less than the 20% criterion. These results indicate that these reference sediments were acceptable for SMS comparison. Survival in the test treatment was 100%; MIG in the test treatment was 0.543 mg/ind/day. MIG measurements in the AFDW assessment, which removes any grain size effect, are also shown in Table 6.

Dissolved oxygen, salinity and pH measurements were within acceptable limits throughout the test. Temperatures were recorded slightly below the recommended limit, but by no more than 0.3°C. All deviations were within the tolerance range for *N. arenaceodentata*. These deviations would not be expected to affect the test results.

Table 6. Test Results for *Neanthes arenaceodentata*.

Treat-ment	Repli-cate	Number Initiated	Survivors	Mean Mortality (%)	Individual Growth (mg/ind/day)					
					Dry Weight	Mean	Std Dev	AFDW	Mean	Std Dev
Control	1	5	5	0	0.654	0.611	0.044	0.511	0.478	0.058
	2	5	5		0.582			0.464		
	3	5	5		0.549			0.397		
	4	5	5		0.625			0.466		
	5	5	5		0.645			0.552		
CI-01	1	5	5	4	0.524	0.565	0.084	0.419	0.454	0.042
	2	5	5		0.624			0.483		
	3	5	4		0.477			0.422		
	4	5	5		0.521			0.431		
	5	5	5		0.679			0.513		
GJ-8-2011	1	5	5	0	0.545	0.543	0.036	0.476	0.455	0.033
	2	5	5		0.585			0.478		
	3	5	5		0.552			0.463		
	4	5	5		0.485			0.398		
	5	5	5		0.546			0.459		

Table 7. Water Quality Summary for *Neanthes arenaceodentata*.

Treatment	Dissolved Oxygen (mg/L)			Temperature (°C)			pH (units)			Salinity (ppt)		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Control	7.4	7.0	7.6	19.4	18.8	20.0	7.8	7.4	8.0	28	28	29
CI-01	7.6	7.3	7.9	19.2	18.7	19.9	7.9	7.5	8.3	29	28	29
GJ-8-2011	7.2	6.0	8.1	19.2	18.7	19.9	7.8	7.5	8.2	28	28	29

Table 8. Ammonia and Sulfide Summary for *Neanthes arenaceodentata*.

Treatment	Overlying Ammonia (mg/L Total)		Interstitial Ammonia (mg/L Total)		Overlying Sulfides (mg/L Total)		Interstitial Sulfides (mg/L Total)	
	Day 0	Day 20	Day 0	Day 20	Day 0	Day 20	Day 0	Day 20
Control	< 0.5	< 0.5	< 0.5	ND	0.007	0.004	0.000	0.042
CI-01	0.889	< 0.5	5.78	ND	0.043	0.009	0.175	ND
GJ-8-2011	1.98	< 0.5	7.44	ND	0.041	0.008	0.130	3.14

ND – no data; insufficient volume for analysis

Table 9. Test Condition Summary for *Neanthes arenaceodentata*.

Test Conditions: PSEP *N. arenaceodentata* (SMS)		
Sample Identification	GJ-8-2011, CI-01, and Control	
Date sampled	July 6, 2011 and July 27, 2011	
Date received at NewFields Northwest	July 7, 2011 and July 27, 2011	
Test dates	August 5-15, 2011	
Sample storage conditions	4°C, dark	
Days of holding Recommended: ≤8 weeks (56 days)	30 days	
Source of control sediment	Yaquina Bay, Oregon	
Test Species	***N. arenaceodentata***	
Supplier	Aquatic Toxicology Support	
Date acquired	August 9, 2011	
Acclimation/holding time	1 day	
Age class	Juvenile	
Test Procedures	PSEP 1995 with SMARM revisions	
Regulatory Program	SMS	
Test location	NewFields Northwest Laboratory	
Test type/duration	20-Day static renewal	
Control water	North Hood Canal, sand filtered	
Test temperature	Recommended: 20 ± 1 °C	Achieved: 18.7 – 20.0 °C
Test Salinity	Recommended: 28 ± 2 ppt	Achieved: 28 – 29 ppt
Test dissolved oxygen	Recommended: > 4.6 mg/L (60% Sat @ 20°C, 28ppt)	Achieved: 6.0 – 8.1 mg/L
Test pH	Recommended: 7 – 9	Achieved: 7.4 – 8.3

Test Conditions: PSEP *N. arenaceodentata* (SMS)		
SMS control performance standard	Recommended: Control ≤ 10% mortality; C_{MIG} ≥ 0.38 mg/ind/day	Achieved: 0% mortality; C_{MIG} = 0.633 mg/ind/day
SMS reference performance standard	Recommended: MIG R/C ≥ 80%	Achieved: 4% mortality; MIG R/C: CI-01 = 89.7%
Reference Toxicant LC_{50} (unionized ammonia)	1.55 mg NH_3/L	
Mean; Acceptable Range	1.58 mg NH_3/L ; 0.55 – 2.60 mg NH_3/L	
Test Lighting	Continuous	
Test chamber	1-Liter Glass Chamber	
Replicates/treatment	5 + 2 surrogates (one used for WQ measurements throughout the test)	
Organisms/replicate	5	
Exposure volume	175 mL sediment/ 950 mL water	
Feeding	40 mg/jar every other day (8mg/ind every other day)	
Water renewal	Water renewed every third day (1/3 volume of exposure chamber)	
Deviations from Test Protocol	Minor deviations in temperature	

3.3 Larval Development Bioassay

The larval development test with *M. galloprovincialis* was validated by 3.6% mean combined mortality in the control treatment, within the SMS acceptability criteria of <30%. A summary of the test results for all samples is shown in Table 10. Summaries of water quality measurements, ammonia and sulfide concentrations, and test conditions are presented in Tables 11, 12, and 13.

The LC_{50} for the ammonia reference-toxicant test (unionized) was 0.09 mg NH_3/L and was within two standard deviations of the laboratory mean (0.13; range 0.00 – 0.31 mg NH_3/L). This indicates that the population of test organisms used in this test was of similar sensitivity to those previously tested at the NewFields laboratory. The No Observed Effect Concentrations (NOEC) of ammonia were 6.02 mg NH_3+NH_4^+/L (total) and 0.06 mg NH_3/L (unionized). These concentrations were well above the measurements in the overlying water, indicating that ammonia should not have been a contributing factor to any reduced test organism response observed in these treatments.

Mean control-normalized normal survival in the reference treatment was 86.0%; mean normal survival in the test treatment was 78.9%. The resuspension results were comparable to the standard protocol results (Table 10).

Dissolved oxygen, salinity and pH measurements were within acceptable limits throughout the test. Temperatures were recorded slightly above the recommended limit, but by no more than 0.1°C. This deviation would not be expected to affect the test results.

Table 10. Test Results for *Mytilus galloprovincialis*.

Treatment	Replicate	Normal Survival (%)[1]	Mean Normal Survival (%)	Std. Dev.	Normal Survival Resuspension (%)[1]	Mean Normal Survival Resuspension (%)	Std. Dev.
Control	1	100.0	96.4	4.0	96.0	96.9	2.7
	2	90.8			99.6		
	3	100.0			94.1		
	4	97.5			94.8		
	5	93.8			100.0		
CI-01	1	81.0	86.0	11.9	91.5	85.0	7.6
	2	77.6			81.2		
	3	74.1			94.7		
	4	97.4			79.0		
	5	100.0			78.4		
GJ-8-2011	1	78.8	78.9	6.3	74.9	80.6	6.1
	2	74.1			74.3		
	3	89.2			80.3		
	4	73.5			85.9		
	5	78.8			87.5		

[1] Reference and treatment normal survivals are normalized to mean Control normal survival.

Table 11. Water Quality Summary for *Mytilus galloprovincialis*.

Treatment	Dissolved Oxygen (mg/L)			Temperature (°C)			pH (units)			Salinity (ppt)		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Control	7.8	7.6	8.0	16.5	16.2	16.8	7.7	7.7	7.8	29	29	29
CI-01	7.3	7.1	7.7	16.6	16.5	16.8	7.7	7.7	7.7	29	29	29
GJ-8-2011	6.7	6.3	7.3	16.8	16.5	17.1	7.8	7.7	7.8	29	29	29

Table 12. Ammonia and Sulfide Summary for *Mytilus galloprovincialis*.

Treatment	Overlying Ammonia (mg/L Total)		Overlying Sulfides (mg/L Total)	
	Initial	Final	Initial	Final
Control	<0.5	<0.5	0.000	0.003
CI-01	<0.5	<0.5	0.000	0.056
GJ-8-2011	<0.5	<0.5	0.000	0.017

Table 13. Test Condition Summary for *Mytilus galloprovincialis*.

Test Conditions: PSEP *M. galloprovincialis* (SMS)		
Sample Identification	GJ-8-2011, CI-01, and Control	
Date sampled	July 6, 2011 and July 27, 2011	
Date received at NewFields Northwest	July 7, 2011 and July 27, 2011	
Test dates	August 5-15, 2011	
Sample storage conditions	4°C, dark	
Holding time Recommended: < 8 weeks (56 days)	30 days	
Test Species	***M. galloprovincialis***	
Supplier	Taylor Shellfish, Shelton, WA	
Date acquired	August 5, 2011	
Acclimation/holding time	3 days	
Age class	<2-h old embryos	
Test Procedures	PSEP 1995 with SMARM revisions	
Regulatory Program	SMS	
Test location	NewFields Northwest Laboratory	
Test type/duration	48-96 Hour static test	
Control water	North Hood Canal sea water, 0.45µm filtered	
Test temperature	Recommended: 16 ± 1 °C	Achieved: 16.2 – 17.1°C
Test Salinity	Recommended: 28 ± 1 ppt	Achieved: 29 ppt
Test dissolved oxygen	Recommended: > 5.0 mg/L (60% Sat @ 16°C, 28ppt)	Achieved: 6.3 – 8.0 mg/L
Test pH	Recommended: 7 – 9	Achieved: 7.7 – 7.8
Stocking Density	Recommended: 20 – 40 embryos/mL	Achieved: 32.8 embryos/mL
SMS control performance standard	Recommended: Control normal survival ≥ 70%	Achieved: 96.4%, Pass
SMS reference performance standard	Recommended: Reference normal/Control normal ≥ 65%	Achieved: 86.0%
Reference Toxicant LC_{50} (unionized ammonia)	0.09 mg NH_3/L	
Mean; Acceptable Range	0.13 mg NH_3/L ; 0.00 – 0.31 mg NH_3/L	
Test Lighting	16hr Light / 8hr Dark	
Test chamber	1-Liter Glass Chamber	
Replicates/treatment	5 + 1 surrogate (used for WQ measurements throughout the test)	
Exposure volume	18 g sediment/ 900 mL water	
Feeding	none	
Water renewal	none	
Deviations from Test Protocol	Minor deviation in temperature	

4.0 DISCUSSION

Sediments were evaluated based on Sediment Management Standards (SMS) criteria. The biological criteria are based on both statistical significance (a statistical comparison) and the degree of biological response (a numerical comparison). The SMS criteria are derived from the Washington Department of Ecology Sampling and Analysis Plan Appendix (WDOE 2008). Comparisons were made for each treatment against the reference sample. Two numerical comparisons were made under SMS, the Sediment Quality Standards (SQS) and the Cleanup Standards Limit (CSL).

4.1 AMPHIPOD TEST SUITABILITY DETERMINATION

Under the SMS program, a treatment will fail SQS if mean mortality in the test sediment is >25% more than the mean mortality in the appropriate reference sediment and the difference is statistically significant ($p \leq 0.05$). Treatments fail the CSL if mean mortality in the test treatment >30% relative to the reference sediment and the difference is statistically significant.

The test sample GJ-8-2011 met the SQS and CSL criteria for the amphipod test as shown in Table 14.

Table 14. SMS Comparison for *Eohaustorius estuarius*.

Treatment	Mean Mortality (%)	Comparison To:	Statistically More than Reference?	Mortality Comparison to Reference M_T-M_R (%)	Fails SQS?[1] > 25 %	Fails CSL?[2] > 30 %
Control	3					
CI-01	5					
GJ-8-2011	8	CI-01	No	3	PASS	PASS

[1]SQS: Statistical Significance and M_T-M_R >25%
[2]CSL: Statistical Significance and M_T-M_R >30%

4.2 JUVENILE POLYCHAETE TEST SUITABILITY DETERMINATION

Suitability determinations for the juvenile polychaete test were based on mean individual growth (MIG). A test treatment fails SQS criteria if MIG is statistically lower in the test treatment, relative to the reference, and MIG in the test treatment is <70% that of the reference. The treatments will fail CSL criteria if MIG is significantly lower than the reference treatment and is <50% that of the treatment.

The test sample met the SQS and CSL criteria when evaluated on the dry weight and AFDW basis (Table 15).

Table 15. SMS Comparison for *Neanthes arenaceodentata*.

Treatment	MIG (mg/ind/day)	Comparison to:	Statistically Less than Reference?	MIG Relative to Reference MIG_T/MIG_R (%)	Fails SQS?[1] < 70%	Fails CSL?[2] < 50%
Dry Weight						
Control	0.611					
CI-01	0.565					
GJ-8-2011	0.543	CI-01	No	96.1	PASS	PASS
Ash-Free Dry Weight						
Control	0.478					
CI-01	0.454					
GJ-8-2011	0.455	CI-01	No	100.2	PASS	PASS

[1]SQS: Statistical Significance and MIG_T/MIG_R <70%
[2]CSL: Statistical Significance and MIG_T/MIG_R <50%

4.3 Larval Test Suitability Determination

Larval test treatments fail SQS criteria if the percentage of normal larvae in the test treatment is significantly lower than that of the reference and if the normal larval development in the test treatment is less than 85% of the normal development in the reference. Treatments fail CSL criteria if the percentage of normal larvae in the test treatment is significantly lower than that of the reference and if the normal larval development in the test treatment is less than 70% of the normal development in the reference.

Sample GJ-8-2011 met both SQS and CSL criteria. The comparison results are summarized in Table 16 below. The results from the resuspended counts are also shown in Table 16 and support the standard protocol results.

Table 16. SMS Comparison for *Mytilus galloprovincialis*.

Treatment	Mean Normal Survival (%)	Comparison To:	Statistically Less than Reference?	Normal Survival Comparison to Reference $(N_T/N_C)/(N_R/N_C)$	Fails SQS?[1] < 85%	Fails CSL?[2] < 70%
Standard Protocol						
Control	96.4					
CI-01	86.0					
GJ-8-2011	78.9	CI-01	No	91.7	PASS	PASS
Resuspension						
Control	96.9					
CI-01	85.0					
GJ-8-2011	80.6	CI-01	No	94.8	PASS	PASS

[1]SQS: Statistical Significance and $N_{CT}<0.85*N_{CR}$
[2]CSL: Statistical Significance and $N_{CT}<0.70*N_{CR}$

4.4 Summary

Sample GJ-8-2011 met all criteria for the three tests.

5.0 REFERENCES

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APPENDICES

A. AMPHIPOD TEST

A. JUVENILE POLYCHAETE TEST

B. LARVAL DEVELOPMENT TEST

C. STATISTICAL COMPARISONS

D. CHAIN-OF-CUSTODY FORMS

APPENDIX A

AMPHIPOD TEST

***Eohaustorius estuarius* Survival and Growth Test: Laboratory Data Sheets**

***Eohaustorius estuarius*: Reference Toxicant Test**

***Eohaustorius estuarius Organism* Receipt**

Privileged and Confidential
Attorney-Client Work Product

NEWFIELDS

10-DAY SOLID PHASE TEST OBSERVATION DATA

CLIENT	PROJECT	SPECIES	NEWFIELDS LABORATORY	PROTOCOL
AMEC	Confidential	*Eohaustorius estuarius*	Port Gamble .	PSEP 1995
NEWFIELDS JOB NUMBER	PROJECT MANAGER	TEST START DATE	TEST END DATE	
.	B. Hester	5-Aug-11	15-Aug-11	

N = Normal
#E = Emergence
#M = Mortality or Molts
G = Growth
(fungal, bacterial, or algal)
D = No Air Flow (DO?)
FOS = Floating on Surface
TC = Too Cloudy

Client/NewFields ID	Rep	Jar #	Initial # of Organisms	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Number Alive	
				ENDPOINT DATA AND OBSERVATIONS											
			20	Date 8/06/11	Date 8/07/11	Date 8/08	Date 8/09	Date 8/10	Date 8/11	Date 8/12	Date 8/13	Date 8/14	Date 8/15		
				Technician JL	Technician JL	Technician JL	Technician JL	Technician JL	Technician JL	Technician JL	Technician JL	Technician JL	Technician JL		
Control	1			N	N	N	N	N	N	N	N	N	N	20	
	2				↓			N						19	1M
	3				1M			1E						19	
	4				N			N						20	97
	5				1M		↓	N						19	
C1-01	1				N		1M	N						18	
	2						N							19	
	3													19	95
	4													20	
	5					↓								19	
GJ-8	1					1M							1M BH	17	1M
	2					N		↓		↓				20	
	3			↓				1E		1M				18	
	4			1E				N		N				18	92
	5			N	↓	↓	↓	N	↓	↓	↓	↓	↓	19	

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NEWFIELDS

10 DAY SOLID PHASE BIOASSAY
WATER QUALITY DATA SHEET

CLIENT	PROJECT	SPECIES		NEWFIELDS LABORATORY	PROTOCOL
AMEC	Confidential	*Eohaustorius estuarius*		Port Gamble .	PSEP 1995
NEWFIELDS JOB NUMBER	PROJECT MANAGER	TEST START DATE	TIME	TEST END DATE	TIME
	B. Hester	5-Aug-11	1345	15-Aug-11	1100

Test Conditions				WATER QUALITY DATA									
				DO (mg/L) >5.0 mg/L		Temperature (°C) 15±1		Salinity (ppt) 28±1		pH 7.8±0.5		Tech	Date
Client/NewFields ID	Day	Rep	Jar#	meter	mg/L	meter	deg C	meter	ppt	meter	unit		
Control	0	WQ	10	6	8.2	2	14.4	2	30	2	8.1	JL	8/05/11
C1-01	0	WQ	14	↓	8.2	↓	14.3	↓	30	↓	7.7	↓	↓
GJ-8	0	WQ	4	↓	8.1	↓	14.3	↓	30	↓	8.0	↓	↓
Control	1	WQ	10	6	8.2	①~~6~~2	14.3	2	30	2	8.0	JL	8/06/11
C1-01	1	WQ	14	↓	8.1	↓	14.2	↓	30	↓	8.0	↓	↓
GJ-8	1	WQ	4	↓	8.1	↓	14.2 ~~30~~ ②	↓	30	↓	8.1	↓	↓
Control	2	WQ	10	6	8.0	2	14.3	2	30	2	8.0	JL	8/07/11
C1-01	2	WQ	14	↓	8.1	↓	14.3	↓	30	↓	7.9	↓	↓
GJ-8	2	WQ	4	↓	8.0	↓	14.7	↓	29	↓	8.0	↓	↓
Control	3	WQ	10	6	8.2	2	14.2	2	30	2	8.0	JL	8/08/11
C1-01	3	WQ	14	↓	8.2	↓	14.2	↓	30	↓	7.9	↓	↓
GJ-8	3	WQ	4	↓	8.2	↓	14.2	↓	30	↓	8.0	↓	↓
Control	4	WQ	10	6	8.1	2	14.5	2	30	2	8.1	JL	8/09/11
C1-01	4	WQ	14	↓	8.2	↓	14.5	↓	30	↓	8.0	↓	↓
GJ-8	4	WQ	4	↓	8.0	↓	14.5	↓	30	↓	8.0	↓	↓
Control	5	WQ	10	6	7.9	2	15.6	2	30	2	7.6	JL	8/10/11
C1-01	5	WQ	14	↓	8.1	↓	15.5	↓	30	↓	7.8	↓	↓
GJ-8	5	WQ	4	↓	8.0	↓	15.5	↓	30	↓	8.1	↓	↓

① wrong probe, JL 8/06/11.
② WC, JL 8/06/11.

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NEWFIELDS

10 DAY SOLID PHASE BIOASSAY
WATER QUALITY DATA SHEET

CLIENT	PROJECT	SPECIES		NEWFIELDS LABORATORY	PROTOCOL
AMEC	Confidential	*Eohaustorius estuarius*		Port Gamble .	PSEP 1995
NEWFIELDS JOB NUMBER	PROJECT MANAGER	TEST START DATE	TIME	TEST END DATE	TIME
.	B. Hester	5-Aug-11	1345	15-Aug-11	1100

				WATER QUALITY DATA									
Test Conditions				DO (mg/L) >5.0 mg/L		Temperature (°C) 15±1		Salinity (ppt) 28±~~1~~2		pH 7.8±0.5		Tech	Date
Client/NewFields ID	Day	Rep	Jar#	meter	mg/L	meter	deg C	meter	ppt	meter	unit		
Control	6	WQ	10	6	8.3	2	15.3	2	30	2	8.1	AE	8/11/11
C1-01	6	WQ	14	6	8.4	2	15.3	2	30	2	7.9	↓	↓
GJ-8	6	WQ	4	6	8.3	2	15.4	2	29	2	8.1	↓	↓
Control	7	WQ	10	6	7.8	2	17.1	2	30	2	8.1	JC	8/12/11
C1-01	7	WQ	14	↓	7.8	↓	17.1	↓	30	↓	8.0	↓	↓
GJ-8	7	WQ	4	↓	7.7	↓	17.2	↓	30	↓	8.0	↓	↓
Control	8	WQ	10	6	7.7	2	17.4	2	30	2	8.1	JC	8/13/11
C1-01	8	WQ	14	↓	7.7	↓	17.3	↓	30	↓	7.9	↓	↓
GJ-8	8	WQ	4	↓	7.7	↓	17.3	↓	29	↓	8.2	↓	↓
Control	9	WQ	10	6	7.5	2	19.5	2	30	2	8.1	JC	8/14/11
C1-01	9	WQ	14	↓	7.5	↓	19.5	↓	30	↓	8.0	↓	↓
GJ-8	9	WQ	4	↓	7.5	↓	19.5	↓	30	↓	8.1	↓	↓
Control	10	WQ	10	6	8.0	2	16.4	2	30	2	8.0	AE	8/15/11
C1-01	10	WQ	14	↓	8.1	↓	16.2	↓	30	↓	8.0	↓	↓
GJ-8	10	WQ	4	↓	8.0	↓	16.5	↓	30	↓	8.2	↓	↓

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NEWFIELDS

Page ____of____

Ammonia and Sulfide Analysis Record

Client/Project:	Organism:	Test Duration (days):
AMEC/Confidential	Eohs	10

PRETEST / INITIAL / FINAL / OTHER (circle one) DAY of TEST: Ø
OVERLYING (OV) / & POREWATER (PW) (circle one)

Comments: _____

Calibration Standards Temperature		Sample temperature should be within ±1°C of standards temperature at time and date of analysis.
Date:	Temperature:	
8/5/11	21.0	

Sample ID or Description	Conc. or Rep	Date of Sampling and Initials	Ammonia Value (mg/L)	Temp °C	Date of Reading and Initials	Sample Preserved (Y/N)	pH	Sal (ppt)	Sulf. mg/L
OV Ø	Surr.	8/5/11 MMB	<0.5	20.5	8/5/11 MMB	N			0.004
C1.01			<0.5						0.047
GJ8			1.47						0.025
PW Ø			<0.5	21.0			7.5	30	0.011x2= 0.022
C1.01			1.87				7.6	30	0.144x2= 0.288
GJ8			14.9				7.8	30	0.127

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NEWFIELDS

Ammonia and Sulfide Analysis Record

Page ____ of ____

Client/Project:	Organism:	Test Duration (days):
AMEC / SSA	Eoh	10

PRETEST / INITIAL / FINAL / OTHER (circle one) DAY of TEST: 10

OVERLYING (OV) / POREWATER (PW) (circle one) / Comments: _____

Calibration Standards Temperature		
Date:	Temperature:	Sample temperature should be within ±1°C of standards temperature at time and date of analysis.
8/15/11	20.5	

Sample ID or Description	Conc. or Rep	Date of Sampling and Initials	Ammonia Value (mg/L)	Temp °C	Date of Reading and Initials	Sample Preserved (Y/N)	pH	Sal (ppt)	Sample Volume (mL)	Measured Sulf. (mg/L)	Multi-plier	Calc-ulated Sulf. (mg/L)
Control	PW	8/15/11 BH	0.08	20.5	8/15/11 ✓	N	7.7	30	10	0.003		
Control	OV	↓	0.00	↓	↓	↓	NA	NA	10	0.000		
GJ-8	PW	↓	1.26	↓	↓	↓	7.7	30	10	0.000		
GJ-8	OV	↓	~~0.00~~ 0.09	↓	↓	↓	NA	NA	10	0.003		
CI-01	PW	↓	0.154	↓	↓	↓	7.7	30	NA	NA		
CI-01	OV	↓	~~0.40~~ 0.00	↓	↓	↓	NA	NA	10	0.000		

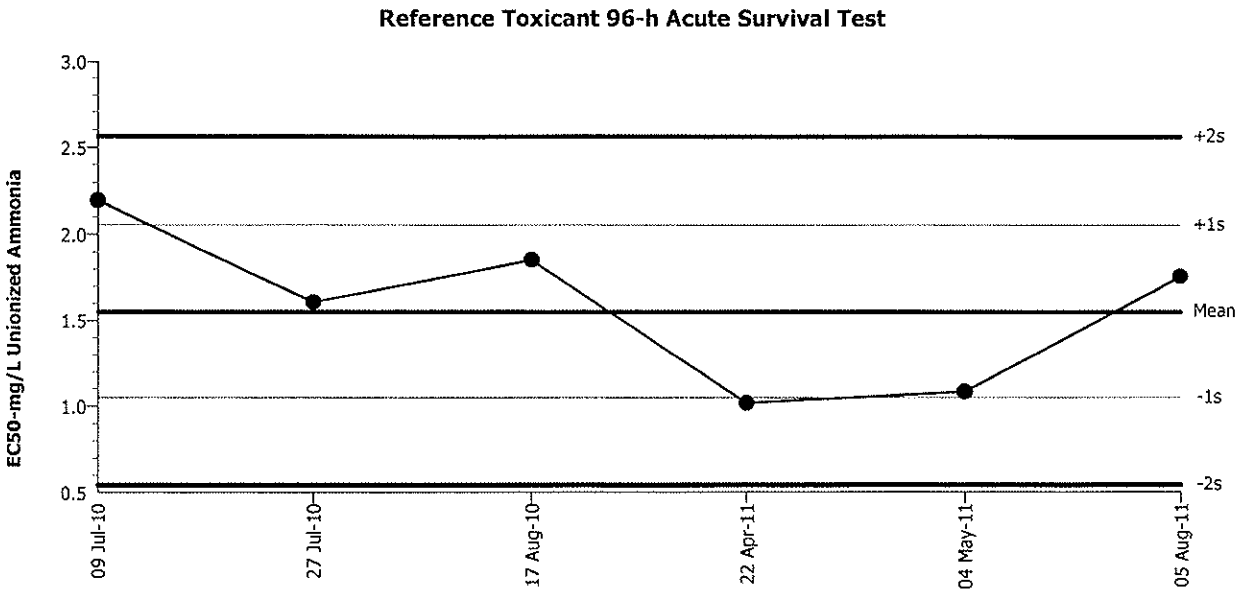
① WC 8/15/11 ✓

CETIS QC Plot

Report Date: 24 Aug-11 16:53 (1 of 1)

Reference Toxicant 96-h Acute Survival Test **NewFields**

Test Type:	Survival	**Organism:**	Eohaustorius estuarius (Amphipod)	**Material:**	Unionized Ammonia
Protocol:	EPA/600/R-94/025 (1994)	**Endpoint:**	Proportion Survived	**Source:**	Reference Toxicant-REF



Mean:	1.552	**Count:**	5	**-1s Warning Limit:**	1.047	**-2s Action Limit:**	0.5428
Sigma:	0.5046	**CV:**	32.50%	**+1s Warning Limit:**	2.057	**+2s Action Limit:**	2.561

Quality Control Data

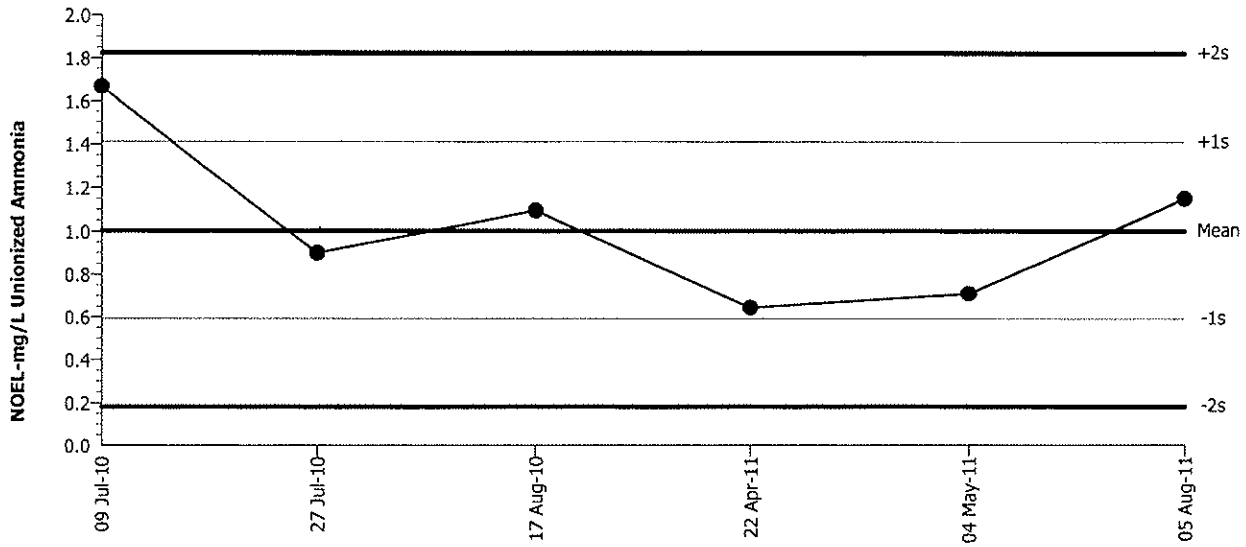
Point	Year	Month	Day	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2010	Jul	9	2.198	0.6455	1.279	(+)		01-7209-8485	05-8082-3474
2			27	1.608	0.05638	0.1117			00-7007-0295	03-9110-2709
3		Aug	17	1.854	0.3023	0.599			04-9660-1658	10-4250-3896
4	2011	Apr	22	1.017	-0.5346	-1.059	(-)		03-6965-3395	14-3447-2473
5		May	4	1.081	-0.4708	-0.9329			18-8723-9922	17-9305-2155
6		Aug	5	1.76	0.2082	0.4126			17-9542-0646	06-2792-7024

CETIS QC Plot

Report Date: 24 Aug-11 16:53 (1 of 1)

Reference Toxicant 96-h Acute Survival Test — **NewFields**

Test Type:	Survival	**Organism:**	Eohaustorius estuarius (Amphipod)	**Material:**	Unionized Ammonia
Protocol:	EPA/600/R-94/025 (1994)	**Endpoint:**	Proportion Survived	**Source:**	Reference Toxicant-REF



Mean:	1.003	**Count:**	5	**-1s Warning Limit:**	0.5931	**-2s Action Limit:**	0.1832
Sigma:	0.4099	**CV:**	40.90%	**+1s Warning Limit:**	1.413	**+2s Action Limit:**	1.823

Quality Control Data

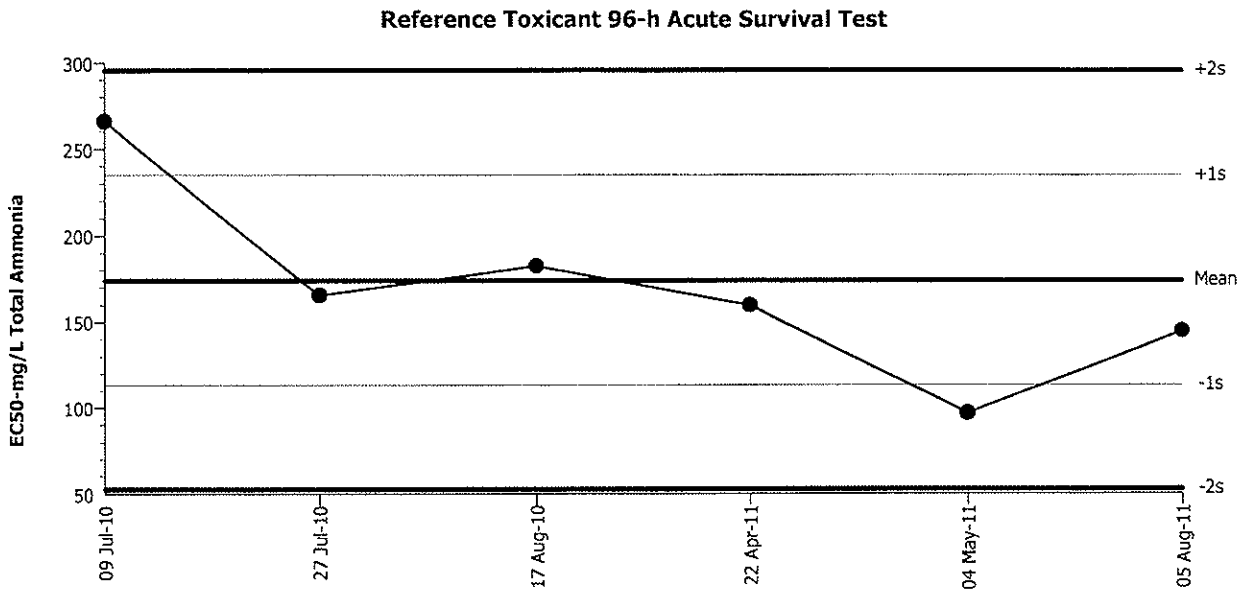
Point	Year	Month	Day	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2010	Jul	9	1.665	0.662	1.615	(+)		01-7209-8485	15-5728-8112
2			27	0.9	-0.103	-0.2513			00-7007-0295	13-8034-1240
3		Aug	17	1.096	0.093	0.2269			04-9660-1658	04-8886-1755
4	2011	Apr	22	0.644	-0.359	-0.8758			03-6965-3395	08-9559-0930
5		May	4	0.71	-0.293	-0.7148			18-8723-9922	06-9505-1415
6		Aug	5	1.152	0.149	0.3635			17-9542-0646	01-3764-6854

CETIS QC Plot

Report Date: 24 Aug-11 16:53 (1 of 1)

Reference Toxicant 96-h Acute Survival Test — **NewFields**

Test Type:	Survival	**Organism:**	Eohaustorius estuarius (Amphipod)	**Material:**	Total Ammonia
Protocol:	EPA/600/R-94/025 (1994)	**Endpoint:**	Proportion Survived	**Source:**	Reference Toxicant-REF



Mean:	174.1	**Count:**	5	**-1s Warning Limit:**	113.3	**-2s Action Limit:**	52.58
Sigma:	60.76	**CV:**	34.90%	**+1s Warning Limit:**	234.9	**+2s Action Limit:**	295.6

Quality Control Data

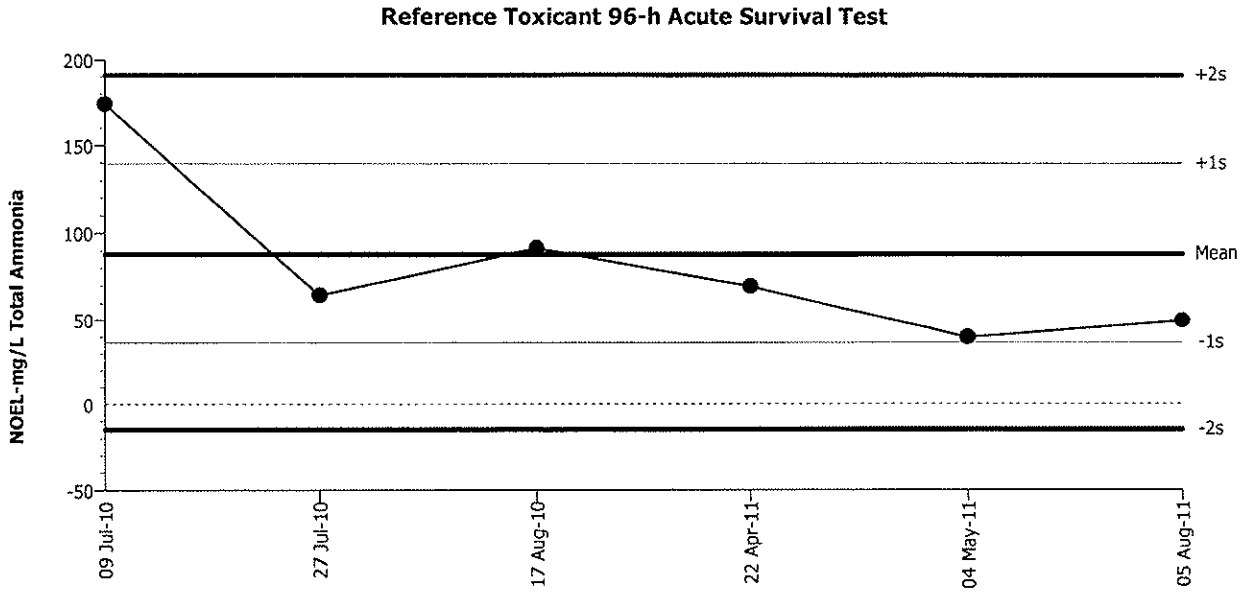
Point	Year	Month	Day	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2010	Jul	9	265.9	91.85	1.512	(+)		02-9263-1875	13-7083-7088
2			27	165.5	-8.579	-0.1412			16-3262-6250	12-1070-3879
3		Aug	17	182.5	8.443	0.139			00-5947-2918	13-7468-5586
4	2011	Apr	22	159.7	-14.44	-0.2376			12-3251-7366	15-6923-8618
5		May	4	96.78	-77.32	-1.273	(-)		15-9053-5291	03-3498-4458
6		Aug	5	144.9	-29.24	-0.4813			05-3970-3796	17-5474-7748

CETIS QC Plot

Report Date: 24 Aug-11 16:54 (1 of 1)

Reference Toxicant 96-h Acute Survival Test — **NewFields**

Test Type:	Survival	**Organism:**	Eohaustorius estuarius (Amphipod)	**Material:**	Total Ammonia
Protocol:	EPA/600/R-94/025 (1994)	**Endpoint:**	Proportion Survived	**Source:**	Reference Toxicant-REF



Mean:	87.98	**Count:**	5	**-1s Warning Limit:**	36.49	**-2s Action Limit:**	-15
Sigma:	51.49	**CV:**	58.50%	**+1s Warning Limit:**	139.5	**+2s Action Limit:**	191

Quality Control Data

Point	Year	Month	Day	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2010	Jul	9	174	86.02	1.671	(+)		02-9263-1875	21-0926-0699
2			27	64.7	-23.28	-0.4521			16-3262-6250	07-8105-4494
3		Aug	17	91.6	3.62	0.0703			00-5947-2918	19-8213-9681
4	2011	Apr	22	69.8	-18.18	-0.3531			12-3251-7366	16-4565-4919
5		May	4	39.8	-48.18	-0.9357			15-9053-5291	14-1177-0441
6		Aug	5	49.6	-38.38	-0.7454			05-3970-3796	20-5970-4725

CETIS Summary Report

Report Date: 24 Aug-11 16:53 (p 1 of 1)
Test Code: 6B03F1E6 | 17-9542-0646

Reference Toxicant 96-h Acute Survival Test

NewFields

Batch ID:	17-5903-1923	Test Type:	Survival	Analyst:	
Start Date:	05 Aug-11 14:35	Protocol:	EPA/600/R-94/025 (1994)	Diluent:	Laboratory Water
Ending Date:	09 Aug-11 16:15	Species:	Eohaustorius estuarius	Brine:	Not Applicable
Duration:	4d 2h	Source:	Northwestern Aquatic Science, OR	Age:	

Sample ID:	08-9750-2151	Code:	357ECBC7	Client:	Internal Lab
Sample Date:	09 Apr-09	Material:	Unionized Ammonia	Project:	Reference Toxicant
Receive Date:	09 Apr-09	Source:	Reference Toxicant		
Sample Age:	848d 15h	Station:	P090409.68		

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
01-3764-6854	Proportion Survived	1.152	1.358	1.251	13.3%		Dunnett's Multiple Comparison Test

Point Estimate Summary

Analysis ID	Endpoint	Level	mg/L	95% LCL	95% UCL	TU	Method
06-2792-7024	Proportion Survived	EC50	1.76	1.612	1.923		Spearman-Kärber

Proportion Survived Summary

Conc-mg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	3	0.9667	0.9451	0.9882	0.9	1	0.03333	0.05774	5.97%	0.0%
0.52		3	1	1	1	1	1	0	0	0.0%	-3.45%
1.152		3	0.9	0.8627	0.9373	0.8	1	0.05774	0.1	11.11%	6.9%
1.358		3	0.6333	0.6118	0.6549	0.6	0.7	0.03333	0.05774	9.12%	34.48%
2.023		3	0.6333	0.5902	0.6765	0.5	0.7	0.06667	0.1155	18.23%	34.48%
2.535		3	0	0	0	0	0	0	0		100.0%

Proportion Survived Detail

Conc-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	1	0.9	1
0.52		1	1	1
1.152		1	0.8	0.9
1.358		0.7	0.6	0.6
2.023		0.7	0.7	0.5
2.535		0	0	0

CETIS Test Data Worksheet

Report Date: 24 Aug-11 16:52 (p 1 of 1)
Test Code: 17-9542-0646/6B03F1E6

Reference Toxicant 96-h Acute Survival Test — **NewFields**

.art Date:	05 Aug-11 14:35	**Species:**	Eohaustorius estuarius	**Sample Code:**	357ECBC7
End Date:	09 Aug-11 16:15	**Protocol:**	EPA/600/R-94/025 (1994)	**Sample Source:**	Reference Toxicant
Sample Date:	09 Apr-09	**Material:**	Unionized Ammonia	**Sample Station:**	P090409.68

Conc-mg/L	Code	Rep	Pos	# Exposed	# Survived	Notes
0	D	1	11	10	10	
0	D	2	7	10	9	
0	D	3	6	10	10	
0.52		1	2	10	10	
0.52		2	9	10	10	
0.52		3	15	10	10	
1.152		1	12	10	10	
1.152		2	4	10	8	
1.152		3	5	10	9	
1.358		1	16	10	7	
1.358		2	8	10	6	
1.358		3	3	10	6	
2.023		1	14	10	7	
2.023		2	13	10	7	
2.023		3	18	10	5	
2.535		1	1	10	0	
2.535		2	10	10	0	
2.535		3	17	10	0	

CETIS Summary Report

Report Date: 24 Aug-11 16:50 (p 1 of 1)
Test Code: 202B39F4 | 05-3970-3796

Reference Toxicant 96-h Acute Survival Test — **NewFields**

atch ID:	20-5407-1663	**Test Type:**	Survival	**Analyst:**	
Start Date:	05 Aug-11 14:35	**Protocol:**	EPA/600/R-94/025 (1994)	**Diluent:**	Laboratory Water
Ending Date:	09 Aug-11 16:15	**Species:**	Eohaustorius estuarius	**Brine:**	Not Applicable
Duration:	4d 2h	**Source:**	Northwestern Aquatic Science, OR	**Age:**	

Sample ID:	04-6170-0026	**Code:**	1B84FBBA	**Client:**	Internal Lab
Sample Date:	09 Apr-09	**Material:**	Total Ammonia	**Project:**	Reference Toxicant
Receive Date:	09 Apr-09	**Source:**	Reference Toxicant		
Sample Age:	848d 15h	**Station:**	P090409.68		

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
20-5970-4725	Proportion Survived	49.6	93.2	67.99	13.3%		Dunnett's Multiple Comparison Test

Point Estimate Summary

Analysis ID	Endpoint	Level	mg/L	95% LCL	95% UCL	TU	Method
17-5474-7748	Proportion Survived	EC50	144.9	121.9	172.1		Spearman-Kärber

Proportion Survived Summary

Conc-mg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	3	0.9667	0.9451	0.9882	0.9	1	0.03333	0.05774	5.97%	0.0%
22.7		3	1	1	1	1	1	0	0	0.0%	-3.45%
49.6		3	0.9	0.8627	0.9373	0.8	1	0.05774	0.1	11.11%	6.9%
93.2		3	0.6333	0.6118	0.6549	0.6	0.7	0.03333	0.05774	9.12%	34.48%
173		3	0.6333	0.5902	0.6765	0.5	0.7	0.06667	0.1155	18.23%	34.48%
337		3	0	0	0	0	0	0	0		100.0%

roportion Survived Detail

onc-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	1	0.9	1
22.7		1	1	1
49.6		1	0.8	0.9
93.2		0.7	0.6	0.6
173		0.7	0.7	0.5
337		0	0	0

CETIS Test Data Worksheet

Report Date: 24 Aug-11 16:50 (p 1 of 1)
Test Code: 05-3970-3796/202B39F4

Reference Toxicant 96-h Acute Survival Test **NewFields**

:art Date:	05 Aug-11 14:35	**Species:**	Eohaustorius estuarius	**Sample Code:**	1B84FBBA
End Date:	09 Aug-11 16:15	**Protocol:**	EPA/600/R-94/025 (1994)	**Sample Source:**	Reference Toxicant
Sample Date:	09 Apr-09	**Material:**	Total Ammonia	**Sample Station:**	P090409.68

Conc-mg/L	Code	Rep	Pos	# Exposed	# Survived	Notes
0	D	1	15	10	10	
0	D	2	6	10	9	
0	D	3	4	10	10	
22.7		1	11	10	10	
22.7		2	2	10	10	
22.7		3	14	10	10	
49.6		1	5	10	10	
49.6		2	7	10	8	
49.6		3	17	10	9	
93.2		1	16	10	7	
93.2		2	18	10	6	
93.2		3	10	10	6	
173		1	8	10	7	
173		2	9	10	7	
173		3	12	10	5	
337		1	3	10	0	
337		2	13	10	0	
337		3	1	10	0	

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Ammonia Reference Toxicant Test Survival Data Sheet for Eohs

NEWFIELDS

SPECIES					
			Eohaustorius estuarius		
CLIENT	PROJECT	NEWFIELDS JOB NO.	PROJECT MANAGER	MEC LABORATORY	PROTOCOL
AMEC	Confidential	.	B. Hester	Port Gamble .	PSEP 1995

SURVIVAL & BEHAVIOR DATA

N = Normal
#E = Emergence
#M = Mortality or Molts
G = Growth
(fungal, bacterial, or algal)
D = No Air Flow (DO?)
FOS = Floating on Surface
TC = Too Cloudy

INITIAL # OF ORGANISMS: 10

CLIENT/ NEWFIELDS ID	CONC. value	CONC. units	REP	INITIAL NUMBER	DATE 8/06/11			DATE 8/07/11			DATE 8/08/11			DATE 8/9/11		
					TECHNICIAN JL			TECHNICIAN JL			TECHNICIAN JL			TECHNICIAN MMB		
					#ALIVE	#DEAD	OBS	#ALIVE	#DEAD	OBS	#ALIVE	#DEAD	OBS	#ALIVE	#DEAD	OBS
Ref.Tox.- NH_3	0	mg/L	1	10	10	Ø	3FOS	10	Ø	2FOS	10	Ø	1FOS	10	Ø	N
			2		10	Ø	3FOS	10	Ø	N	10	Ø	1FOS	9	1	1FOS
			3		10	Ø	1FOS	10	Ø	↓	10	Ø	N	10	Ø	N
Ref.Tox.- NH_3	15	mg/L	1		10	Ø	4FOS	10	Ø	2FOS	10	Ø	1FOS	10	Ø	1FOS
			2		10	Ø	5FOS	10	Ø	3FOS	10	Ø	3FOS	10	Ø	2FOS
			3		10	Ø	3FOS	10	Ø	1FOS	10	Ø	1FOS	10	Ø	1FOS
Ref.Tox.- NH_3	30	mg/L	1		10	Ø	3FOS	10	Ø	2FOS	10	Ø	N	10	Ø	1FOS
			2		10	Ø	3FOS	10	Ø	2FOS	10	Ø	1FOS	8	2	N
			3		10	Ø	2FOS	10	Ø	N	10	Ø	1FOS	9	1	N
Ref.Tox.- NH_3	60	mg/L	1		9	1	1FOS	9	Ø	1FOS	9	Ø	N	7	2	1FOS
			2		10	Ø	1FOS	9	1	1FOS	7	2	Q	6	1	Q
			3		9	1	1FOS	8	1	N	7	1	Q	6	1	Q
Ref.Tox.- NH_3	120	mg/L	1		10	Ø	6FOS	10	Ø	Q	10	Ø	Q	7	3	Q
			2		10	Ø	4FOS Q	10	Ø	↓	10	Ø	Q	7	3	Q
			3		10	Ø	4FOS Q	9	1	2FOS	9	Ø	Q	5	4	Q
Ref.Tox.- NH_3	240	mg/L	1		7	3	Q	4	3	Q	1	3	Q	Ø	1	N
			2		6	4	1FOS Q	3	3	Q	1	2	Q	Ø	1	N
			3	↓	6	4	Q	2	4	Q	Ø	2	NA	—	—	—

① IE, JL 8/06/11.

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NEW FIELDS

Ammonia Reference Toxicant Test Water Quality Data Sheet for Eohs

CLIENT	PROJECT	SPECIES	NEWFIELDS LABORATORY	PROTOCOL
AMEC	Confidential	*Eohaustorius estuarius*	Port Gamble .	PSEP 1995

NEWFIELDS JOB NUMBER	PROJECT MANAGER	QUANTITY OF STOCK: 70.5 mL	QUANTITY OF DILUENT: 1500mL	INIT MMB
.	B. Hester	ACTUAL: 70.5 g	ACTUAL: 1600.0 g	DATE PREP 8/5/11

TEST ID	LOT #:	TEST START DATE	TIME	TEST END DATE	TIME
P090409.68	48339902	05Aug11	1435	09Aug11	1615

WATER QUALITY DATA

DILTIN.WAT.BATCH	TEMP REC#	REFERENCE TOX. MATERIAL	REFERENCE TOXXICANT	LOT NO.	96-H LC_{50}
FSW080411.01		0	0		

TEST CONDITIONS	DO (mg/L)	TEMP(C)	SAL (ppt)	pH	TECHNICIAN	AMMONIA	SULFIDES
	> 5.0	15 ± 1	28 ± 2	7.8 ± 0.5			

CLIENT/ NEWFIELDS ID	CONCENTRATION value	CONCENTRATION units	DAY	REP	D.O. meter	D.O. mg/L	TEMP. meter	TEMP. °C	SALINITY meter	SALINITY ppt	pH meter	pH unit	WQ TECH	AMMONIA METER	AMMONIA mg/L	AMMONIA Tech	SULFIDES meter	SULFIDES mg/L	SULFIDES Tech
Ref.Tox.- NH_3	0	mg/L	0	Stock	6	7.6	2	15.5	2	30	2	8.0	MMB 8/9/11						
			1	1	6	7.5	2	14.3	2	30	2	7.8	JL 8/06						
			2	2	6	7.3	2	14.9	2	29	2	7.6	JL 8/07						
	<0.5		3	3	6	7.2	2	14.9	2	29	2	7.7	JL 8/08						
			4	1	6	7.2	2	15.3	2	30	2	7.6	MMB 8/9/11						
Ref.Tox.- NH_3	15	mg/L	0	Stock	6	7.7	2	15.4	2	30	2	8.0	MMB 8/5/11						
			1	1	6	7.7	2	14.1	2	30	2	7.9	JL 8/06						
			2	2	6	7.5	2	14.2	2	30	2	7.7	JL 8/07						
	22.7		3	3	6	7.6	2	14.2	2	30	2	7.7	JL 8/08						
			4	1	6	7.3	2	15.3	2	30	2	7.7	MMB 8/9						
Ref.Tox.- NH_3	30	mg/L	0	Stock	6	7.7	2	15.6	2	30	2	8.0	MMB 8/5/11						
			1	1	6	7.8	2	14.0	2	30	2	7.9	JL 8/06						
			2	2	6	7.6	2	14.1	2	30	2	7.7	JL 8/07						
	49.6		3	3	6	7.6	2	14.1	2	30	2	7.7	JL 8/08						
			4	1	6	7.4	2	15.2	2	30	2	7.7	MMB 8/9						

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NEW FIELDS

Ammonia Reference Toxicant Test Water Quality Data Sheet for Eohs

CLIENT	PROJECT	SPECIES	NEWFIELDS LABORATORY	PROTOCOL
AMEC	Confidential	*Eohaustorius estuarius*	Port Gamble .	PSEP 1995

NEWFIELDS JOB NUMBER	PROJECT MANAGER	QUANTITY OF STOCK:	QUANTITY OF DILUENT: 1500mL	INIT
.	B. Hester	ACTUAL:	ACTUAL:	DATE PREP

TEST ID	LOT #:	TEST START DATE	TIME	TEST END DATE	TIME
P090409.68	48339902	05Aug11	1435	09Aug11	1615

WATER QUALITY DATA

DILTIN.WAT.BATCH	TEMP REC#	REFERENCE TOX. MATERIAL	REFERENCE TOXXICANT	LOT NO.	96-H LC_{50}
FSW080411.01		0	0		

TEST CONDITIONS				DO (mg/L) > 5.0		TEMP(C) 15 ± 1		SAL (ppt) 28 ± 1		pH 7.8 ± 0.5		TECHNICIAN	AMMONIA	SULFIDES
Ref.Tox.- NH_3	60 mg/L 93.2	0	Stock	6	7.6	2	15.4	2	30	2	7.8	MMB 8/5/11		
		1	1	6	7.6	2	14.0	2	30	2	7.8	JL 8/06		
		2	2	6	7.6	2	14.1	2	30	2	7.6	JL 8/07		
		3	3	6	7.6	2	14.1	2	30	2	7.6	JL 8/08		
		4	1	6	7.5	2	15.3	2	30	2	7.7	MMB 8/9/11		
Ref.Tox.- NH_3	120 mg/L 173	0	Stock	6	7.6	2	15.5	2	30	2	7.7	MMB 8/5/11		
		1	1	6	7.8	2	14.0	2	30	2	7.8	JL 8/06		
		2	2	6	7.6	2	14.0	2	30	2	7.6	JL 8/07		
		3	3	6	7.7	2	14.0	2	30	2	7.7	JL 8/08		
		4	1	6	7.4	2	15.4	2	30	2	7.7	MMB 8/9/11		
Ref.Tox.- NH_3	240 mg/L 337	0	Stock	6	7.6	2	15.7	2	30	2	7.5	MMB 8/5/11		
		1	1	6	7.7	2	14.0	2	30	2	7.7	JL 8/06		
		2	2	6	7.7	2	14.0	2	30	2	7.5	JL 8/07		
		3	3	6	7.8	2	14.0	2	30	2	7.6	JL 8/08		
		4	1	6	7.8	2	15.2	2	30	2	7.6	MMB 8/9/11		

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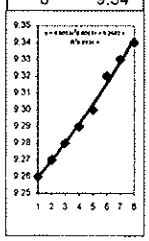
NEWFIELDS

Un-ionized Ammonia Calculator

Project:	Ammonia RT	Date of Test:	05-Aug-11
Project ID:		Test Type:	*E. estuarius*

To convert Total Ammonia (mg/L) to Free (un-ionized) Ammonia (mg/L) enter the corresponding total ammonia, salinity, temperature, and pH.

Integer:	I-factor
1	9.26
2	9.27
3	9.28
4	9.29
5	9.30
6	9.32
7	9.33
8	9.34



	Sample	Mod	*NH3T (mg/L)*	*salinity (ppt)*	*pH*	*temp (C)*	temp (K)	i-factor	Mod	**NH3U (mg/L)**
	Example		0.610	22.9	8.0	24.1	297.26	9.3053		**0.027**
	Example2		2.000	10.0	7.5	5.0	278.16	9.2750		**0.008**
1										**0.000**
2	15		22.700	30	8.0	15.4	288.56	9.3242		**0.520**
3	30		49.600	30	8.0	15.6	288.76	9.3242		**1.152**
4	60		93.200	30	7.8	15.4	288.56	9.3242		**1.358**
5	120		173.000	30	7.7	15.5	288.66	9.3242		**2.023**
6	240		337.000	30	7.5	15.7	288.86	9.3242		**2.535**
7										
8										
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NEWFIELDS

ORGANISM RECEIPT LOG

Date: 8/3/11	**Time:** 1320	**NewFields Batch No.** NAS 5737
Organism / Project: Eohs / AMEC Confidential & Kwajalein	**Source:** Northwestern Aquatic Sciences	
Address: On File		**Invoice Attached** (Yes) No
Phone: On File	**Contact:** On File	
No. Ordered: 1100	**No. Received:** 1210	**Source Batch:** Field
Condition of Organisms:	**Approximate Size or Age:** 3-5 mm	
Shipper: FedEx	**B of L (Tracking No.)** 8756 0039 5737	
Condition of Container: Good	**Received By:** MMB	

Container	D.O. (mg/L)	Temp. (°C)	Conductivity or Salinity (Include Units)	pH (Units)	Technician (Initials)
1	7.6	13.8	28 ppt	7.4	MMB

Notes: 1 WQ from composite, MMB 8/3/11.

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Northwestern Aquatic Sciences
3814 Yaquina Bay Rd., P.O. Box 1437, Newport, OR 97365
Tel: 541-265-7225, Fax: 541-265-2799, www.nwaquatic.com

SUBJECT: Animal Collection Data Sheet (shipping)

SOLD TO: Newfields Northwest
4729 NE View Dr.
P.O. Box 216
Port Gamble WA 98364

Brian Hester/Collin Ray
360.297.6044

FedEx# 3689-9072-8

DATE OF SHIPMENT: 8-2-11

ANIMAL HISTORY

Species	Age/Size	Number Shipped
Eohaustorius estuarius	3-5mm	1,100 + 10%

WATER QUALITY AT TIME OF SHIPMENT

Temperature (°C): 14.4	pH: 8.4	Salinity (ppt): 31.0	D.O. (mg/L): 8.5
Other:			

PACKAGED BY: Yves Nalcahama **DATE:** 8-2-11

FIELD COLLECTION/CULTURE NOTES

Collected 8-1-11 Yaquina Bay, OR.
Interstitial WQ: Temp: 13.5 °C, Salinity 34.0 ppt. Salinity adjusted down ~4 ppt.
Held at 15°C in aerated water.

ADDITIONAL COMMENTS

2-liters of 0.5 mm sieved home sediment included.

PLEASE RETURN ALL SHIPPING MATERIALS

If you have any questions, Please call Gary Buhler or Gerald Irissarri at (541) 265-7225. Thank You.

APPENDIX B

JUVENILE POLYCHAETE TEST

***Neanthes arenaceodentata* Survival and Growth Test: Laboratory Data Sheets**

***Neanthes arenaceodentata*: Reference Toxicant Test**

***Neanthes arenaceodentata Organism* Receipt**

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NEWFIELDS

20-DAY SOLID PHASE BIOASSAY OBSERVATION DATASHEET

CLIENT	PROJECT	JOB NO.	PROJECT MANAGER	NEWFIELDS LABORATORY	PROTOCOL	SPECIES
AMEC	Confidential		B. Hester	Port Gamble .	PSEP 1995	*Neanthes arenaceodentata*

	Rep	Number	Tare Weight (mg)	End Weight (mg)	Ashed Weight (mg)	Comments:
Initial Biomass	1	5	44.88	46.99	45.12	
	2	5	45.07	47.41	45.42	
	3	5	45.56	47.82	~~44.85~~ ② 45.92	

ENDPOINT DATA & OBSERVATIONS

N = Normal
#E = Emergence
#M = Mortality
G = Growth
(fungal, bacterial, or algal)
D = No Air Flow (DO?)
FOS = Floating on Surface
T... Too Cloudy
...s food

INITIAL # OF ORGANISMS: 5

CLIENT/NEWFIELDS ID	REP	JAR	INITIAL #	Date and Initials	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	NUMBER REMAINING	TARE WEIGHT (mg)	TOTAL WEIGHT (mg)	ASHED WEIGHT (mg)
					8/10 JL	8/11 JL	8/12 JL	8/13 JL	8/14 JL	8/15 JL	8/16 JL	8/17 MMG	8/18 JL	8/19 JL	8/20 JL	8/21 JL	8/22 JL	8/23 JL	8/24 CR	8/25 CR	8/26 JL	② 8/27 8/26 JL	8/28 JL	8/29 JL				
Control /	1		5		N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	5	45.36	112.95	59.98
	2		5																U			IE	IE		5	46.02	106.42	58.13
	3		5																N		IE	~~IE~~ IE	IE		5	45.39	102.49	60.91
	4		5																N		N	N	N		5	46.35	111.05	62.55
	5		5																N		IE	~~IE~~ N			5	45.51	112.22	55.11
C1-01 /	1		5											N					G,U	G	G	N			5	45.28	99.92	56.11
	2		5											G					G						5	44.50	109.16	58.90
	3		5																G						4	45.31	85.27	49.96
	4		5																G,U						5	44.48	98.81	53.76
	5		5																G		IE	~~IE~~			5	44.90	115.07	61.88
GJ-8 /	1		5											N					N	N	IE	~~IE~~		N	5	81 45.26	101.99	52.49
	2		5																		IE	~~IE~~		G	5	82 45.18	105.91	56.19
	3		5				G														IE	~~IE~~		N	5	83 44.61	102.04	53.80
	4		5				IE														N			N	5	84 44.58	95.35	53.67
	5		5				N	D	D						D	D	D	D			D	D	D	2E	5	85 45.22	102.10	54.30

① wrong day, JL 8/27/11. ② IE, JL 9/27/11

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NEWFIELDS

20 DAY SOLID PHASE BIOASSAY
WATER QUALITY DATASHEET

CLIENT	PROJECT	START TIME/ END TIME	DILUTION WATER BATCH	PROTOCOL	TEST START DATE
AMEC	Confidential	/	FSW080811.01	PSEP 1995	9/~~8~~-Aug-2011
JOB NUMBER	**PROJECT MANAGER**	**NEWFIELDS LABORATORY**	**TEMP. RECDR./HOBO#**	**TEST SPECIES**	**TEST END DATE**
	B. Hester			*Neanthes arenaceodentata*	29/~~28~~-Aug-2011

WATER QUALITY DATA

TEST CONDITIONS				DO (mg/L) > 6.0		TEMP (C) 20 ± 1		SALINITY (ppt) 28 ± ~~1~~ 2		pH 8.0±1.0				
CLIENT/NEWFIELDS ID	DAY	REP	JAR	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	SALINITY meter	SALINITY ppt	pH meter	pH unit	WATER RENEWAL	Feeding	TECH/DATE
Control /	0	Surr	58	6	7.6	2	19.1	2	28	2	7.9		✓	JL 8/09/11
Control /	1	Surr		6	7.3	2	19.2	2	28	2	7.8			~~JL~~ 8/10/11
Control /	2	Surr		6	7.5	2	19.7	2	28	2	7.8		~~JL~~	~~JL~~ 8/11/11
Control /	3	Surr		6	7.3	2	19.6	2	28	2	8.0	JL		JL 8/12
Control /	4	Surr		6	7.4	2	20.0	2	28	2	8.0		JL	JL 8/13
Control /	5	Surr		6	7.0	2	20.0	2	29	2	⊙ 20 7.6			JL 8/14
Control /	6	Surr		6	7.4	2	19.9	2	29	2	7.8	~~JL~~	~~JL~~	~~JL~~ 8/15
Control /	7	Surr		6	7.4	2	19.6	2	29	2	7.7			JB 8/16
Control /	8	Surr		6	7.4	2	19.6	2	29	2	7.9		JL	JL 8/17
Control /	9	Surr		6	7.5	2	18.9	2	29	2	7.8	~~JL~~		
Control /	10	Surr		6	7.6	2	19.6	2	29	2	7.9		✓	✓ 8/19
Control /	11	Surr		6	7.4	2	19.1	2	29	2	7.7			JL 8/20
Control /	12	Surr		6	7.4	2	18.9	2	29	2	7.8	JL	JL	JL 8/21
Control /	13	Surr		6	7.4	2	19.6	2	28	2	7.9			JL 8/22
Control /	14	Surr		6	7.4	2	18.8	2	28	2	8.0		JL	~~JL~~ 8/23
Control /	15	Surr		6	7.2	2	19.1	2	28	2	7.7	✓		CR 8/24
Control /	16	Surr		6	7.5	2	19.1	2	28	2	8.0		CR	CR 8/25
Control /	17	Surr		6	7.4	2	19.2	2	28	2	7.7			✓ 8/26
Control /	18	Surr		6	7.3	2	19.2	2	28	2	7.9	JL	→	8/27
Control /	19	Surr		6	7.3	2	19.3	2	28	2	7.9			JL 8/28
Control /	20	Surr		6	7.6	2	19.0	2	28	2	8.0			JL 8/29

DWC, JV 8/14/11.

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NEWFIELDS

20 DAY SOLID PHASE BIOASSAY
WATER QUALITY DATASHEET

CLIENT	PROJECT	START TIME/ END TIME	DILUTION WATER BATCH	PROTOCOL	TEST START DATE
AMEC	Confidential	/	FSW080811.01	PSEP 1995	9 ~~8~~-Aug-2011
JOB NUMBER	**PROJECT MANAGER**	**NEWFIELDS LABORATORY**	**TEMP. RECDR./HOBO#**	**TEST SPECIES**	**TEST END DATE**
	B. Hester			*Neanthes arenaceodentata*	29 ~~26~~-Aug-2011

WATER QUALITY DATA

TEST CONDITIONS				DO (mg/L) > 6.0		TEMP (C) 20 ± 1		SALINITY (ppt) 28 ± ~~1~~ 2		pH 8.0±1.0				
CLIENT/NEWFIELDS ID	DAY	REP	JAR	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	SALINITY meter	SALINITY ppt	pH meter	pH unit	WATER RENEWAL	Feeding	TECH/DATE
C1-01 /	0	Surr	13	6	7.7	2	18.9	2	28	2	7.9		✓	JL 8/09/11
C1-01 /	1	Surr		6	7.4	2	19.2	2	28	2	7.7			HE 8/10/11
C1-01 /	2	Surr		6	7.8	2	19.6	2	28	2	8.0		HE	HE 8/11/11
C1-01 /	3	Surr		6	7.3	2	19.6	2	28	2	7.9	JL		JL 8/12
C1-01 /	4	Surr		6	7.4	2	19.9	2	29	2	8.0		JL	JL 8/13
C1-01 /	5	Surr		6	7.3	2	19.9	2	29	2	8.0			JL 8/14
C1-01 /	6	Surr		6	7.5	2	19.8	2	29	2	8.0	HE	HE	HE 8/15
C1-01 /	7	Surr		6	7.5	2	19.6	2	29	2	7.9			JB 8/16
C1-01 /	8	Surr		6	7.3	2	19.5	2	29	2	7.9		JL	JL 8/17
C1-01 /	9	Surr		6	7.5	2	19.0	2	29	2	8.0	HE		HE 8/18
C1-01 /	10	Surr		6	7.7	2	18.8	2	29	2	7.9		✓	✓ 8/19
C1-01 /	11	Surr		6	7.4	2	18.9	2	29	2	7.8			JL 8/20
C1-01 /	12	Surr		6	7.5	2	18.7	2	29	2	7.9	JL	JL	JL 8/21
C1-01 /	13	Surr		6	7.5	2	19.4	2	28	2	7.7			JL 8/22
C1-01 /	14	Surr		6	7.5	2	19.0	2	28	2	~~8.1~~ ① 7.7		JL	HE 8/23
C1-01 /	15	Surr		6	7.6	2	19.0	2	29	2	7.5	✓		CR 8/24
C1-01 /	16	Surr		6	7.8	2	18.8	2	29	2	8.2		CR	CR 8/25
C1-01 /	17	Surr		6	7.8	2	19.0	2	29	2	7.8			✓ 8/26
C1-01 /	18	Surr		6	7.8	2	19.1	2	29	2	8.3	JL		8/27
C1-01 /	19	Surr		6	7.7	2	19.2	2	28	2	8.2			JL 8/28
C1-01 /	20	Surr		6	7.9	2	19.0	2	28	2	8.3			JL 8/29

① WP HE 8/23

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20 DAY SOLID PHASE BIOASSAY
WATER QUALITY DATASHEET

CLIENT	PROJECT	START TIME/ END TIME	DILUTION WATER BATCH	PROTOCOL	TEST START DATE
AMEC	Confidential	/	FSW080811.01	PSEP 1995	9 ~~8~~-Aug-2011
JOB NUMBER	**PROJECT MANAGER**	**NEWFIELDS LABORATORY**	**TEMP. RECDR./HOBO#**	**TEST SPECIES**	**TEST END DATE**
.	B. Hester		NA	*Neanthes arenaceodentata*	~~29~~ 28-Aug-2011

WATER QUALITY DATA

TEST CONDITIONS				DO (mg/L) > 6.0		TEMP (C) 20 ± 1		SALINITY (ppt) 28 ± ~~1~~ 2		pH 8.0±1.0				
CLIENT/NEWFIELDS ID	DAY	REP	JAR	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	SALINITY meter	SALINITY ppt	pH meter	pH unit	WATER RENEWAL	Feeding	TECH/DATE
GJ-8 /	0	Surr		6	7.6	2	18.8	2	28	2	8.0		✓	JL 8/09/11
GJ-8 /	1	Surr	4A	6	6.9	2	19.1	2	28	2	7.5			~~JL~~ 8/10/11
GJ-8 /	2	Surr		6	7.6	2	19.6	2	28	2	7.9		~~JL~~	~~JL~~ 8/11/11
GJ-8 /	3	Surr		6	6.0	2	19.7	2	28	2	7.8	JL		JL 8/12
GJ-8 /	4	Surr		6	7.3	2	19.8	2	28	2	7.9		JL	JL 8/13
GJ-8 /	5	Surr		6	7.1	2	19.9	2	28	2	7.9			JL 8/14
GJ-8 /	6	Surr		6	7.5	2	19.8	2	28	2	7.9	~~JL~~	~~JL~~	~~JL~~ 8/15
GJ-8 /	7	Surr		6	6.9	2	19.6	2	29	2	7.6			JB 8/16
GJ-8 /	8	Surr		6	7.2	2	19.6	2	29	2	7.8		JL	JL 8/17
GJ-8 /	9	Surr		6	7.1	2	19.0	2	29	2	7.8	~~JL~~		~~JL~~ 8/18
GJ-8 /	10	Surr		6	7.1	2	19.0	2	29	2	7.8		✓	✓ 8/19
GJ-8 /	11	Surr		6	6.6	2	18.8	2	29	2	7.5			JL 8/20
GJ-8 /	12	Surr		6	7.2	2	18.7	2	29	2	7.8	JL	JL	JL 8/21
GJ-8 /	13	Surr		6	7.1	2	19.3	2	28	2	7.5			JL 8/22
GJ-8 /	14	Surr		6	7.3	2	18.8	2	28	2	8.0		JL	~~JL~~ 8/23
GJ-8 /	15	Surr		6	7.1	2	18.9	2	28	2	7.7	✓		CR 8/24
GJ-8 /	16	Surr		6	7.7	2	18.8	2	28	2	8.0		CR	CR 8/25
GJ-8 /	17	Surr		6	7.2	2	19.0	2	28	2	7.8			✓ 8/26
GJ-8 /	18	Surr		6	7.4	2	19.3	2	28	2	7.9	JL	→	8/27
GJ-8 /	19	Surr		6	7.3	2	19.2	2	28	2	8.0			JL 8/28
GJ-8 /	20	Surr		6	8.1	2	19.2	2	28	2	8.2			JL 8/29

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NEWFIELDS

Page ____ of ____

Ammonia and Sulfide Analysis Record

Client/Project:	Organism:	Test Duration (days):
AMEC / Confidential	Neanthes	20

PRETEST / INITIAL / FINAL / OTHER (circle one) DAY of TEST: Ø

OVERLYING (OV) / POREWATER (PW) (circle one)

Comments: Ø

Calibration Standards Temperature		Sample temperature should be within ±1°C of standards temperature at time and date of analysis.
Date:	Temperature:	
9 Aug. '11	21.5	

Sample ID or Description	Conc. or Rep	Date of Sampling and Initials	Ammonia Value (mg/L)	Temp °C	Date of Reading and Initials	Sample Preserved (Y/N)	pH	Sal (ppt)	Sulf. mg/L
OV Ø	Surr.	8/9/11 [illegible]	0.00	21.0	8/9/11 [illegible]	N			0.007
C1.01			0.889	21.0					0.043
GJ.8			1.98	21.0					0.041
PW Ø			<0.5	21.0			7.6	30	0.00
C1.01			5.78	21.0			7.8	29	0.035 x 5 = 0.175
GJ.8			7.44	21.0			7.9	29	0.026 x 5 = 0.130

Privileged and Confidential
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NEWFIELDS

Ammonia and Sulfide Analysis Record

Page ____of____

Client/Project:	Organism:	Test Duration (days):
AMEC / SSA Marine	Neanthes	20

PRETEST / INITIAL / FINAL / OTHER (circle one) DAY of TEST: 20

OVERLYING (OV) / POREWATER (PW) (circle one) / Comments: _____

Calibration Standards Temperature		
Date: 8/29/11	Temperature: 21.8	Sample temperature should be within ±1°C of standards temperature at time and date of analysis.

	Sample ID or Description	Conc. or Rep	Date of Sampling and Initials	Ammonia Value (mg/L)	Temp °C	Date of Reading and Initials	Sample Preserved (Y/N)	pH	Sal (ppt)	Sample Volume (mL)	Measured Sulf. (mg/L)	Multi-plier	Calc-ulated Sulf. (mg/L)
OV.	GJ-8	Surr	8/29/11 JB	<0.5	21.0	8/29/11 JL	N	NA	NA	10	.008		
PW.	GJ-8	↓	8/29/11 JB	①			↓	7.6	28	5	1.57	2	3.14

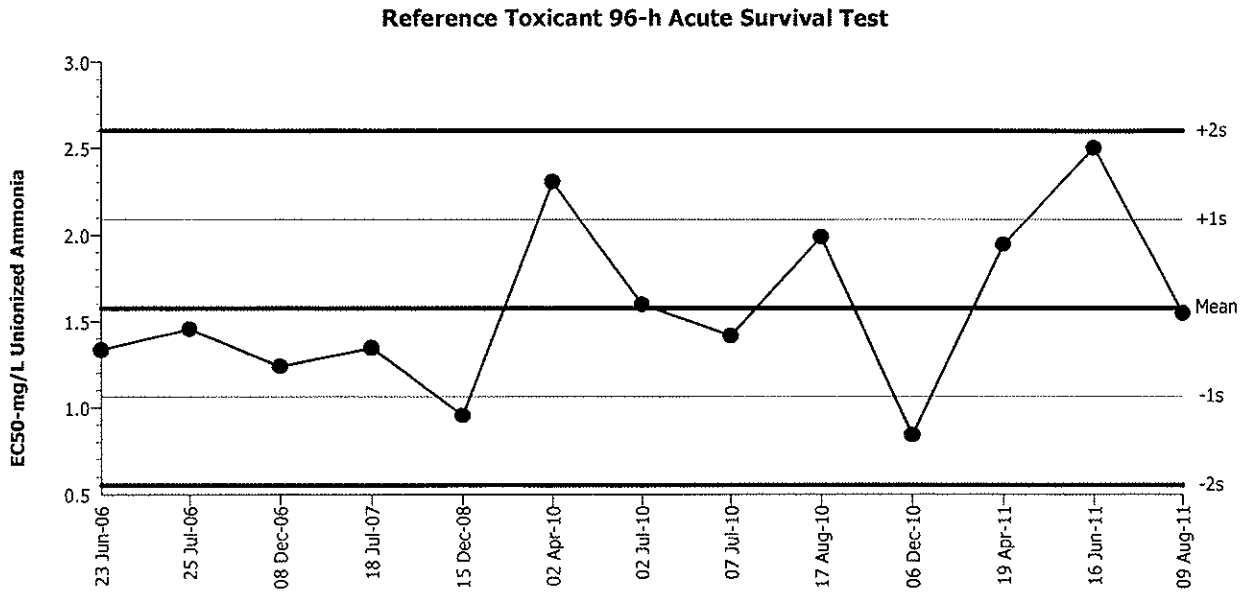
① insufficient volume

CETIS QC Plot

Report Date: 30 Aug-11 16:35 (1 of 1)

Reference Toxicant 96-h Acute Survival Test — **NewFields**

Test Type:	Survival	**Organism:**	Neanthes arenaceodentata (Polycha	**Material:**	Unionized Ammonia
otocol:	PSEP (1995)	**Endpoint:**	Proportion Survived	**Source:**	Reference Toxicant-REF



Mean:	1.577	**Count:**	12	**-1s Warning Limit:**	1.065	**-2s Action Limit:**	0.5522
Sigma:	0.5124	**CV:**	32.50%	**+1s Warning Limit:**	2.089	**+2s Action Limit:**	2.602

uality Control Data

. oint	Year	Month	Day	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2006	Jun	23	1.334	-0.2431	-0.4745			01-5620-7672	06-6109-1329
2		Jul	25	1.455	-0.1223	-0.2387			04-0700-8845	10-0339-7479
3		Dec	8	1.239	-0.3383	-0.6601			15-8106-3809	02-6828-4699
4	2007	Jul	18	1.346	-0.2314	-0.4516			11-3020-7799	19-4406-8190
5	2008	Dec	15	0.9538	-0.6232	-1.216	(-)		14-6494-6267	11-2844-7295
6	2010	Apr	2	2.304	0.727	1.419	(+)		16-4339-8227	08-2621-0447
7		Jul	2	1.597	0.01984	0.03871			11-7762-4490	10-2411-3483
8			7	1.415	-0.1621	-0.3163			08-8641-2659	00-5658-4852
9		Aug	17	1.989	0.4121	0.8042			12-6587-7533	07-3551-5397
10		Dec	6	0.8418	-0.7352	-1.435	(-)		05-4045-9367	05-9672-3549
11	2011	Apr	19	1.945	0.3678	0.7178			02-6580-6357	08-0700-2079
12		Jun	16	2.503	0.926	1.807	(+)		19-7724-1701	13-2075-9938
13		Aug	9	1.547	-0.03032	-0.05917			03-9854-4015	07-2063-2491

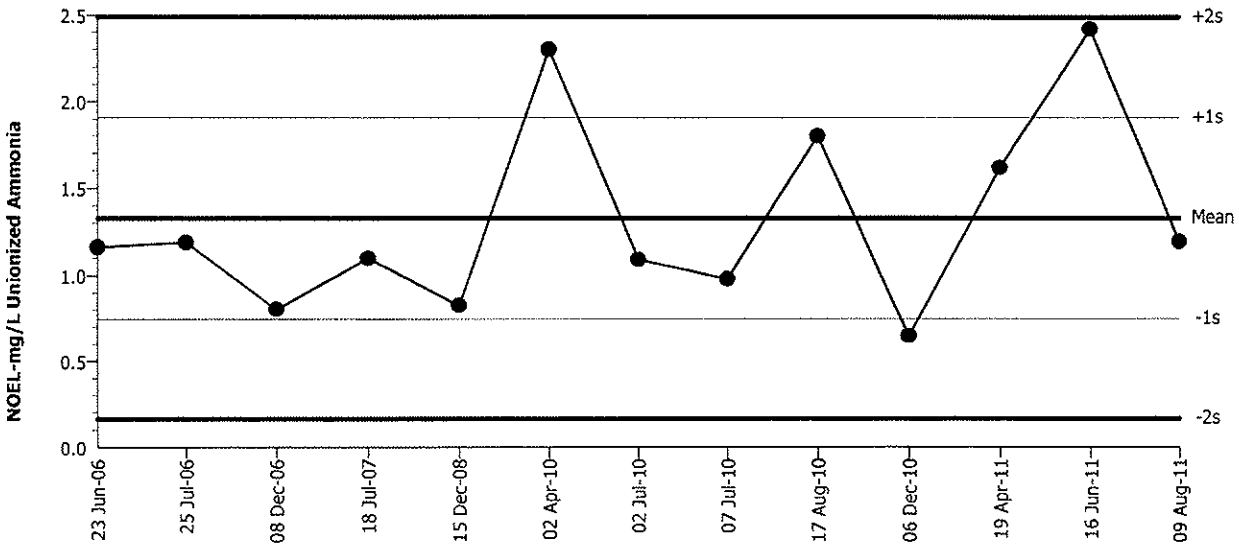
Privileged and Confidential
Attorney-Client Work Product

CETIS QC Plot

Report Date: 30 Aug-11 16:35 (1 of 1)

Reference Toxicant 96-h Acute Survival Test — **NewFields**

Test Type:	Survival	**Organism:**	Neanthes arenaceodentata (Polycha	**Material:**	Unionized Ammonia
otocol:	PSEP (1995)	**Endpoint:**	Proportion Survived	**Source:**	Reference Toxicant-REF



Mean:	1.328	**Count:**	12	**-1s Warning Limit:**	0.7467	**-2s Action Limit:**	0.1654
Sigma:	0.5813	**CV:**	43.80%	**+1s Warning Limit:**	1.909	**+2s Action Limit:**	2.491

uality Control Data

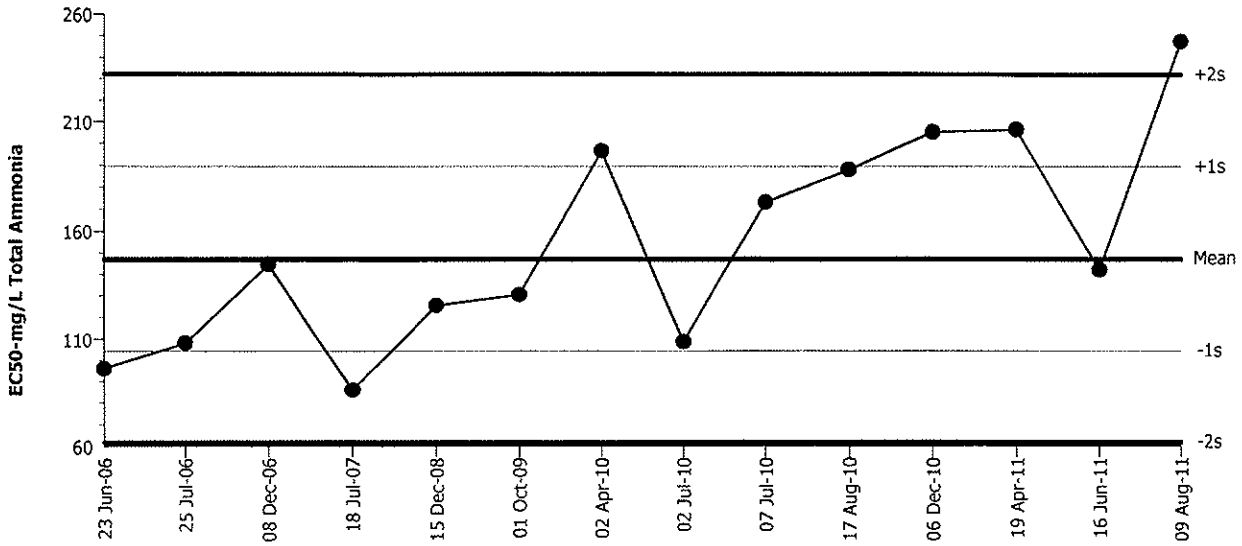
. oint	Year	Month	Day	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2006	Jun	23	1.163	-0.165	-0.2838			01-5620-7672	12-8683-2201
2		Jul	25	1.19	-0.138	-0.2374			04-0700-8845	17-9113-5370
3		Dec	8	0.804	-0.524	-0.9014			15-8106-3809	21-1756-9787
4	2007	Jul	18	1.098	-0.23	-0.3957			11-3020-7799	09-9664-9126
5	2008	Dec	15	0.826	-0.502	-0.8636			14-6494-6267	14-8258-9804
6	2010	Apr	2	2.302	0.974	1.676	(+)		16-4339-8227	09-5140-8774
7		Jul	2	1.09	-0.238	-0.4094			11-7762-4490	16-8950-8191
8			7	0.978	-0.35	-0.6021			08-8641-2659	09-2658-2229
9		Aug	17	1.8	0.472	0.812			12-6587-7533	16-5550-9006
10		Dec	6	0.648	-0.68	-1.17	(-)		05-4045-9367	19-1510-4313
11	2011	Apr	19	1.617	0.289	0.4972			02-6580-6357	12-6447-3293
12		Jun	16	2.421	1.093	1.88	(+)		19-7724-1701	13-8173-2038
13		Aug	9	1.193	-0.135	-0.2322			03-9854-4015	01-1263-9916

CETIS QC Plot

Report Date: 30 Aug-11 16:35 (1 of 1)

Reference Toxicant 96-h Acute Survival Test — **NewFields**

Test Type:	Survival	**Organism:**	Neanthes arenaceodentata (Polycha	**Material:**	Total Ammonia
Protocol:	PSEP (1995)	**Endpoint:**	Proportion Survived	**Source:**	Reference Toxicant-REF



Mean:	146.9	**Count:**	13	**-1s Warning Limit:**	104.3	**-2s Action Limit:**	61.66
Sigma:	42.62	**CV:**	29.00%	**+1s Warning Limit:**	189.5	**+2s Action Limit:**	232.1

Quality Control Data

Point	Year	Month	Day	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2006	Jun	23	96.1	-50.8	-1.192	(-)		18-3054-4508	06-1670-4995
2		Jul	25	108.1	-38.84	-0.9113			00-5832-0530	08-6734-2268
3		Dec	8	144.4	-2.467	-0.05788			13-1239-1057	05-4422-5195
4	2007	Jul	18	85.98	-60.92	-1.429	(-)		17-4748-5140	14-5179-0546
5	2008	Dec	15	125.4	-21.45	-0.5034			00-2280-4578	04-7353-4211
6	2009	Oct	1	130.4	-16.5	-0.3871			11-7052-2566	08-8009-7600
7	2010	Apr	2	196.6	49.68	1.166	(+)		05-7967-6526	05-9239-0913
8		Jul	2	108.7	-38.22	-0.8967			04-1544-7246	20-6247-6714
9			7	173.2	26.32	0.6175			06-6061-1457	04-3232-7747
10		Aug	17	188.2	41.29	0.9687			01-3810-2666	20-3593-2576
11		Dec	6	205.1	58.22	1.366	(+)		05-4114-1826	07-2949-5130
12	2011	Apr	19	206.2	59.34	1.392	(+)		09-3617-4279	06-7713-4574
13		Jun	16	141.9	-4.989	-0.1171			19-0037-4539	19-9050-3573
14		Aug	9	247.5	100.6	2.361	(+)	(+)	03-1197-4176	17-1966-7852

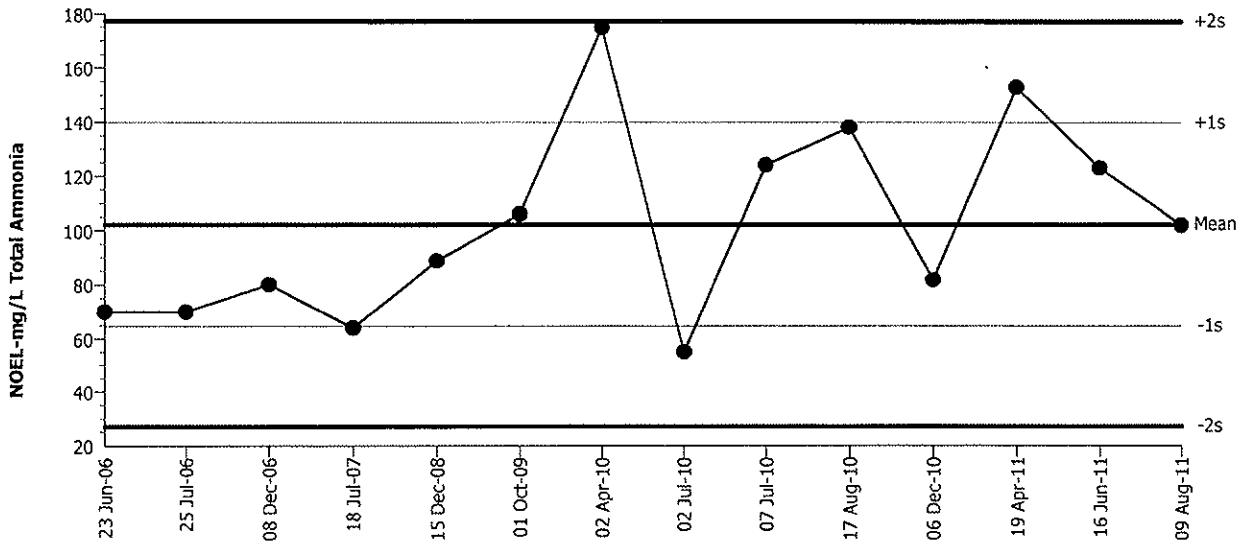
CETIS QC Plot

Report Date: 30 Aug-11 16:35 (1 of 1)

Reference Toxicant 96-h Acute Survival Test — **NewFields**

Test Type:	Survival	**Organism:**	Neanthes arenaceodentata (Polycha	**Material:**	Total Ammonia
Protocol:	PSEP (1995)	**Endpoint:**	Proportion Survived	**Source:**	Reference Toxicant-REF

Reference Toxicant 96-h Acute Survival Test



Mean:	102.2	**Count:**	13	**-1s Warning Limit:**	64.63	**-2s Action Limit:**	27.06
Sigma:	37.57	**CV:**	36.80%	**+1s Warning Limit:**	139.8	**+2s Action Limit:**	177.3

Quality Control Data

Point	Year	Month	Day	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2006	Jun	23	70	-32.2	-0.8571			18-3054-4508	02-6960-3413
2		Jul	25	70	-32.2	-0.8571			00-5832-0530	14-3508-8233
3		Dec	8	80	-22.2	-0.5909			13-1239-1057	06-4243-0537
4	2007	Jul	18	64	-38.2	-1.017	(-)		17-4748-5140	09-6772-8140
5	2008	Dec	15	88.7	-13.5	-0.3593			00-2280-4578	12-2432-7546
6	2009	Oct	1	106	3.8	0.1011			11-7052-2566	11-6901-3523
7	2010	Apr	2	175	72.8	1.938	(+)		05-7967-6526	20-2882-0572
8		Jul	2	55	-47.2	-1.256	(-)		04-1544-7246	20-7364-4574
9			7	124	21.8	0.5803			06-6061-1457	16-8916-0042
10		Aug	17	138	35.8	0.9529			01-3810-2666	16-7191-0863
11		Dec	6	81.7	-20.5	-0.5456			05-4114-1826	00-3492-4461
12	2011	Apr	19	153	50.8	1.352	(+)		09-3617-4279	00-3274-1559
13		Jun	16	123	20.8	0.5536			19-0037-4539	07-2127-0891
14		Aug	9	102	-0.2	-0.005323			03-1197-4176	21-2173-4671

CETIS Summary Report

Report Date: 30 Aug-11 16:34 (p 1 of 1)
Test Code: 17C14C8F | 03-9854-4015

Reference Toxicant 96-h Acute Survival Test — NewFields

Batch ID:	13-3298-2720	**Test Type:**	Survival	**Analyst:**	
Start Date:	09 Aug-11 15:30	**Protocol:**	PSEP (1995)	**Diluent:**	Laboratory Seawater
Ending Date:	12 Aug-11 15:40	**Species:**	Neanthes arenaceodentata	**Brine:**	Not Applicable
Duration:	72h	**Source:**	Aquatic Toxicology Support	**Age:**	Juv

Sample ID:	01-7103-2688	**Code:**	A31C070	**Client:**	Internal Lab
Sample Date:	09 Apr-09	**Material:**	Unionized Ammonia	**Project:**	Reference Toxicant
Receive Date:	09 Apr-09	**Source:**	Reference Toxicant		
Sample Age:	852d 16h	**Station:**	P090409.70		

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
01-1263-9916	Proportion Survived	1.193	1.408	1.296	5.31%		Dunnett's Multiple Comparison Test

Point Estimate Summary

Analysis ID	Endpoint	Level	mg/L	95% LCL	95% UCL	TU	Method
07-2063-2491	Proportion Survived	EC50	1.547	1.508	1.586		Spearman-Kärber

Proportion Survived Summary

Conc-mg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	3	1	1	1	1	1	0	0	0.0%	0.0%
0.462		3	1	1	1	1	1	0	0	0.0%	0.0%
0.769		3	1	1	1	1	1	0	0	0.0%	0.0%
1.193		3	1	1	1	1	1	0	0	0.0%	0.0%
1.408		3	0.8667	0.8451	0.8882	0.8	0.9	0.03333	0.05774	6.66%	13.33%
1.794		3	0	0	0	0	0	0	0		100.0%

Proportion Survived Detail

Conc-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	1	1	1
0.462		1	1	1
0.769		1	1	1
1.193		1	1	1
1.408		0.9	0.9	0.8
1.794		0	0	0

CETIS Test Data Worksheet

Report Date: 30 Aug-11 16:34 (p 1 of 1)
Test Code: 03-9854-4015/17C14C8F

Reference Toxicant 96-h Acute Survival Test **NewFields**

art Date: 09 Aug-11 15:30 **Species:** Neanthes arenaceodentata **Sample Code:** A31C070
End Date: 12 Aug-11 15:40 **Protocol:** PSEP (1995) **Sample Source:** Reference Toxicant
Sample Date: 09 Apr-09 **Material:** Unionized Ammonia **Sample Station:** P090409.70

Conc-mg/L	Code	Rep	Pos	# Exposed	# Survived	Notes
0	D	1	7	10	10	
0	D	2	1	10	10	
0	D	3	13	10	10	
0.462		1	14	10	10	
0.462		2	4	10	10	
0.462		3	15	10	10	
0.769		1	18	10	10	
0.769		2	10	10	10	
0.769		3	2	10	10	
1.193		1	17	10	10	
1.193		2	3	10	10	
1.193		3	12	10	10	
1.408		1	5	10	9	
1.408		2	8	10	9	
1.408		3	9	10	8	
1.794		1	6	10	0	
1.794		2	11	10	0	
1.794		3	16	10	0	

CETIS Summary Report

Report Date: 30 Aug-11 16:32 (p 1 of 1)
Test Code: 12985920 | 03-1197-4176

Reference Toxicant 96-h Acute Survival Test — NewFields

Batch ID:	03-3293-2190	**Test Type:**	Survival	**Analyst:**	
Start Date:	09 Aug-11 15:30	**Protocol:**	PSEP (1995)	**Diluent:**	Laboratory Seawater
Ending Date:	13 Aug-11 15:40	**Species:**	Neanthes arenaceodentata	**Brine:**	Not Applicable
Duration:	4d 0h	**Source:**	Aquatic Toxicology Support	**Age:**	Juv

Sample ID:	10-2932-2731	**Code:**	3D5A37EB	**Client:**	Internal Lab
Sample Date:	09 Apr-09	**Material:**	Total Ammonia	**Project:**	Reference Toxicant
Receive Date:	09 Apr-09	**Source:**	Reference Toxicant		
Sample Age:	852d 16h	**Station:**	P090409.70		

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
21-2173-4671	Proportion Survived	102	190	139.2	5.31%		Dunnett's Multiple Comparison Test

Point Estimate Summary

Analysis ID	Endpoint	Level	mg/L	95% LCL	95% UCL	TU	Method
17-1966-7852	Proportion Survived	EC50	247.5	228	268.8		Spearman-Kärber

Proportion Survived Summary

Conc-mg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	3	1	1	1	1	1	0	0	0.0%	0.0%
25.1		3	1	1	1	1	1	0	0	0.0%	0.0%
52.4		3	1	1	1	1	1	0	0	0.0%	0.0%
102		3	1	1	1	1	1	0	0	0.0%	0.0%
190		3	0.8667	0.8451	0.8882	0.8	0.9	0.03333	0.05774	6.66%	13.33%
385		3	0	0	0	0	0	0	0		100.0%

Proportion Survived Detail

Conc-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	1	1	1
25.1		1	1	1
52.4		1	1	1
102		1	1	1
190		0.9	0.9	0.8
385		0	0	0

CETIS Test Data Worksheet

Report Date: 30 Aug-11 16:31 (p 1 of 1)
Test Code: 03-1197-4176/12985920

Reference Toxicant 96-h Acute Survival Test **NewFields**

Start Date: 09 Aug-11 15:30 **Species:** Neanthes arenaceodentata **Sample Code:** 3D5A37EB
End Date: 13 Aug-11 15:40 **Protocol:** PSEP (1995) **Sample Source:** Reference Toxicant
Sample Date: 09 Apr-09 **Material:** Total Ammonia **Sample Station:** P090409.70

Conc-mg/L	Code	Rep	Pos	# Exposed	# Survived	Notes
0	D	1	9	10	10	
0	D	2	2	10	10	
0	D	3	14	10	10	
25.1		1	5	10	10	
25.1		2	16	10	10	
25.1		3	17	10	10	
52.4		1	4	10	10	
52.4		2	6	10	10	
52.4		3	15	10	10	
102		1	7	10	10	
102		2	11	10	10	
102		3	18	10	10	
190		1	1	10	9	
190		2	8	10	9	
190		3	10	10	8	
385		1	12	10	0	
385		2	13	10	0	
385		3	3	10	0	

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96-HOUR REFERENCE TOXICANT TEST
OBSERVATION DATASHEET

SPECIES					
			Neanthes arenaceodentata		
CLIENT	PROJECT	NEWFIELDS JOB #	PROJECT MANAGER	NEWFIELDS LAB	PROTOCOL
WDOE	Port Gamble	860.0358.000	Will Hafner	Port Gamble .	PSEP 1995

SURVIVAL & BEHAVIOR DATA

OBSERVATIONS KEY Q: Quiescent
N = normal L = anoxic surface
B= no burrows F= fungal patches
M= dead on surface D= no air flow (DO?)
A= avoidance U= excess food

CLIENT/ NEWFIELDS ID	CONC. value	CONC. units	REP	INITIAL NUMBER	DAY 1 DATE 8/10/11 TECHNICIAN RE #ALIVE	DAY 1 #DEAD	DAY 1 OBS	DAY 2 DATE 8/11/11 TECHNICIAN RE #ALIVE	DAY 2 #DEAD	DAY 2 OBS	DAY 3 DATE 8/12/11 TECHNICIAN NMB #ALIVE	DAY 3 #DEAD	DAY 3 OBS	DAY 4 DATE 8/13/11 TECHNICIAN JL #ALIVE	DAY 4 #DEAD	DAY 4 OBS
Ref.Tox.-	0	mg/L	1	10	10	Ø	N	10	Ø	N	10	Ø	N	10	Ø	N
			2		10	Ø	N	10	Ø	N	10	Ø	↓	10	Ø	↓
			3		10	Ø	N	10	Ø	N	10	Ø	↓	10	Ø	↓
Ref.Tox.-	15.0	mg/L	1		10	Ø	N	10	Ø	N	10	Ø	N	10	Ø	1 FOS
			2		10	Ø	N	10	Ø	N	10	Ø	↓	10	Ø	N
			3		10	Ø	N	10	Ø	N	10	Ø	↓	10	Ø	↓
Ref.Tox.-	30	mg/L	1		10	Ø	N	10	Ø	N	10	Ø	N	10	Ø	N
			2		10	Ø	N	10	Ø	N	10	Ø	↓	10	Ø	↓
			3		10	Ø	N	10	Ø	N	10	Ø	↓	10	Ø	↓
Ref.Tox.-	60	mg/L	1		10	Ø	N	10	Ø	N	10	Ø	Q	10	Ø	Q
			2		10	Ø	N	10	Ø	N	10	Ø	↓	10	Ø	↓
			3		10	Ø	N	10	Ø	N	10	Ø	↓	10	Ø	↓
Ref.Tox.-	120	mg/L	1		10	Ø	Q	10	Ø	Q	10	Ø	Q	9	1	Q
			2		10	Ø	Q	10	Ø	Q	10	Ø	↓	9	1	↓
			3		10	Ø	Q	10	Ø	Q	10	Ø	↓	8	2	↓
Ref.Tox.-	240	mg/L	1		10	Ø	Q	7	3	Q	Ø	7	NA	—	—	—
			2		10	Ø	Q	9	1	Q	Ø	9	↓	—	—	—
			3	↓	10	Ø	Q	7	3	Q	Ø	7	↓	—	—	—

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NEWFIELDS

96-HOUR REFERENCE TOXICANT TEST WATER QUALITY DATASHEET

CLIENT	PROJECT	SPECIES	NEWFIELDS LABORATORY	PROTOCOL
WDOE	Port Gamble	*Neanthes arenaceodentata*	Port Gamble .	PSEP 1995
NEWFIELDS JOB NUMBER: 860.0358.000	PROJECT MANAGER: Will Hafner	QUANTITY OF STOCK TARGET: 70.5 mL ACTUAL: 70.5g	QUANTITY OF DILUENT: 1500mL ACTUAL: 1500.0g	INIT mmo DATE PREP 8.9.11
Test ID: PO 90409.70	LOT #: 48339902	TEST START DATE: 09Aug11	TIME: 1530 / TEST END DATE: 13Aug11	TIME: 1540

WATER QUALITY DATA

DILTIN.WAT.BATCH	TEMP REC#	REFERENCE TOX. MATERIAL	REFERENCE TOXXICANT
FSW080811.01		0	0

TEST CONDITIONS	DO (mg/L)	TEMP(C)	SAL (ppt)	pH	TECHNICIAN
	> 6.0	20 ± 1	28 ± 1	8.00 ± 1	

CLIENT/ NEWFIELDS ID	CONCENTRATION value	CONCENTRATION units	DAY	REP	D.O. meter	D.O. mg/L	TEMP. meter	TEMP. °C	SALINITY meter	SALINITY ppt	pH meter	pH unit	WQ TECH
Ref.Tox.-ammonia	0	mg/L	0	Stock	6	7.8	2	18.5	2	29	2	7.8	JL 8/09
			1	Rep	6	7.5	2	19.1	2	29	2	7.9	JL 8/10
			2	Rep	6	8.0	2	19.6	2	29	2	7.7	JL 8/11
			3	Rep	6	7.5	2	19.3	2	29	2	7.7	JL 8/12
Ref.Tox.-ammonia	15	mg/L	0	Stock	6	7.8	2	18.5	2	29	2	7.8	JL 8/09
			1	Rep	6	7.6	2	18.8	2	29	2	7.6	JL 8/10
			2	Rep	6	7.7	2	19.3	2	29	2	7.8	JL 8/11
			3	Rep	6	7.3	2	19.5	2	29	2	7.9	JL 8/12
Ref.Tox.-ammonia	30	mg/L	0	Stock	6	7.8	2	18.5	2	29	2	7.7	JL 8/09
			1	Rep	6	7.2	2	18.9	2	29	2	7.6	JL 8/10
			2	Rep	6	7.6	2	19.5	2	29	2	7.8	JL 8/11
			3	Rep	6	7.3	2	19.5	2	29	2	7.9	JL 8/12
Ref.Tox.-ammonia	60	mg/L	0	Stock	6	7.8	2	18.5	2	29	2	7.6	JL 8/09
			1	Rep	6	7.3	2	19.1	2	29	2	7.6	JL 8/10
			2	Rep	6	7.7	2	19.5	2	29	2	7.7	JL 8/11
			3	Rep	6	7.3	2	19.5	2	29	2	7.8	JL 8/12
Ref.Tox.-ammonia	120	mg/L	0	Stock	6	7.8	2	18.5	2	29	2	7.4	JL 8/09
			1	Rep	6	7.3	2	19.0	2	29	2	7.6	JL 8/10
			2	Rep	6	7.7	2	19.5	2	29	2	7.6	JL 8/11
			3	Rep	6	7.3	2	19.5	2	29	2	7.7	JL 8/12
Ref.Tox.-ammonia	240	mg/L	0	Stock	6	7.8	2	18.5	2	30	2	7.2	JL 8/09
			1	Rep	6	7.4	2	18.9	2	30	2	7.4	JL 8/10
			2	Rep	6	7.6	2	19.2	2	30	2	7.5	JL 8/11
			3	Rep	6	①~~7.3~~ 6.2	2	19.5	2	30	2	7.5	JL 8/12

①WC, JL 8/12/11.

Day 4		DO	Temp	Sal.	pH
Rep. 1	Ø	7.3	19.8	29	7.9
	15	7.3	19.8	29	7.9
	30	7.2	19.8	29	7.9
	60	7.1	19.8	29	7.8
	120	7.0	19.8	29	7.7

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NEWFIELDS

Page ____ of ____

Ammonia and Sulfide Analysis Record

Client/Project:	Organism: Neanthes	Test Duration (days): 20

PRETEST / INITIAL / FINAL / OTHER (circle one) DAY of TEST: 0
OVERLYING (OV) / POREWATER (PW) (circle one)

Comments: NH_3 RT

Calibration Standards Temperature		Sample temperature should be within ±1°C of standards temperature at time and date of analysis.
Date:	Temperature:	
8/9/11	21.5	

Sample ID or Description	Conc. or Rep	Date of Sampling and Initials	Ammonia Value (mg/L)	Temp °C	Date of Reading and Initials	Sample Preserved (Y/N)	pH	Sal (ppt)	Sulf. mg/L
0	Surr.	8/9/11 JL	0.0576	21.0	8/9/11 MMB	N			
15	↓	↓	25.1	↓	↓	↓			
30			52.4						
60			102						
120			190						
240			385						

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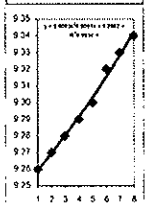
NEWFIELDS

Un-ionized Ammonia Calculator

Project:	Ammonia RT	Date of Test:	09-Aug-11
Project ID:		Test Type:	*N. arenaceodentata*

To convert Total Ammonia (mg/L) to Free (un-ionized) Ammonia (mg/L) enter the corresponding total ammonia, salinity, temperature, and pH.

Integer:	i-factor
1	9.26
2	9.27
3	9.28
4	9.29
5	9.30
6	9.32
7	9.33
8	9.34



	Sample	Mod *NH3T (mg/L)*	*salinity (ppt)*	*pH*	*temp (C)*	temp (K)	i-factor	Mod **NH3U (mg/L)**
	Example	0.610	22.9	8.0	24.1	297.26	9.3053	**0.027**
	Example2	2.000	10.0	7.5	5.0	278.16	9.2750	**0.008**
1								**0.000**
2	15	25.100	29	7.8	18.5	291.66	9.3214	**0.462**
3	30	52.400	29	7.7	18.5	291.66	9.3214	**0.769**
4	60	102.000	29	7.6	18.5	291.66	9.3214	**1.193**
5	120	190.000	29	7.4	18.5	291.66	9.3214	**1.408**
6	240	385.000	30	7.2	18.5	291.66	9.3242	**1.794**
7								
8								
9								
10								
11								
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NEWFIELDS

ORGANISM RECEIPT LOG

Date:	Time:	NewFields Batch No.
8/09/11	1036	ATS080911

Organism / Project:	Source:
Neanthes / POA Gamble & AMEC	Aquatic Tox. Support

Address:	Invoice Attached
On File	Yes (circled) No

Phone:	Contact:
On File	B. Hester

No. Ordered:	No. Received:	Source Batch:
800	800 + 10-1	Culture

Condition of Organisms:	Approximate Size or Age:
Good	Emerge date 7/20-7/22/11

Shipper:	B of L (Tracking No.)
Courier	N/A

Condition of Container:	Received By:
Good	JL

Container	D.O. (mg/L)	Temp. (°C)	Conductivity or Salinity (Include Units)	pH (Units)	Technician (Initials)
1	13.9	20.1	30 ppt	7.7	JL

Notes:

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Aquatic Toxicology Support
1849 Charleston Beach Road West
Bremerton, Washington 98312
(360) 813-1202

Order Summary

Species: *Neanthes arenaceodentata**	Emerge Date: 7/20-7/22/11
Number Ordered: 800	Number Shipped: 800 + 10 %
Date Shipped: 8/9/11	Salinity (ppt): 31

*Smith 1964. CSU Long Beach strain. Feed upon arrival.

APPENDIX C

LARVAL DEVELOPMENT TEST

***Mytilus galloprovincialis* Development Test: Laboratory Data Sheets**

***Mytilus galloprovincialis*: Reference Toxicant Test**

***Mytilus galloprovincialis Organism* Receipt**

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NEWFIELDS

LARVAL DEVELOPMENT TEST
ENDPOINT DATA

SPECIES					
Mytilus sp					
CLIENT	PROJECT	JOB NUMBER	PROJECT MANAGER	NEWFIELDS LAB / LOCATION	PROTOCOL
AMEC	Confidential	.	B. Hester	Port Gamble / Incubator	PSEP (1995)

ORGANISM BATCH	TEST START DATE:	TIME	TEST END DATE:	TIME
TS 0291	8/8/11	1700	8/10/11	1900

LARVAL OBSERVATION DATA

CLIENT/ NEWFIELDS ID	REP	NUMBER NORMAL	NUMBER	DATE	TECHNICIAN	COMMENTS
STOCKING DENSITY	1		306	8/15/11	BG	
	2		322			
	3		343			
	4		341			
	5		329			
Control /	1	334	11		BG	
	2	298	4			
	3	332	9			
	4	320	4			
	5	308	4			
CI-01 /	1	258	2			
	2	247	5			
	3	236	4			
	4	310	4			
	5	342	4			
GJ-8 /	1	251	4	8/30/11		
	2	236	6			
	3	284	5			
	4	234	7			
	5	251	7			

Resuspension

SPECIES					
Mytilus sp					
CLIENT	PROJECT	JOB NUMBER	PROJECT MANAGER	NEWFIELDS LAB / LOCATION	PROTOCOL
AMEC	Confidential	.	B. Hester	Port Gamble / Incubator	PSEP (1995)

ORGANISM BATCH	TEST START DATE:	TIME	TEST END DATE:	TIME
T80291	8/8/11	1700	8/11/11	1800

LARVAL OBSERVATION DATA

CLIENT/ NEWFIELDS ID	REP	NUMBER NORMAL	NUMBER	DATE	TECHNICIAN	COMMENTS
STOCKING DENSITY	1		306			
	2		322			
	3		343			
	4		341			
	5		329			
Control /	1	315	3			
	2	327	4			
	3	309	6			
	4	311	1			
	5	333	1			
CI-01 /	1	292	1			
	2	259	1			
	3	302	3			
	4	252	1			
	5	250	2			
GJ-8 /	1	239	2			
	2	237	4			
	3	256	3			
	4	274	1			
	5	279	3			

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LARVAL DEVELOPMENT TEST
WATER QUALITY DATA

CLIENT	PROJECT	SPECIES		NEWFIELDS LAB / LOCATION	PROTOCOL
AMEC	Confidential	*Mytilus sp*		Port Gamble / Incubator	PSEP (1995)
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE**	**TIME**	**TEST END DATE**	**TIME**
.	B. Hester	08Aug11	1700	8.10.11	1900

resus
8.11.11 1500

* Day 3&4 observations needed only if development endpoint not met by day 2

WATER QUALITY DATA

TEST CONDITIONS				DO (mg/L) >5.0		Temp (°C) 16 ± 1		Sal (ppt) 28 ± 1		pH 7.8 ± 0.5		Ammonia NA		Sulfide NA		TECH	DATE
				D.O.		TEMP.		SALINITY		pH		AMMONIA		SULFIDE			
CLIENT/ NEWFIELDS ID	DAY	Random #	REP	meter	mg/L	meter	°C	meter	ppt	meter	unit	Techn.	mg/L (total)	Techn.	mg/L (Total)		
Control /	0		WQ Surr	6	8.0	2	16.5	2	29	2	7.7	mmb	<0.5	mmb	0.000	MMB	8/8/11
Control /	1		WQ Surr	6	7.7	2	16.8	2	29	2	7.7					JL	8/09
Control /	2		WQ Surr	6	7.6	2	16.2	2	29	2	7.8	[illegible]	<0.5	[illegible]	0.003	[illegible]	8/10
Control /	3		WQ Surr	6	7.7		16.4	2	29	2	7.7					[illegible]	8/11
Control /	4		WQ Surr	6	7.5	2	16.7	2	29	2	7.8					JL	8/12
CI-01 /	0		WQ Surr	6	7.7	2	16.5	2	29	2	7.7	mmb	<0.5	mmb	0.000	MMB	8/8/11
CI-01 /	1		WQ Surr	6	7.1	2	16.8	2	29	2	7.7					JL	8/09
CI-01 /	2		WQ Surr	6	7.2	2	16.5	2	29	2	7.7	[illegible]	<0.5	[illegible]	0.056	[illegible]	8/10
CI-01 /	3		WQ Surr	6	7.1	2	16.0	2	29	2	7.7					[illegible]	8/11
CI-01 /	4		WQ Surr	6	6.9	2	16.9	2	29	2	7.7					JL	8/12
GJ-8 /	0		WQ Surr	6	7.3	2	16.5	2	29	2	7.8	mmb	<0.5	mmb	0.000	MMB	8/8/11
GJ-8 /	1		WQ Surr	6	6.3	2	17.1	2	29	2	7.8					JL	8/09
GJ-8 /	2		WQ Surr	6	6.6	2	16.7	2	29	2	7.7	[illegible]	<0.5	[illegible]	.017	[illegible]	8/10
GJ-8 /	3		WQ Surr	6	6.8	2	16.8	2	29	2	8.0					[illegible]	8/11
GJ-8 /	4		WQ Surr	6	6.4	2	16.6	2	29	2	7.7					JL	8/12

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NEWFIELDS

Page ____ of ____

Ammonia and Sulfide Analysis Record

Client/Project:	Organism:	Test Duration (days):
AMEC / Confidential	Mytilus sp. (larval)	4

PRETEST / INITIAL / FINAL / OTHER (circle one) DAY of TEST: Ø
OVERLYING (OV) / POREWATER (PW) (circle one)

Comments: _____

Calibration Standards Temperature		Sample temperature should be within ±1°C of standards temperature at time and date of analysis.
Date:	Temperature:	
8 Aug. '11	21.5	

Sample ID or Description	Conc. or Rep	Date of Sampling and Initials	Ammonia Value (mg/L)	Temp °C	Date of Reading and Initials	Sample Preserved (Y/N)	pH	Sal (ppt)	Sulf. mg/L
Ø	SWW	8/8/11 MMB	<0.5	21.5	8/8/11 MMB	① N			Ø
C1.01	↓	↓	<0.5	↓	↓	↓			Ø
GJ.8	↓	↓	<0.5	↓	↓	① ↓			Ø

① SM, sample preserved = N, MMB 8/8/11.

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NEWFIELDS

LARVAL DEVELOPMENT TEST INITIATION DATA SHEET

Batch 1

CLIENT	PROJECT	JOB NUMBER	PROJECT MANAGER	LABORATORY	PROTOCOL
WDOE	Port Gamble	860.0358.000	Will Hafner	Port Gamble Incubator	PSEP (1995)

TEST ORGANISM SPAWNING DATA

SPECIES: *Mytilus sp*			
SUPPLIER: Taylor Shellfish		ORGANISM BATCH: TS0291	
DATE RECEIVED: 8.5.11	TIME RECEIVED: 0943	DATE USED: 8.8.11	
SPAWNING METHOD: heat shock	INITIAL SPAWNING TIME: 1420	FINAL SPAWNING TIME: 1500	
MALES: 3 / FEMALES: 7	SPERM VIABILITY: ✓	EGG CONDITION: Good	
BEGIN FERTILIZATION: 1500	END FERTILIZATION: 1655	CONDITION OF EMBRYOS: Good	

SAMPLE STORAGE: 4 Degrees Celsius - dark
SEDIMENT TREATMENT: none
TEST CHAMBERS: 1 L Mason Jars
EXPOSURE VOLUME: 900mL seawater / 18g Sediment
TIME OF SHAKE: 1210
TIME OF INITIATION: PG: 1655 AMEC: 1700

SPECIAL CONDITIONS

UV LIGHT EXPOSURE (YES/NO)	AERATION FROM TEST INITIATION (YES/NO)
No	No
SCREEN TUBE TEST (YES/NO)	**OTHER (EXPLAIN)**
No	

EMBRYO DENSITY CALCULATIONS

Egg stock = 56 x 100 = 5600

Target / Actual $\frac{27,000}{5,600} = 4.82$ Deliver 4.8mL/chamber

RT $\frac{2700}{5600} = 0.48 \times 100mL = \frac{48mL \text{ egg stock}}{52mL \text{ seawater}}$

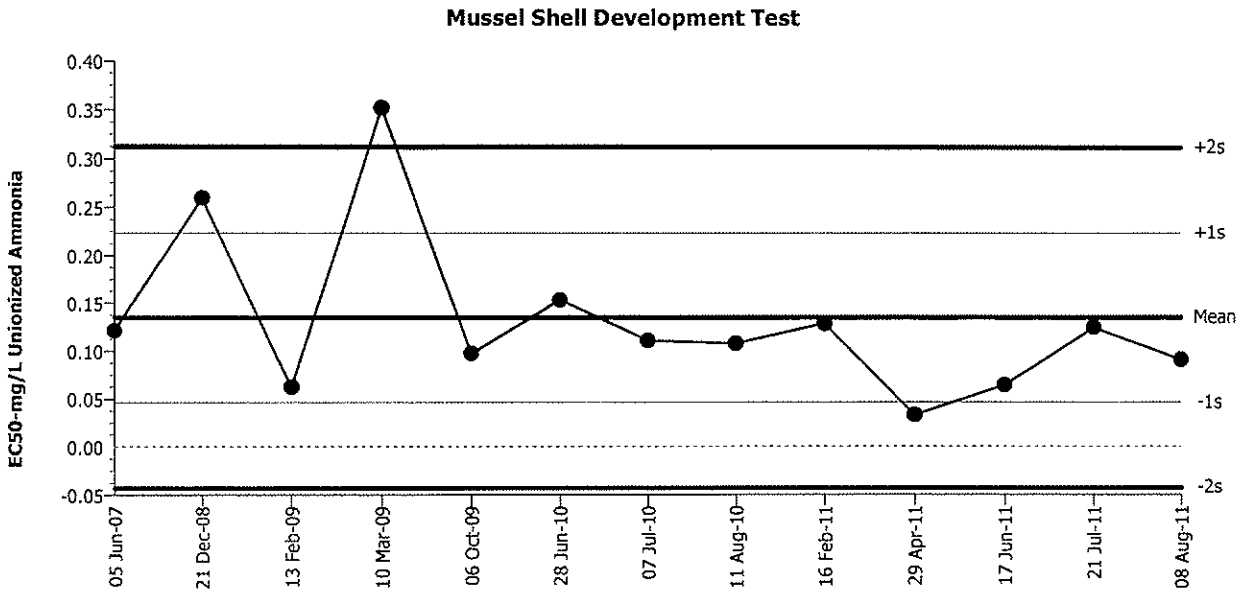
Deliver 0.100mL/vial

CETIS QC Plot

Report Date: 14 Sep-11 09:55 (1 of 1)

Mussel Shell Development Test **NewFields**

Test Type:	Development-Survival	**Organism:**	Mytilis galloprovincialis (Bay Mussel)	**Material:**	Unionized Ammonia
Protocol:	EPA/600/R-95/136 (1995)	**Endpoint:**	Combined Proportion Normal	**Source:**	Reference Toxicant-REF



Mean:	0.1345	**Count:**	12	**-1s Warning Limit:**	0.04577	**-2s Action Limit:**	-0.043
Sigma:	0.08873	**CV:**	66.00%	**+1s Warning Limit:**	0.2232	**+2s Action Limit:**	0.312

Quality Control Data

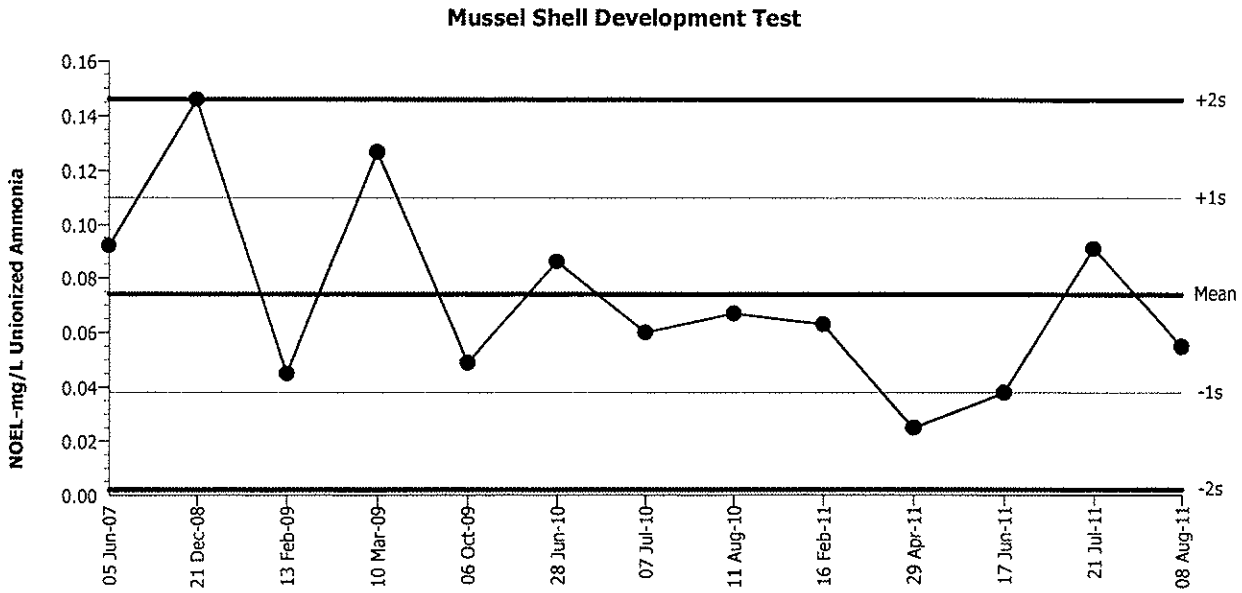
Point	Year	Month	Day	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2007	Jun	5	0.1213	-0.0132	-0.1488			17-0739-8898	10-1591-5669
2	2008	Dec	21	0.2595	0.125	1.409	(+)		05-3499-0994	20-3133-7893
3	2009	Feb	13	0.06204	-0.07246	-0.8167			18-6239-0561	06-7481-6770
4		Mar	10	0.3517	0.2172	2.448	(+)	(+)	01-2553-1917	07-8608-9501
5		Oct	6	0.09737	-0.03713	-0.4184			12-5136-9103	16-3438-8103
6	2010	Jun	28	0.153	0.01853	0.2088			06-4991-0393	17-5757-3927
7		Jul	7	0.1108	-0.02372	-0.2674			02-1495-2371	00-1000-1952
8		Aug	11	0.1078	-0.02673	-0.3012			00-0200-7271	19-2014-1654
9	2011	Feb	16	0.1285	-0.006036	-0.06803			09-3897-2905	17-1388-7996
10		Apr	29	0.03302	-0.1015	-1.144	(-)		15-8989-1267	11-3776-9131
11		Jun	17	0.06406	-0.07044	-0.7938			09-8870-1345	11-6524-9003
12		Jul	21	0.1245	-0.009967	-0.1123			11-2515-1636	01-5330-1472
13		Aug	8	0.09088	-0.04362	-0.4916			18-0422-6477	19-2033-3628

CETIS QC Plot

Report Date: 14 Sep-11 09:55 (1 of 1)

Mussel Shell Development Test **NewFields**

Test Type:	Development-Survival	**Organism:**	Mytilis galloprovincialis (Bay Mussel)	**Material:**	Unionized Ammonia
Protocol:	EPA/600/R-95/136 (1995)	**Endpoint:**	Combined Proportion Normal	**Source:**	Reference Toxicant-REF



Mean:	0.07408	**Count:**	12	**-1s Warning Limit:**	0.03805	**-2s Action Limit:**	0.00202
Sigma:	0.03603	**CV:**	48.60%	**+1s Warning Limit:**	0.1101	**+2s Action Limit:**	0.1461

Quality Control Data

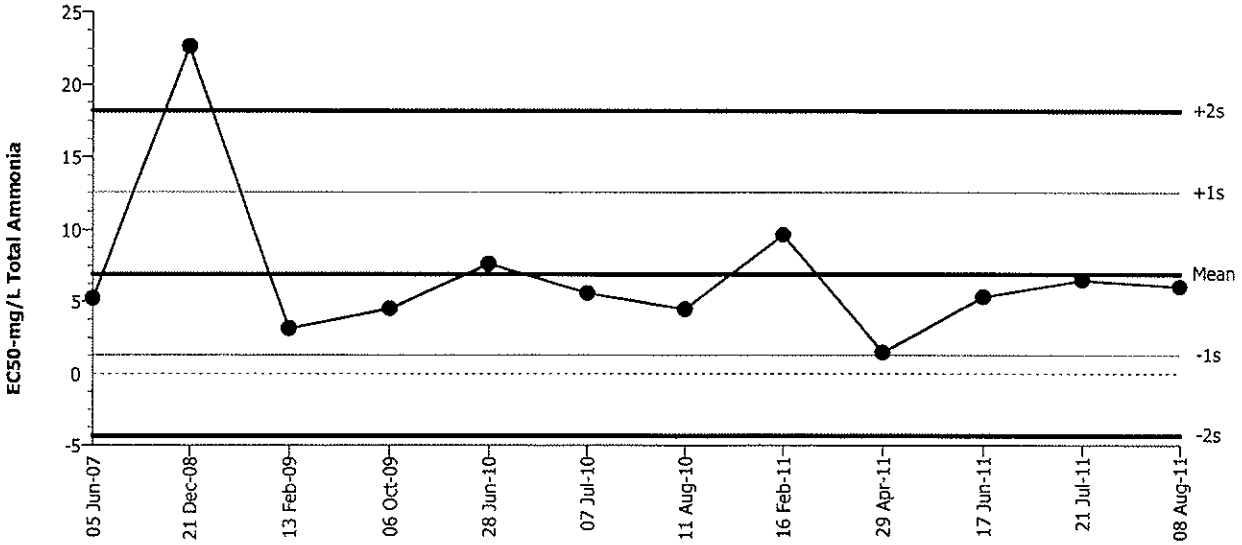
Point	Year	Month	Day	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2007	Jun	5	0.092	0.01792	0.4974			17-0739-8898	07-0629-1792
2	2008	Dec	21	0.146	0.07192	1.996	(+)		05-3499-0994	18-9577-0809
3	2009	Feb	13	0.045	-0.02908	-0.8071			18-6239-0561	11-6295-6211
4		Mar	10	0.127	0.05292	1.469	(+)		01-2553-1917	11-1585-4256
5		Oct	6	0.049	-0.02508	-0.6961			12-5136-9103	12-5054-7030
6	2010	Jun	28	0.086	0.01192	0.3308			06-4991-0393	11-6909-7502
7		Jul	7	0.06	-0.01408	-0.3908			02-1495-2371	16-9581-2110
8		Aug	11	0.067	-0.00708	-0.1965			00-0200-7271	08-0625-7138
9	2011	Feb	16	0.063	-0.01108	-0.3075			09-3897-2905	06-6760-4608
10		Apr	29	0.025	-0.04908	-1.362	(-)		15-8989-1267	19-9101-7366
11		Jun	17	0.038	-0.03608	-1.001	(-)		09-8870-1345	16-9496-0223
12		Jul	21	0.091	0.01692	0.4696			11-2515-1636	20-3348-1432
13		Aug	8	0.055	-0.01908	-0.5296			18-0422-6477	16-9302-5062

CETIS QC Plot

Report Date: 14 Sep-11 09:53 (1 of 1)

Mussel Shell Development Test **NewFields**

Test Type:	Development-Survival	**Organism:**	Mytilis galloprovincialis (Bay Mussel)	**Material:**	Total Ammonia
Protocol:	EPA/600/R-95/136 (1995)	**Endpoint:**	Combined Proportion Normal	**Source:**	Reference Toxicant-REF



Mean:	6.916	**Count:**	11	**-1s Warning Limit:**	1.278	**-2s Action Limit:**	-4.36
Sigma:	5.638	**CV:**	81.50%	**+1s Warning Limit:**	12.55	**+2s Action Limit:**	18.19

Quality Control Data

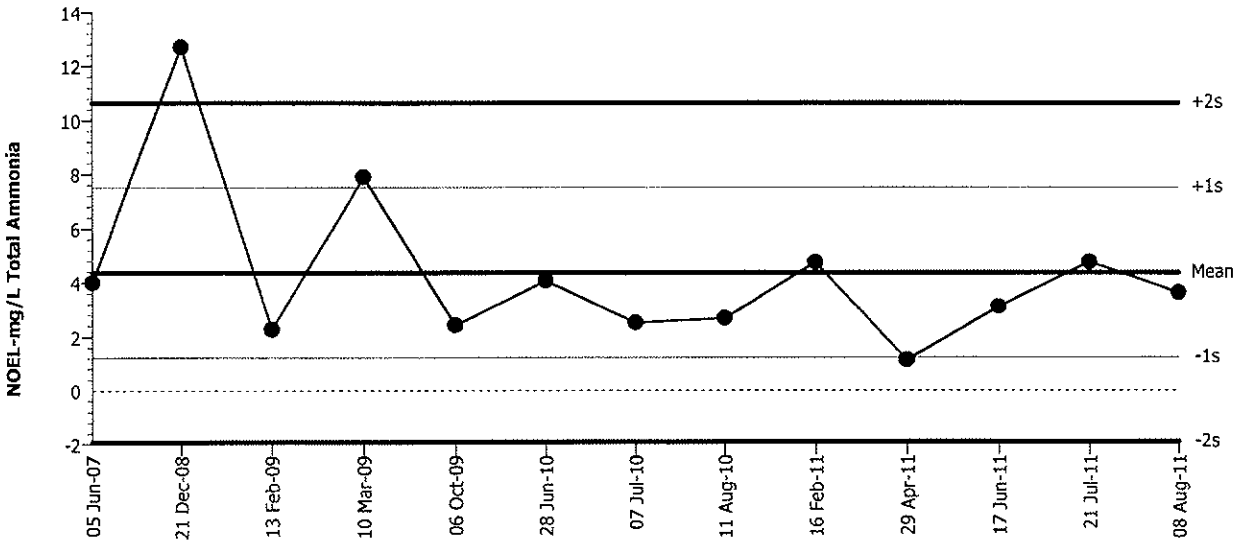
Point	Year	Month	Day	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2007	Jun	5	5.215	-1.701	-0.3016			01-6333-0814	12-4098-9949
2	2008	Dec	21	22.62	15.7	2.785	(+)	(+)	12-6474-4613	04-0535-6581
3	2009	Feb	13	3.131	-3.785	-0.6713			10-3071-2823	08-8123-7720
4		Oct	6	4.492	-2.424	-0.4299			07-2371-5815	13-0415-7840
5	2010	Jun	28	7.648	0.7321	0.1299			07-1034-9426	03-6358-7926
6		Jul	7	5.575	-1.341	-0.2378			04-2822-4836	15-5999-5088
7		Aug	11	4.462	-2.454	-0.4352			13-7609-4380	17-7827-2329
8	2011	Feb	16	9.664	2.748	0.4873			20-0761-1522	20-6550-1011
9		Apr	29	1.476	-5.44	-0.9648			18-3523-8130	06-7880-5033
10		Jun	17	5.304	-1.612	-0.2858			02-0301-0805	04-5775-2688
11		Jul	21	6.488	-0.4278	-0.07588			21-3110-1881	08-5324-8376
12		Aug	8	6.021	-0.8952	-0.1588			00-5338-2187	07-3882-4906

CETIS QC Plot

Report Date: 14 Sep-11 09:53 (1 of 1)

Mussel Shell Development Test **NewFields**

st Type:	Development-Survival	**Organism:**	Mytilis galloprovincialis (Bay Mussel)	**Material:**	Total Ammonia
rotocol:	EPA/600/R-95/136 (1995)	**Endpoint:**	Combined Proportion Normal	**Source:**	Reference Toxicant-REF



Mean:	4.362	**Count:**	12	**-1s Warning Limit:**	1.218	**-2s Action Limit:**	-1.926
Sigma:	3.144	**CV:**	72.10%	**+1s Warning Limit:**	7.506	**+2s Action Limit:**	10.65

uality Control Data

Point	Year	Month	Day	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2007	Jun	5	4	-0.362	-0.1151			01-6333-0814	13-4506-0854
2	2008	Dec	21	12.7	8.338	2.652	(+)	(+)	12-6474-4613	15-0418-5551
3	2009	Feb	13	2.28	-2.082	-0.6622			10-3071-2823	17-3079-6683
4		Mar	10	7.89	3.528	1.122	(+)		06-0704-5509	16-7894-0234
5		Oct	6	2.43	-1.932	-0.6145			07-2371-5815	10-2017-4175
6	2010	Jun	28	4.08	-0.282	-0.08969			07-1034-9426	04-4386-3406
7		Jul	7	2.52	-1.842	-0.5859			04-2822-4836	10-1366-3288
8		Aug	11	2.69	-1.672	-0.5318			13-7609-4380	12-7053-9764
9	2011	Feb	16	4.75	0.388	0.1234			20-0761-1522	16-1511-4918
10		Apr	29	1.13	-3.232	-1.028	(-)		18-3523-8130	21-1832-0856
11		Jun	17	3.11	-1.252	-0.3982			02-0301-0805	00-1872-7736
12		Jul	21	4.76	0.398	0.1266			21-3110-1881	06-7241-9373
13		Aug	8	3.62	-0.742	-0.236			00-5338-2187	08-7520-6674

CETIS Summary Report

Report Date: 14 Sep-11 09:55 (p 1 of 1)
Test Code: 6B8A4FAD | 18-0422-6477

Mussel Shell Development Test — NewFields

atch ID:	06-5464-4788	Test Type:	Development-Survival	Analyst:	
Start Date:	08 Aug-11 17:05	Protocol:	EPA/600/R-95/136 (1995)	Diluent:	Laboratory Seawater
Ending Date:	10 Aug-11 19:00	Species:	Mytilis galloprovincialis	Brine:	Not Applicable
Duration:	50h	Source:	Taylor Shelfish	Age:	

Sample ID:	00-3591-0043	Code:	223F19B	Client:	Internal Lab
Sample Date:	09 Apr-09	Material:	Unionized Ammonia	Project:	Reference Toxicant
Receive Date:	09 Apr-09	Source:	Reference Toxicant		
Sample Age:	851d 17h	Station:	P090409.68		

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
16-9302-5062	Combined Proportion Norm	0.055	0.117	0.08022	1.68%		Dunnett's Multiple Comparison Test

Point Estimate Summary

Analysis ID	Endpoint	Level	mg/L	95% LCL	95% UCL	TU	Method
19-2033-3628	Combined Proportion Norm	EC50	0.09088	0.08921	0.09259		Spearman-Kärber

Test Acceptability

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits	Overlap	Decision
16-9302-5062	Combined Proportion Norm	PMSD	0.01676	NL - 0.25	No	Passes Acceptibility Criteria

Combined Proportion Normal Summary

Conc-mg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	3	1	1	1	1	1	0	0	0.0%	0.0%
0.011		3	1	1	1	1	1	0	0	0.0%	0.0%
0.025		3	1	1	1	1	1	0	0	0.0%	0.0%
055		3	0.984	0.9748	0.9933	0.9555	1	0.0143	0.02477	2.52%	1.6%
0.117		3	0.2192	0.2029	0.2355	0.1712	0.2568	0.02524	0.04372	19.95%	78.08%
0.192		3	0	0	0	0	0	0	0		100.0%

Combined Proportion Normal Detail

Conc-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	1	1	1
0.011		1	1	1
0.025		1	1	1
0.055		0.9966	0.9555	1
0.117		0.1712	0.2568	0.2295
0.192		0	0	0

CETIS Test Data Worksheet

Report Date: 14 Sep-11 09:54 (p 1 of 1)
Test Code: 18-0422-6477/6B8A4FAD

Mussel Shell Development Test — **NewFields**

Start Date: 08 Aug-11 17:05 **Species:** Mytilis galloprovincialis **Sample Code:** 223F19B
End Date: 10 Aug-11 19:00 **Protocol:** EPA/600/R-95/136 (1995) **Sample Source:** Reference Toxicant
Sample Date: 09 Apr-09 **Material:** Unionized Ammonia **Sample Station:** P090409.68

Conc-mg/L	Code	Rep	Pos	Initial Density	Final Density	# Counted	# Normal	Notes
0	D	1	13	292	305	305	305	
0	D	2	8	292	299	299	298	
0	D	3	11	292	312	312	312	
0.011		1	7	292	310	310	308	
0.011		2	3	292	299	299	297	
0.011		3	18	292	318	318	318	
0.025		1	12	292	298	298	294	
0.025		2	5	292	306	306	302	
0.025		3	17	292	316	316	314	
0.055		1	4	292	295	295	291	
0.055		2	10	292	281	281	279	
0.055		3	2	292	309	309	304	
0.117		1	1	292	296	296	50	
0.117		2	16	292	282	282	75	
0.117		3	14	292	289	289	67	
0.192		1	9	292	250	250	0	
0.192		2	15	292	277	277	0	
0.192		3	6	292	250	250	0	

CETIS Summary Report

Report Date: 14 Sep-11 09:52 (p 1 of 1)
Test Code: 32E8C2B | 00-5338-2187

Mussel Shell Development Test — **NewFields**

atch ID:	06-5464-4788	**Test Type:**	Development-Survival	**Analyst:**	
Start Date:	08 Aug-11 17:05	**Protocol:**	EPA/600/R-95/136 (1995)	**Diluent:**	Laboratory Seawater
Ending Date:	10 Aug-11 19:00	**Species:**	Mytilis galloprovincialis	**Brine:**	Not Applicable
Duration:	50h	**Source:**	Taylor Shelfish	**Age:**	

Sample ID:	05-3391-8248	**Code:**	1FD2F228	**Client:**	Internal Lab
Sample Date:	09 Apr-09	**Material:**	Total Ammonia	**Project:**	Reference Toxicant
Receive Date:	09 Apr-09	**Source:**	Reference Toxicant		
Sample Age:	851d 17h	**Station:**	P090409.68		

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
08-7520-6674	Combined Proportion Norm	3.62	7.46	5.197	1.68%		Dunnett's Multiple Comparison Test

Point Estimate Summary

Analysis ID	Endpoint	Level	mg/L	95% LCL	95% UCL	TU	Method
07-3882-4906	Combined Proportion Norm	EC50	6.021	5.894	6.151		Spearman-Kärber

Test Acceptability

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits	Overlap	Decision
08-7520-6674	Combined Proportion Norm	PMSD	0.01676	NL - 0.25	No	Passes Acceptibility Criteria

Combined Proportion Normal Summary

Conc-mg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	3	1	1	1	1	1	0	0	0.0%	0.0%
0.704		3	1	1	1	1	1	0	0	0.0%	0.0%
1.59		3	1	1	1	1	1	0	0	0.0%	0.0%
3.62		3	0.984	0.9748	0.9933	0.9555	1	0.0143	0.02477	2.52%	1.6%
7.46		3	0.2192	0.2029	0.2355	0.1712	0.2568	0.02524	0.04372	19.95%	78.08%
15.5		3	0	0	0	0	0	0	0		100.0%

Combined Proportion Normal Detail

Conc-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	1	1	1
0.704		1	1	1
1.59		1	1	1
3.62		0.9966	0.9555	1
7.46		0.1712	0.2568	0.2295
15.5		0	0	0

CETIS Test Data Worksheet

Report Date: 14 Sep-11 09:51 (p 1 of 1)
Test Code: 00-5338-2187/32E8C2B

Mussel Shell Development Test — **NewFields**

Start Date: 08 Aug-11 17:05 **Species:** Mytilis galloprovincialis **Sample Code:** 1FD2F228
End Date: 10 Aug-11 19:00 **Protocol:** EPA/600/R-95/136 (1995) **Sample Source:** Reference Toxicant
Sample Date: 09 Apr-09 **Material:** Total Ammonia **Sample Station:** P090409.68

Conc-mg/L	Code	Rep	Pos	Initial Density	Final Density	# Counted	# Normal	Notes
0	D	1	10	292	305	305	305	
0	D	2	18	292	299	299	298	
0	D	3	1	292	312	312	312	
0.704		1	11	292	310	310	308	
0.704		2	9	292	299	299	297	
0.704		3	15	292	318	318	318	
1.59		1	17	292	298	298	294	
1.59		2	16	292	306	306	302	
1.59		3	5	292	316	316	314	
3.62		1	8	292	295	295	291	
3.62		2	7	292	281	281	279	
3.62		3	3	292	309	309	304	
7.46		1	12	292	296	296	50	
7.46		2	4	292	282	282	75	
7.46		3	14	292	289	289	67	
15.5		1	6	292	250	250	0	
15.5		2	2	292	277	277	0	
15.5		3	13	292	250	250	0	

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Batch 1

NEWFIELDS

LARVAL DEVELOPMENT TEST
AMMONIA REF TOX OBSERVATION SHEET

SPECIES
Mytilus sp

CLIENT	PROJECT	JOB NUMBER	PROJECT MANAGER	NEWFIELDS LAB / LOCATION	PROTOCOL
WDOE	Port Gamble	860.0358.000	Will Hafner	Port Gamble / Incubator	PSEP (1995)

TEST ID	ORGANISM BATCH	TEST START DATE:	TIME	TEST END DATE:	TIME
P090409.68	TS0291	8.8.11	1705	8.10.11	1900

LARVAL OBSERVATION DATA

CLIENT/ NEWFIELDS ID	CONC. value	CONC. units	VIAL NUMBER	REP	NUMBER NORMAL	NUMBER ABNORMAL	DATE	TECHNICIAN	COMMENTS
Ref.Tox. - Ammonia	0	mg/L		1	305	0			
				2	298	1			
				3	312	0			
Ref.Tox. - Ammonia	0.75	mg/L		1	308	2			
				2	297	2			
				3	318	0			
Ref.Tox. - Ammonia	1.5	mg/L		1	294	4			
				2	302	4			
				3	314	2			
Ref.Tox. - Ammonia	3	mg/L		1	291	4			
				2	279	2			
				3	304	5			
Ref.Tox. - Ammonia	6	mg/L		1	50	246			
				2	75	207			
				3	67	221			
Ref.Tox. - Ammonia	12	mg/L		1	0	250			
				2	0	277			
				3	0	250			

STOCKING DENSITY			1		240			
			2		329			
			3		308			

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NEWFIELDS

LARVAL DEVELOPMENT TEST
AMMONIA REF TOX WQ

CLIENT	PROJECT	SPECIES	NEWFIELDS LAB / LOCATION	PROTOCOL
WDOE	Port Gamble	*Mytilus sp*	Port Gamble / Incubator	PSEP (1995)
JOB NUMBER	PROJECT MANAGER	QUANTITY OF TOXICANT:	QUANTITY OF DILUENT:	INIT BH
860.0358.000	Will Hafner	ACTUAL: See spiking sheet	ACTUAL:	
TEST ID P090409.68	LOT #: 48339902	TEST START DATE: 08Aug11	TIME 1705 / TEST END DATE 8.10.11	TIME 1900

WATER QUALITY DATA

DILTIN.WAT.BATCH	ORGANISM BATCH	REFERENCE TOX. MATERIAL	REFERENCE TOXXICANT
FSW080811.01		Ammonium chloride	Ammonia

	DO (mg/L)	TEMP(C)	SAL (ppt)	pH
	>5.0	16 ± 1	28 ± 1	7.8 ± 0.5

CLIENT/ NEWFIELDS ID	CONCENTRATION value	CONCENTRATION units	DAY	REP	D.O. meter	D.O. mg/L	TEMP. meter	TEMP. °C	SALINITY meter	SALINITY ppt	pH meter	pH unit	TECH.	DATE
Ref.Tox.-Ammonia	Target: 0	mg/L	0	Stock	6	8.0	2	16.4	2	29	2	7.7	MMB	8/8/11
			1	Stock	6	7.9	2	16.3	2	29	2	7.5	JL	8/09
	Actual: 0.00		2	Stock	6	7.7	2	17.0	2	29	2	7.3	HE	8/10
			3	Stock										
			4	Stock										
Ref.Tox.-Ammonia	Target: 0.75	mg/L	0	Stock	6	8.1	2	16.3	2	29	2	7.8	MMB	8/8/11
			1	Stock	6	8.0	2	16.0	2	29	2	7.7	JL	8/09
	Actual: 0.704		2	Stock	6	7.9	2	17.0	2	29	2	7.6	HE	8/10
			3	Stock										
			4	Stock										
Ref.Tox.-Ammonia	Target: 1.5	mg/L	0	Stock	6	8.1	2	16.2	2	29	2	7.8	MMB	8/8/11
			1	Stock	6	8.0	2	16.1	2	29	2	7.8	JL	8/09
	Actual: 1.59		2	Stock	6	7.9	2	17.0	2	28	2	7.8	HE	8/10
			3	Stock										
			4	Stock										
Ref.Tox.-Ammonia	Target: 3	mg/L	0	Stock	6	8.1	2	16.0	2	29	2	7.8	MMB	8/8/11
			1	Stock	6	8.0	2	15.7	2	30	2	7.8	JL	8/09
	Actual: 3.62		2	Stock	6	8.0	2	17.0	2	30	2	7.8	HE	8/10
			3	Stock										
			4	Stock										
Ref.Tox.-Ammonia	Target: 6	mg/L	0	Stock	6	8.1	2	16.3	2	29	2	7.8	MMB	8/8/11
			1	Stock	6	8.1	2	16.2	2	29	2	7.8	JL	8/09
	Actual: 7.46		2	Stock	6	8.0	2	17.0	2	29	2	7.8	HE	8/10
			3	Stock										
			4	Stock										
Ref.Tox.-Ammonia	Target: 12	mg/L	0	Stock	6	8.1	2	16.2	2	29	2	7.7	MMB	8/8/11
			1	Stock	6	8.1	2	16.2	2	29	2	7.8	JL	8/09
	Actual: 15.5		2	Stock	6	~~7.9~~ 8.0	2	17.0	2	29	2	7.8	HE	8/10
			3	Stock										
			4	Stock										

① WC HE 8/10/11

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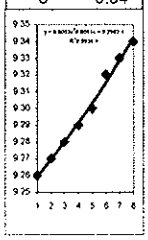
NEWFIELDS

Un-ionized Ammonia Calculator

Project:	Ammonia RT	Date of Test:	08-Aug-11
Project ID:		Test Type:	*M. galloprovencialis*

To convert Total Ammonia (mg/L) to Free (un-ionized) Ammonia (mg/L) enter the corresponding total ammonia, salinity, temperature, and pH.

Integer:	I-factor
1	9.26
2	9.27
3	9.28
4	9.29
5	9.30
6	9.32
7	9.33
8	9.34



	Sample	Mod	*NH3T (mg/L)*	*salinity (ppt)*	*pH*	*temp (C)*	temp (K)	i-factor	Mod	**NH3U (mg/L)**
	Example		0.610	22.9	8.0	24.1	297.26	9.3053		**0.027**
	Example2		2.000	10.0	7.5	5.0	278.16	9.2750		**0.008**
1										**0.000**
2	0.75		0.704	29	7.8	16.3	289.46	9.3214		**0.011**
3	1.5		1.590	29	7.8	16.2	289.36	9.3214		**0.025**
4	3		3.620	29	7.8	16.0	289.16	9.3214		**0.055**
5	6		7.460	29	7.8	16.3	289.46	9.3214		**0.117**
6	12		15.500	29	7.7	16.2	289.36	9.3214		**0.192**
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NEWFIELDS

ORGANISM RECEIPT LOG

Date: 8/5/11	**Time:** 0943	**NewFields Batch No.** TS 0291
Organism / Project: Mytilus Sp.	**Source:** Taylor Shellfish	
Address: Same		**Invoice Attached** Yes (No)
Phone: Same	**Contact:** Same	
No. Ordered: 1 batch	**No. Received:** 1 batch	**Source Batch:** NA
Condition of Organisms: Good	**Approximate Size or Age:** Adult	
Shipper: UPS	**B of L (Tracking No.)** 1Z98X685 0100020291	
Condition of Container: Good	**Received By:** [illegible]	

Container	D.O. (mg/L)	Temp. (°C)	Conductivity or Salinity (Include Units)	pH (Units)	Technician (Initials)
*					

Notes: * Received dry no WQ

APPENDIX D

STATISTICAL COMPARISONS

One-tailed Test Result Summary

Test	Endpoint	Treatment	Comparison	Prob Normal	Prob Homogeneous	Statistical Test	Prob > T	Significant	One-tailed Test Result
Eohaustaurius	Percentage Survival	CI-01	Control	0.047	0.465	Mann-Whitney	0.212		Treatment >= Comparison
Eohaustaurius	Percentage Survival	GJ-8	CI-01	0.062	0.558	T-test Equal Var	0.278		Treatment >= Comparison
Larval Standard	Percentage Normal Development	C1-01	Control	0.185	0.099	T-test Unequal Var	0.089	Yes	Treatment < Comparison
Larval Standard	Percentage Normal Development	GJ-8	CI-01	0.507	0.011	T-test Unequal Var	0.124		Treatment >= Comparison
Larval Resuspension	Percentage Normal Development	C1-01	Control	0.012	0.830	Mann-Whitney	0.024	Yes	Treatment < Comparison
Larval Resuspension	Percentage Normal Development	GJ-8	CI-01	0.089	0.132	T-test Equal Var	0.162		Treatment >= Comparison
Neanthes Dry Weight	Individual Growth Rate (mg/ind/d)	C1-01	Control	0.794	0.074	T-test Unequal Var	0.161		Treatment >= Comparison
Neanthes Dry Weight	Individual Growth Rate (mg/ind/d)	GJ-8	CI-01	0.881	0.032	T-test Unequal Var	0.302		Treatment >= Comparison
Neanthes Ashed Weight	Individual Growth Rate (mg/ind/d)	C1-01	Control	0.740	0.659	T-test Equal Var	0.238		Treatment >= Comparison
Neanthes Ashed Weight	Individual Growth Rate (mg/ind/d)	GJ-8	CI-01	0.874	0.291	T-test Equal Var	0.516		Treatment >= Comparison

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T-test Results, This is a 2-tailed result
See Summary Page for 1-tail Result

---------- test=Larval Standard endpoint=Percentage Normal Development Treatment=C1-01 ----------

The TTEST Procedure

Variable: result

group	N	Mean	Std Dev	Std Err	Minimum	Maximum
Control	5	1.4273	0.1415	0.0633	1.2626	1.5708
Reference	5	1.2426	0.2342	0.1047	1.0371	1.5708
Diff (1-2)		0.1846	0.1935	0.1224		

group	Method	Mean	95% CL Mean		Std Dev	95% CL Std Dev	
Control		1.4273	1.2516	1.6029	0.1415	0.0847	0.4065
Reference		1.2426	0.9518	1.5335	0.2342	0.1403	0.6731
Diff (1-2)	Pooled	0.1846	-0.0975	0.4668	0.1935	0.1307	0.3707
Diff (1-2)	Satterthwaite	0.1846	-0.1086	0.4778			

Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	8	1.51	0.1698
Satterthwaite	Unequal	6.5752	1.51	0.1778

Equality of Variances

Method	Num DF	Den DF	F Value	Pr > F
Folded F	4	4	2.74	0.3522

T-test Results, This is a 2-tailed result
See Summary Page for 1-tail Result

---------- test=Neanthes Ashed Weight endpoint=Individual Growth Rate (mg/ind/d) Treatment=C1-O1 ----------

The TTEST Procedure

Variable: result

group	N	Mean	Std Dev	Std Err	Minimum	Maximum
Control	5	0.4777	0.0581	0.0260	0.3966	0.5519
Reference	5	0.4537	0.0420	0.0188	0.4189	0.5127
Diff (1-2)		0.0240	0.0507	0.0321		

group	Method	Mean	95% CL Mean		Std Dev	95% CL Std Dev	
Control		0.4777	0.4056	0.5498	0.0581	0.0348	0.1669
Reference		0.4537	0.4015	0.5059	0.0420	0.0252	0.1208
Diff (1-2)	Pooled	0.0240	-0.0499	0.0980	0.0507	0.0342	0.0971
Diff (1-2)	Satterthwaite	0.0240	-0.0512	0.0992			

Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	8	0.75	0.4755
Satterthwaite	Unequal	7.2883	0.75	0.4776

Equality of Variances

Method	Num DF	Den DF	F Value	Pr > F
Folded F	4	4	1.91	0.5465

T-test Results, This is a 2-tailed result
See Summary Page for 1-tail Result

---------- test=Neanthes Dry Weight endpoint=Individual Growth Rate (mg/ind/d) Treatment=C1-O1 ----------

The TTEST Procedure

Variable: result

group	N	Mean	Std Dev	Std Err	Minimum	Maximum
Control	5	0.6106	0.0444	0.0199	0.5486	0.6535
Reference	5	0.5651	0.0835	0.0374	0.4771	0.6793
Diff (1-2)		0.0455	0.0669	0.0423		

group	Method	Mean	95% CL Mean		Std Dev	95% CL Std Dev	
Control		0.6106	0.5555	0.6658	0.0444	0.0266	0.1276
Reference		0.5651	0.4614	0.6689	0.0835	0.0501	0.2401
Diff (1-2)	Pooled	0.0455	-0.0521	0.1431	0.0669	0.0452	0.1282
Diff (1-2)	Satterthwaite	0.0455	-0.0577	0.1487			

Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	8	1.08	0.3136
Satterthwaite	Unequal	6.0922	1.08	0.3229

Equality of Variances

Method	Num DF	Den DF	F Value	Pr > F
Folded F	4	4	3.54	0.2482

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Mann-Whitney Test Results

---------- test=Eohaustaurius endpoint=Percentage Survival Treatment=CI-01 ----------

The NPAR1WAY Procedure

Wilcoxon Scores (Rank Sums) for Variable result
Classified by Variable group

group	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
Control	5	31.50	27.50	4.183300	6.30
Reference	5	23.50	27.50	4.183300	4.70

Average scores were used for ties.

Wilcoxon Two-Sample Test

Statistic	31.5000
Normal Approximation	
Z	0.8367
One-Sided Pr > Z	0.2014
Two-Sided Pr > |Z|	0.4028
t Approximation	
One-Sided Pr > Z	0.2122
Two-Sided Pr > |Z|	0.4244

Z includes a continuity correction of 0.5.

Kruskal-Wallis Test

Chi-Square	0.9143

DF	1
Pr > Chi-Square	0.3390

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Mann-Whitney Test Results

---------- test=Larval Resuspension endpoint=Percentage Normal Development Treatment=C1-01 ----------

The NPAR1WAY Procedure

Wilcoxon Scores (Rank Sums) for Variable result
Classified by Variable group

group	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
Control	5	39.0	27.50	4.787136	7.80
Reference	5	16.0	27.50	4.787136	3.20

Wilcoxon Two-Sample Test

Statistic	39.0000
Normal Approximation	
Z	2.2978
One-Sided Pr > Z	0.0108
Two-Sided Pr > |Z|	0.0216
t Approximation	
One-Sided Pr > Z	0.0236
Two-Sided Pr > |Z|	0.0472

Z includes a continuity correction of 0.5.

Kruskal-Wallis Test

Chi-Square	5.7709
DF	1
Pr > Chi-Square	0.0163

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T-test Results, This is a 2-tailed result
See Summary Page for 1-tail Result

---------- test=Eohaustaurius endpoint=Percentage Survival Treatment=GJ-8 ----------

The TTEST Procedure

Variable: Result

group	N	Mean	Std Dev	Std Err	Minimum	Maximum
CI-01	5	1.3711	0.1191	0.0533	1.2490	1.5708
Test	5	1.3175	0.1542	0.0690	1.1731	1.5708
Diff (1-2)		0.0537	0.1378	0.0872		

group	Method	Mean	95% CL Mean		Std Dev	95% CL Std Dev	
CI-01		1.3711	1.2232	1.5191	0.1191	0.0714	0.3423
Test		1.3175	1.1259	1.5090	0.1542	0.0924	0.4432
Diff (1-2)	Pooled	0.0537	-0.1473	0.2547	0.1378	0.0931	0.2640
Diff (1-2)	Satterthwaite	0.0537	-0.1496	0.2569			

Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	8	0.62	0.5550
Satterthwaite	Unequal	7.5201	0.62	0.5561

Equality of Variances

Method	Num DF	Den DF	F Value	Pr > F
Folded F	4	4	1.68	0.6291

T-test Results, This is a 2-tailed result
See Summary Page for 1-tail Result

---------- test=Larval Resuspension endpoint=Percentage Normal Development Treatment=GJ-8 ----------

The TTEST Procedure

Variable: Result

group	N	Mean	Std Dev	Std Err	Minimum	Maximum
CI-01	5	1.1835	0.1154	0.0516	1.0871	1.3378
Test	5	1.1181	0.0779	0.0348	1.0391	1.2088
Diff (1-2)		0.0654	0.0984	0.0623		

group	Method	Mean	95% CL Mean		Std Dev	95% CL Std Dev	
CI-01		1.1835	1.0402	1.3267	0.1154	0.0691	0.3315
Test		1.1181	1.0213	1.2148	0.0779	0.0467	0.2238
Diff (1-2)	Pooled	0.0654	-0.0781	0.2090	0.0984	0.0665	0.1886
Diff (1-2)	Satterthwaite	0.0654	-0.0817	0.2126			

Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	8	1.05	0.3239
Satterthwaite	Unequal	7.0195	1.05	0.3281

Equality of Variances

Method	Num DF	Den DF	F Value	Pr > F
Folded F	4	4	2.19	0.4655

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T-test Results, This is a 2-tailed result
See Summary Page for 1-tail Result

---------- test=Larval Standard endpoint=Percentage Normal Development Treatment=GJ-8 ----------

The TTEST Procedure

Variable: Result

group	N	Mean	Std Dev	Std Err	Minimum	Maximum
CI-01	5	1.2426	0.2342	0.1047	1.0371	1.5708
Test	5	1.0977	0.0828	0.0370	1.0300	1.2359
Diff (1-2)		0.1450	0.1757	0.1111		

group	Method	Mean	95% CL Mean		Std Dev	95% CL Std Dev	
CI-01		1.2426	0.9518	1.5335	0.2342	0.1403	0.6731
Test		1.0977	0.9949	1.2004	0.0828	0.0496	0.2378
Diff (1-2)	Pooled	0.1450	-0.1112	0.4012	0.1757	0.1186	0.3365
Diff (1-2)	Satterthwaite	0.1450	-0.1409	0.4308			

Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	8	1.30	0.2282
Satterthwaite	Unequal	4.9837	1.30	0.2489

Equality of Variances

Method	Num DF	Den DF	F Value	Pr > F
Folded F	4	4	8.01	0.0685

T-test Results, This is a 2-tailed result
See Summary Page for 1-tail Result

---------- test=Neanthes Ashed Weight endpoint=Individual Growth Rate (mg/ind/d) Treatment=GJ-8 ----------

The TTEST Procedure

Variable: Result

group	N	Mean	Std Dev	Std Err	Minimum	Maximum
CI-01	5	0.4537	0.0420	0.0188	0.4189	0.5127
Test	5	0.4547	0.0329	0.0147	0.3976	0.4780
Diff (1-2)		-0.00098	0.0378	0.0239		

group	Method	Mean	95% CL Mean		Std Dev	95% CL Std Dev	
CI-01		0.4537	0.4015	0.5059	0.0420	0.0252	0.1208
Test		0.4547	0.4138	0.4956	0.0329	0.0197	0.0946
Diff (1-2)	Pooled	-0.00098	-0.0561	0.0541	0.0378	0.0255	0.0723
Diff (1-2)	Satterthwaite	-0.00098	-0.0566	0.0546			

Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	8	-0.04	0.9681
Satterthwaite	Unequal	7.566	-0.04	0.9682

Equality of Variances

Method	Num DF	Den DF	F Value	Pr > F
Folded F	4	4	1.63	0.6476

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T-test Results, This is a 2-tailed result
See Summary Page for 1-tail Result

---------- test=Neanthes Dry Weight endpoint=Individual Growth Rate (mg/ind/d) Treatment=GJ-8 ----------

The TTEST Procedure

Variable: Result

group	N	Mean	Std Dev	Std Err	Minimum	Maximum
CI-01	5	0.5651	0.0835	0.0374	0.4771	0.6793
Test	5	0.5427	0.0360	0.0161	0.4853	0.5849
Diff (1-2)		0.0224	0.0643	0.0407		

group	Method	Mean	95% CL Mean		Std Dev	95% CL Std Dev	
CI-01		0.5651	0.4614	0.6689	0.0835	0.0501	0.2401
Test		0.5427	0.4980	0.5874	0.0360	0.0216	0.1034
Diff (1-2)	Pooled	0.0224	-0.0714	0.1162	0.0643	0.0434	0.1232
Diff (1-2)	Satterthwaite	0.0224	-0.0797	0.1245			

Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	8	0.55	0.5966
Satterthwaite	Unequal	5.4345	0.55	0.6035

Equality of Variances

Method	Num DF	Den DF	F Value	Pr > F
Folded F	4	4	5.39	0.1316

APPENDIX E

CHAIN-OF-CUSTODY FORMS

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(425) 921-4000
Steve Ellis steve.g.ellis@amec.com

CHAIN OF CUSTODY

Place Sample ID Label Here
or Write ID Number Here
13

Recorded by: GSM

Checked by: _____

	Analysis Containers												
	VOAs	Metals	Pest-PCBs-SVOAs	Grain Size	TOC-TVS-NH3	Sulfides (+ZN Ac)	Archive	TBT P/W		Bioassay		Benthic Infauna	
AMEC-Geomatrix GP-40-2011 COC Form Initials: GSM Date: 7/5/2011 Time: 1045 — Date:	\	\	\	\	\	\				\			Number of containers
Time:													
AMEC-Geomatrix GP-39-2011 COC Form Initials: GSM Date: 7/5/2011 Time: 1120 — Date:	\	\	\	\	\	\	\			\			Number of containers
Time:													
AMEC-Geomatrix GP-46-2011 COC Form Initials: GSM Date: 7/5/2011 Time: 1151 — Date:										\			Number of containers
Time:													
AMEC-Geomatrix GJP-38-2011 COC Form Initials: GSM Date: 7/5/2011 Time: 1247 — te:										\			Number of containers
ıe:													
AMEC-Geomatrix GJP-20-2011 COC Form Initials: GSM Date: 7/5/2011 Time: 1320 — Date:										\			Number of containers
Time:													
AMEC-Geomatrix DGJP-20-2011 COC Form Initials: Date: 7/5/2011 Time: 1347 — Date:										\			Number of containers
Time:													
AMEC-Geomatrix GJP-11-2011 COC Form Initials: GSM Date: 7/5/2011 Time: _____ — Date:										\			Number of containers
Time:													

Relinquished By	Transported By	Received By
Name: Gary Mylett Date: 7-7-2011 Time: 7:29	Justin Tinsley 7-7-11 10:30	Name: Date: Time:
Name: Justin Tinsley Date: 7-7-11 Time: 13:30		Name: Brian Hester Date: 7.7.11 Time: 1330
Name: Date: Time:		Name: Date: Time:

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CHAIN OF CUSTODY

Place Sample ID Label Here
or Write ID Number Here
18

Recorded by: GSM

Checked by: _____

	Analysis Containers												
	VOAs	Metals	Pest-PCBs-SVOAs	Grain Size	TOC-TVS-NH3	Sulfides (+ZN Ac)	Archive	TBT P/W		Bioassay		Benthic Infauna	
AMEC-Geomatrix GJ-45-2011 COC Form Initials: GSM Date: 7/6/2011 Time: 846 — Date:										1			Number of containers
Time:													
AMEC-Geomatrix GJP-10-2011 COC Form Initials: GSM Date: 7/6/2011 Time: 916 — Date:										1			Number of containers
Time:													
AMEC-Geomatrix GJ-18-2011 COC Form Initials: GSM Date: 7/6/2011 Time: 944 — Date:										1			Number of containers
Time:													
AMEC-Geomatrix GJ-36-2011 COC Form Initials: GSM Date: 7/6/2011 Time: 1014 — Date:										1			Number of containers
Time:													
AMEC-Geomatrix GJ-9-2011 COC Form Initials: GSM Date: 7/6/2011 Time: 1047 — Date:										1			Number of containers
Time:													
AMEC-Geomatrix GJ-8-2011 COC Form Initials: GSM Date: 7/6/2011 Time: 1116 — Date:										1			Number of containers
Time:													
AMEC-Geomatrix GJ-44-2011 COC Form Initials: GSM Date: 7/6/2011 Time: 1214 — Date:										1			Number of containers
Time:													

Relinquished By	Transported By	Received By
Name: Gary Miller Date: 7-7-2011 Time: 7:29	Justin Toney 7-7-11 10:30	Name: Date: Time:
Name: Justin Toney Date: 7-7-11 Time: 13:30		Name: Brian Hester Date: 7.7.11 Time: 1330
Name: Date: Time:		Name: Date: Time:

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CHAIN OF CUSTODY

Recorded by: GJM

Checked by: _____

Place Sample ID Label Here or Write ID Number Here: JC

AMEC-Geomatrix
GJP-19-2011
COC Form
Initials: GJM
Date: 7/5/2011 Time: 1453

AMEC-Geomatrix
GJP-37-2011
COC Form
Initials: GJM
Date: 7/5/2011 Time: 1528

		Analysis Containers											
		VOAs	Metals	Pest-PCBs-SVOAs	Grain Size	TOC-TVS-NH3	Sulfides (+ZN Ac)	Archive	TBT P/W		Bioassay		Benthic Infauna	
	Date:										1			Number of containers
	Time:													
	Date:										1			Number of containers
	Time:													
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	Time:													
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	Time:													
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	Time:													

Laboratory Sample Receipt	Relinquished By	Transported By	Received By
	Name: Greg [illegible] Date: 7-7-2011 Time: 7:29	Justin Toney 7-7-11 10:30	Name: Date: Time:
	Name: Justin Toney Date: 7-7-11 Time: 13:30		Name: Brian Hoste Date: 7.7.11 Time: 1330
	Name: Date: Time:		Name: Date: Time:

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Place Sample ID Label Here or Write ID Number Here: 20

AMEC-Geomatrix
GJ-17-2011
COC Form
Initials: GSM
Date: 7/6/2011 Time: 1242

AMEC-Geomatrix
GJ-47-2011
COC Form
Initials: GSM
Date: 7/6/2011 Time: 1311

AMEC-Geomatrix
GJ-35-2011
COC Form
Initials:
Date: 7/6/2011 Time: 1344

AMEC-Geomatrix
GJ-7-2011
COC Form
Initials: GSM
Date: 7/6/2011 Time: 1415

	Analysis Containers											
	VOAs	Metals	Pest-PCBs-SVOAs	Grain Size	TOC-TVS-NH3	Sulfides (+ZN Ac)	Archive	TBT P/W		Bioassay		Benthic Infauna	
Date:										1			Number of containers
Time:													
Date:										1			Number of containers
Time:													
Date:										1			Number of containers
Time:													
Date:										1			Number of containers
Time:													
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Date:													Number of containers
Time:													
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Date:													Number of containers
Time:													
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Date:													Number of containers
Time:													

Laboratory Sample Receipt	Relinquished By	Transported By	Received By
	Name: Gary Mull Date: 7-7-2011 Time: 7:29	Justin Tiney 7-7-11 10:30	Name: Date: Time:
	Name: Justin Tiney Date: 7-7-11 Time: 13:30		Name: Brian Hester Date: 7.7.11 Time: 1330
	Name: Date: Time:		Name: Date: Time:

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or Write ID Number Here
10

Recorded by: GSM

Checked by: _____

	Date/Time	VOAs	Metals	Pest-PCBs-SVOAs	Grain Size	TOC-TVS-NH3	Sulfides (+ZN Ac)	Archive	TBT P/W		Bioassay		Benthic Infauna	Number of containers
AMEC-Geomatrix GJ-23-2011 COC Form Initials: GSM Date: 7/4/2011 Time: 943	Date:										1			
	Time:													
AMEC-Geomatrix GJP-4-2011 QSC Form Initials: Date: 7/___/2011 Time:_____	Date:										1			
	Time:													
AMEC-Geomatrix GJP-6-2011 COC Form Initials: GSM Date: 7/4 /2011 Time:	Date:										1			
	Time:													
AMEC-Geomatrix GJP-5-2011 COC Form Initials: Date: 7/4 /2011 Time: 1222	Date:										1			
	Time:													
AMEC-Geomatrix GJP-21-2011 COC Form Initials: GSM Date: 7/4/2011 Time: 1253	Date:										1			
	Time:													
AMEC-Geomatrix GJ-12-2011 COC Form Initials: GSM Date: 7/4/2011 Time: 1332	Date:										1			
	Time:													
AMEC-Geomatrix GJP-1-2011 COC Form Initials: GSM Date: 7/4/2011 Time: 1410	Date:										1			
	Time:													

Laboratory Sample Receipt	Relinquished By	Transported By	Received By
	Name: Gary Mudge Date: 7-05-2011 Time: 7:45	Justin Toney 7-5-11 9:50	Name: Date: Time:
	Name: Justin Toney Date: 7-5-11 Time: 13:10		Name: Brian Hester Date: 7.5.11 Time: 1310
	Name: Date: Time:		Name: Date: Time:

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CHAIN OF CUSTODY

Recorded by: GM

Checked by: _____

Place Sample ID Label Here or Write ID Number Here: 12

AMEC-Geomatrix
GJP-22-2011
COC Form
Initials: GM
Date: 7/12/2011 Time: 1556

		Analysis Containers											
		VOAs	Metals	Pest-PCBs-SVOAs	Grain Size	TOC-TVS-NH3	Sulfides (+ZN Ac)	Archive	TBT P/W		Bioassay		Benthic Infauna	Number of containers
	Date:										1			
	Time:													
Place Sample ID Label Here or Write ID Number Here	Date:													
	Time:													
Place Sample ID Label Here or Write ID Number Here	Date:													
	Time:													
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	Time:													
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	Time:													
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	Time:													
Place Sample ID Label Here or Write ID Number Here	Date:													
	Time:													

Laboratory Sample Receipt

Relinquished By	Transported By	Received By
Name: Gregory Martin Date: 7-5-2011 Time: 9:45	Sandra Toney 7-5-11 9:50	Name: Date: Time:
Name: Sandra Toney Date: 7-5-11 Time: 13:10		Name: Brian Hester Date: 7.5.11 Time: 1310
Name: Date: Time:		Name: Date: Time:

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or Write ID Number Here
5

Recorded by: GSM

Checked by: _____

	Date:	Time:	VOAs	Metals	Pest-PCBs-SVOAs	Grain Size	TOC-TVS-NH3	Sulfides (+ZN Ac)	Archive	TBT P/W		Bioassay		Benthic Infauna	Number of containers
AMEC-Geomatrix GP-27-2011 COC Form Initials: GSM Date: 7/3/2011 Time: 910												1			
AMEC-Geomatrix GP-43-2011 COC Form Initials: GSM Date: 7/3/2011 Time: 945												1			
AMEC-Geomatrix GP-42-2011 COC Form Initials: GSM Date: 7/3/2011 Time: 1023												1			
AMEC-Geomatrix GJ-26-2011 COC Form Initials: GSM Date: 7/3/2011 Time: 1102												1			
AMEC-Geomatrix GJP-25-2011 COC Form Initials: GSM Date: 7/3/2011 Time: 1148												1			
AMEC-Geomatrix GP-24-2011 COC Form Initials: GSM Date: 7/3/2011 Time: 1313												1			
AMEC-Geomatrix GP-41-2011 COC Form Initials: GSM Date: 7/3/2011 Time: 1351															

Relinquished By	Transported By	Received By
Name: Guy Mitchell Date: 7-5-2011 Time: 7:45	Justin Toney 7-5-11 9:50	Name: Date: Time:
Name: Justin Toney Date: 7-5-11 Time: 1310		Name: Brian Hecht Date: 7.5.11 Time: 1310
Name: Date: Time:		Name: Date: Time:

Admin\Field Forms\COC

Privileged and Confidential
Attorney-Client Work Product

AMEC Geomatrix, Inc.
3500 188th St. SW, Suite 601
Lynnwood,WA 98037
(425) 921-4000
Steve Ellis steve.g.ellis@amec.com

CHAIN OF CUSTODY

Recorded by: GSM

Checked by: _____

Place Sample ID Label Here or Write ID Number Here: 7

AMEC-Geomatrix
GJ-15-2011
COC Form
Initials: GSM
Date: 7/3/2011 Time: 1423

AMEC-Geomatrix
GJ-14-2011
COC Form
Initials: GSM
Date: 7/3/2011 Time: _____

		Analysis Containers												
		VOAs	Metals	Pest-PCBs-SVOAs	Grain Size	TOC-TVS-NH3	Sulfides (+ZN Ac)	Archive	TBT P/W		Bioassay		Benthic Infauna	
Place Sample ID Label Here or Write ID Number Here: 7	Date:										1			Number of containers
	Time:													
AMEC-Geomatrix GJ-14-2011 COC Form Initials: GSM Date: 7/3/2011 Time: _____	Date:										1			Number of containers
	Time:													
Place Sample ID Label Here or Write ID Number Here:	Date:													Number of containers
	Time:													
Place Sample ID Label Here or Write ID Number Here:	Date:													Number of containers
	Time:													
Place Sample ID Label Here or Write ID Number Here:	Date:													Number of containers
	Time:													
Place Sample ID Label Here or Write ID Number Here:	Date:													Number of containers
	Time:													
Place Sample ID Label Here or Write ID Number Here:	Date:													Number of containers
	Time:													

Laboratory Sample Receipt	Relinquished By	Transported By	Received By
	Name: Gy Smith Date: 7.5.2011 Time: 7:45	Justin Tinney 7-5-11 9:50	Name: Date: Time:
	Name: Justin Tinney Date: 7-5-11 Time: 13:10		Name: Brian Hester Date: 7.5.11 Time: 1310
	Name: Date: Time:		Name: Date: Time:

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Steve Ellis steve.g.ellis@amec.com

CHAIN OF CUSTODY

Place Sample ID Label Here
or Write ID Number Here
2

Recorded by: GSM

Checked by: _____

	Date/Time	VOAs	Metals	Pest-PCBs-SVOAs	Grain Size	TOC-TVS-NH3	Sulfides (+ZN Ac)	Archive	TBT P/W		Bioassay		Benthic Infauna	Number of containers
AMEC-Geomatrix GP-34-2011 COC Form Initials: Date: 7/2/2011 Time: 856	Date:										1			
	Time:													
AMEC-Geomatrix GP-33-2015 COC Form Initials: Date: 7/2/2011 Time: 1025	Date:										1			
	Time:													
AMEC-Geomatrix GP-31-2011 COC Form Initials: GSM Date: 7/2/2011 Time: 1115	Date:										1			
	Time:													
AMEC-Geomatrix GP-32-2011 COC Form Initials: GSM Date: 7/2/2011 Time: 1150	Date:										1			
	Time:													
AMEC-Geomatrix GP-16-2011 COC Form Initials: GSM Date: 7/2/2011 Time: 1250	Date:										1			
	Time:													
AMEC-Geomatrix GP-30-2011 COC Form Initials: GSM Date: 7/2/2011 Time: 326	Date:										1			
	Time:													
AMEC-Geomatrix GP-29-2011 COC Form Initials: GSM Date: 7/2/2011 Time: 1400	Date:													
	Time:													

Relinquished By	Transported By	Received By
Name: Gary Mudge Date: 7-3-2011 Time: 7:52	Name: Justin Toney Date: 7-3-11 Time: 10:15	Name: Collin Ray Date: 7/3/11 Time: 1430
Name: Justin Toney Date: 7-3-11 Time: 14:40		Name: Date: Time:
Name: Date: Time:		Name: Date: Time:

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Recorded by: GSM

Checked by: _____

AMEC-Geomatrix
GP-28-2011
COC Form
Initials: GSM
Date: 7/2/2011 Time: 1433

Place Sample ID Label Here or Write ID Number Here		VOAs	Metals	Pest-PCBs-SVOAs	Grain Size	TOC-TVS-NH3	Sulfides (+ZN Ac)	Archive	TBT P/W		Bioassay		Benthic Infauna	Number of containers
3	Date:										1			
	Time:													
	Date:													
	Time:													
	Date:													
	Time:													
	Date:													
	Time:													
	Date:													
	Time:													
	Date:													
	Time:													
	Date:													
	Time:													

Laboratory Sample Receipt

Relinquished By	Transported By	Received By
Name: Gary Mendell Date: 7-2-2011 Time: 1752	Justin Toney 7-3-11 10:15	Name: Collin Ray Date: 7/3/11 Time: 1430
Name: Justin Toney Date: 7-3-11 Time: 1045		Name: Date: Time:
Name: Date: Time:		Name: Date: Time:

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Attorney Client Work Product

NEWFIELDS

NewFields Northwest, LLC.
Shipping: 4725 View Dr.
Mailing: P.O. Box 216
Port Gamble, WA. 98364
Tel: (360) 297-6040, Fax: (360)297-7268

CHAIN OF CUSTODY

13699

Destination Lab: NEWFIELDS	Sample Originator: Newfields	Report Results To: SAME	Phone: —
Destination Contact: Brian Hester	Contact Name: Tim Hammermeister	Contact Name: ←	Fax: —
Date: 7/27/11	Address: 115 2nd Ave N Ste 100 Edmonds, WA 98020	Address: ←	Email: —
Turn-Around-Time —			
Project Name: Port Gamble Supplemental RI	Phone: 206 890-8667	Invoicing To:	
Contract/PO: Tim HAMMERMEISTER	Fax:	Comments or Special Instructions:	
	E-mail: thammermeister@newfields.com		

No.	Sample ID	Matrix	No. & Type of Container	Date & Time	Bioassays	Porewater ammonia	Porewater sulfide				Preservation	Sample Temp Upon Receipt	TAG ~~LAB ID~~ #
1	PG11-CI-01	SED	3-2L	1153 7/27/11	X								10001, 10002, 10003
2	PG11-CI-01		1-1L	"		X	X						10004
3	PG11-CI-02		3-2L	1333 7.27.11	X								10009, 10010, 10011
4	"		1-1L	"		X	X						10012
5	PG11-CI-03		3-2L	1433 7.27.11	X								10017, 10018, 10019
6	"		1-1L	"		X	X						10016
7	PG11-CI-04		3-2L	1520 7.27.11	X								10024, 10025, 10026
8	"		1-1L	"		X	X						10027
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													

Relinquished by:	Recieved by:	Relinquished by:	Recieved by:
Print Name: TIM HAMMERMEISTER	Print Name: WILLIAM GARDINER	Print Name:	Print Name:
Signature: [signature]	Signature: [signature]	Signature:	Signature:
Affiliation: NewFields	Affiliation: NewFields	Affiliation:	Affiliation:
Date/Time: 7.27.11 / 18:24	Date/Time: 7.27.11 / 1825	Date/Time:	Date/Time:

Matrix Codes
FW = Fresh Water
WW = Waste Water
SB = Salt & Brackish Water
SS = Soil & Sediment
TS = plant & Animal Tissue
OT = Other

WHITE – return to originator • YELLOW – lab • PINK – retained by originator