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August 2007

Results of Year 3 Operations, Maintenance, and Monitoring Plan Sampling

Head of the Thea Foss Waterway Remediation Project

prepared for:

PacifiCorp Environmental Remediation Company
and
Puget Sound Energy

Photo taken by Acqualis Photograpy

prepared by: TETRA TECH EC, INC.

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ACRONYMS AND ABBREVIATIONS

ARI	Analytical Resources, Inc.
BEHP	bis(2-ethylhexyl)phthalate
City	City of Tacoma
cm	centimeter
Corps	U.S. Army Corps of Engineers
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethylene
EPA	U.S. Environmental Protection Agency
ESD	Explanation of Significant Differences
HDPE	high-density polyethylene
HPAH	high molecular weight polycyclic aromatic hydrocarbon
ICP	Institutional Control Plan
LPAH	low molecular weight polycyclic aromatic hydrocarbon
µg/kg	microgram per kilogram
m	meter
mg/kg	milligram per kilogram
MLLW	mean lower low water
MOA	Memorandum of Agreement
OMMP	Operation, Maintenance, and Monitoring Plan
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PSDDA	Puget Sound Dredged Disposal Analysis
PSEP	Puget Sound Estuary Program
QAPP	quality assurance project plan
QC	quality control
RA	Remedial Action Area
ROD	Record of Decision

ACRONYMS AND ABBREVIATIONS (continued)

SPI	Sediment Profile Imagery
SQO	sediment quality objective
SR	State Route
SVOC	semivolatile organic compound
Utilities	Advance Ross Subcompany, PacifiCorp, and Puget Sound Energy
WRDA	Water Resources Development Act

1. INTRODUCTION

This report was prepared on behalf of the Advance Ross Sub Company, PacifiCorp, and Puget Sound Energy (the Utilities) and presents the results of Year 3 Operations, Maintenance, and Monitoring Plan (OMMP) observations and sampling for the southern portion of the Thea Foss Waterway. The waterway is part of the Commencement Bay Nearshore/Tideflats Superfund Site in Tacoma, Washington (Figure 1-1). The sampling and analyses were accomplished in accordance with the requirements of the OMMP prepared by Tetra Tech FW, Inc. (TtFW) et al. (2003) with amendments in March and April 2006 (PERCo 2006) and March 2007 (PERCo 2007). The Utilities are responsible for Remedial Action Areas (RAs) 23 and 24 consistent with the Consent Decree and portions of RAs 19b, 20, and 22 as described in a confidential agreement with the City of Tacoma (the City). Portions of the waterway south of a sheet pile wall installed at Station 70+10 are the responsibility of the Utilities; this area is referred to in the remainder of the document as the Utilities' Work Area.

Construction of the remedy for the Utilities' Work Area was completed in February 2004 (DOF 2004a). The selected remedy for the Utilities' area of responsibility was containment of contaminated sediments south of waterway station 70+10. The primary components of the remedy are:

- Installation of a sheet pile wall at waterway station 70+10.
- Dredging beneath the current location of the scour protection apron at the head of the waterway and placement of capping and scour protection material where stormwater discharges from outfalls known as the Twin 96 outfalls.
- Placement of a high-density polyethylene (HDPE) cap over the former location of the State Route (SR) 509 seep.
- Placement of a sand cap over contaminated sediments and over the HDPE cap.
- Placement of slope cap and armor material on waterway slopes.

In addition to the physical remedy components described above, the Utilities' remedy also includes the following:

- **Deauthorization of the navigation channel south of 70+10.** This requires an act of Congress and representatives of the Utilities are working with congressional staff to achieve deauthorization. This deauthorization request is included in the Water Resources Development Act (WRDA) Bill. The House passed its version of WRDA

on April 19, 2007 and the Senate passed its version on May 16, 2007. Both versions contain the Head of the Thea Foss Deauthorization language. The WRDA conference report passed the House on Wednesday, August 1, 2007. Senate leaders expect the conference report to be taken up in September 2007 after they return from summer recess. As an interim step, the Utilities entered into a Memorandum of Agreement (MOA) with the U.S. Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers (Corps) on September 29, 2006, regarding the presence of the cap in the Head of the Waterway. The MOA describes the actions to be taken if the cap is deemed to be an obstruction to navigation. The City also signed the MOA as a sponsor.

- **Institutional Control Plan.** On September 29, 2006, EPA provided final approval for the Utilities' Institutional Control Plan (ICP) for the long-term maintenance of the Head of the Waterway. In January 2007, EPA approved the model restrictive covenant language. Throughout the months of January and February 2007, the City and the Utilities worked on finalizing and recording restrictive covenants for affected properties on the Waterway. Restrictive covenants have been filed for properties in the Head of the Waterway that are either owned by the City or where the City has a right-of-way and with the Foss Waterway Development Authority. The Utilities have three remaining restrictive covenants to obtain and record. One is with Foss Landing; the other two are for parcels that were transferred from Foss Landing to a new owner. The Utilities have drafted the covenants and forwarded them to the appropriate parties for signature. The Utilities are waiting for the covenants to be completed and returned so that they can be recorded.

- **Consent Decree Milestones**. The Utilities completed remedial action construction in Remedial Action Areas 23 and 24 and received a Certification of Completion of Remedial Action Construction from the EPA on September 29, 2006, in compliance with Paragraph 50 of the Utilities' May 9, 2003, Consent Decree with EPA.

  The next milestone for the project, as set forth in Paragraph 51 of the Consent Decree, is completion of remedial action for RAs 23 and 24. The Utilities submitted the Draft Remedial Action Completion Report to EPA on October 11, 2004; Tetra Tech EC, Inc. (TtEC) received EPA comments on the text on February 15, 2005, and submitted responses on March 21, 2005. EPA has indicated that to receive a Certificate of Completion pursuant to Paragraph 51.B, the Utilities must demonstrate that all restrictive covenants have been recorded. The Utilities will be prepared to submit the final Remedial Action Completion Report that demonstrates that the performance standards have been attained as soon as all of the individual restrictive covenants for the Head of the Waterway are in place.

The City is responsible for remediation north of the sheet pile wall installed at waterway station 70+10. Immediately north of the Utilities' Work Area, the City's selected remedy consisted of dredging and capping to maintain the required navigation depth of –19 feet mean lower low water (MLLW). During the 2004 to 2005 construction season, the City completed dredging and partial capping in part of the area next to the sheet pile wall (RA-20 and RA-22). Dredging by the City's contractor (Manson) in the adjacent remediation areas (RA-20 and RA-22) was completed between August 31 and September 17, 2004. Placement of a grout mat and final cap was completed in RA-19B (also adjacent to the sheet pile wall) during the previous 2003 to 2004 construction season. Additional cap placement was conducted by the City in December of 2005 in the Utilities' Work Area north of the SR 509 Bridge in the area of the Utilities' cap that was recontaminated during the City's remedial construction activities.

The City completed remedial action construction in the rest of the Waterway (area north of the sheet pile wall) and received a Certification of Completion of Remedial Action Construction from EPA on September 29, 2006.

1.1 PURPOSE AND OBJECTIVES

As part of the remedial design work, the Utilities prepared an OMMP that was approved by EPA (TtFW et al. 2003) and amended in March and April 2006 (PERCo 2006) and March 2007 (PERCo 2007). The objectives of the Utilities' OMMP are as follows:

- Confirm long-term attainment of Sediment Quality Objectives (SQOs) specified in the Record of Decision (ROD) (EPA 1989) and Explanation of Significant Differences (ESDs) (EPA 1997, 2000).
- Evaluate the effectiveness of source control.
- Evaluate the enhancement of habitat function and fisheries resources.

In 2007 there was a significant change in scope from the original OMMP (TtFW et al. 2003) due to the recontamination of the top of the cap documented in various letters and reports submitted in 2004 through 2006.

In September 2004, the northern portion of the Utilities' completed cap was recontaminated with construction residuals from adjacent dredging activities being conducted by the City as part of their remedial program. The City addressed the area of recontamination in December 2005 by placing additional capping material on top of the area of concern. As a contingency of its approval, EPA required the City to closely monitor the effectiveness of the cap to ensure its protectiveness. Subsequently, the scope of the Year 3 OMMP

sampling program in the Head of the Waterway was expanded to include additional sampling stations in the area where additional capping material was placed. The City was responsible for the collection and analysis of these samples. All activities related to the collection of these samples were coordinated between the City and the Utilities.

Data collected during the Year 1 (2005) and Year 2 (2006) OMMP sampling program confirmed that stormwater discharges are recontaminating the top of the cap. As of May 2006, 7 to 19 centimeters (cm) of very fine-grained sediment had accumulated on top of the southern portion of the Utilities' cap. Constituents detected in the fine-grained sediment are typical of the suite of chemicals normally found in stormwater and have also been detected in stormwater sediment collected from pipe-end sediment traps prior to discharge to the Thea Foss Waterway.

To further assess the stormwater recontamination issue, the City submitted a supplemental sampling proposal to EPA in November 2006 to monitor concentrations of phthalates and PAHs in the Head of the Waterway. Subsequently, the scope of the Year 3 OMMP sampling program was expanded to include additional compliance monitoring sampling to evaluate the concentrations trends for BEHP and PAHs. The City was responsible for these sampling requirements and coordinated their efforts with the Utilities as part of the Year 3 OMMP sampling program.

Commencement Bay
St. Paul Waterway
Middle Waterway
Thea Foss Waterway
Wheeler Osgood Waterway
Downtown Tacoma
Project Area
705
509
99
LOCATION MAP
Puget Sound
Browns Point
Commencement Bay
Vicinity Map Area
Tacoma
0 0.5 1 2
Miles
N
0 0.125 0.25
Miles
Head of Thea Foss Waterway Remediation Project
TETRA TECH EC, INC.
FIGURE 1-1
VICINITY MAP

2. OMMP ACTIVITIES

To meet the OMMP objectives, monitoring of the Utilities Work Area includes physical cap integrity, recolonization monitoring, and recontamination sampling. Table 2-1 is the schedule for OMMP monitoring as revised in March 2007 (PERCo 2007). Physical observations include periodic visual inspections of the cap and hydrographic surveys. Recolonization includes assessment using Sediment Profile Imagery (SPI) as well as collection of benthic abundance samples. Sediment sampling includes collection of samples for chemical and toxicity testing. Three types of sediment samples are collected as part of the OMMP:

- **Compliance Samples.** These are surface sediment samples collected from the depth interval of 0 to 10 cm. This is the point of compliance for application of the sediment quality objectives (SQOs).
- **Early-Warning Recontamination Samples.** Early-warning samples are collected to provide warning from possible "top-down" recontamination of the cap from sources such as stormwater. The early-warning samples are collected from depths of 0 to 2 cm from the cap surface. At any given point in time, this sediment represents the newest deposited sediment for the sample location.
- **Core Samples.** Core samples are collected to provide data to evaluate possible future "bottom-up" recontamination of the waterway cap.

In March 2006, the Utilities worked with the City to develop two sampling plan proposals for EPA's consideration. The first plan was developed to monitor the effectiveness of the additional capping material placed in the Head of the Waterway by the City in December 2005 to address contamination associated with the City's dredging operations. The sampling plan modified the existing OMMP for the Utilities' Work Area and increased sampling in the area of recontamination. The second plan was developed in response to SQOs exceedances for bis(2-ethylhexyl)phthalate (BEHP) in the Head of the Waterway; it outlined a proposed approach for biological testing. The City submitted the proposed plans to EPA on March 23, 2006.

In April 2006, the Utilities and the City worked with EPA and the Corps to adequately respond to EPA and Corps comments on the sampling plans. The Utilities submitted a revised plan for sampling the area of additional cap material placement to EPA on April 28, 2006 (PERCo 2006). The revised plan was approved by EPA on May 4, 2006. EPA approved the March 23, 2006, Biological Testing Sampling Plan on May 1, 2006.

On November 28, 2006, the City submitted a technical memorandum to EPA outlining their proposal for additional sampling in the Head of the Waterway to monitor concentrations of phthalates and polycyclic aromatic hydrocarbons (PAHs). The proposal was developed in response to the presence of phthalates and PAHs in early warning and compliance samples at concentrations that exceeded their SQOs as part of the Year 2 OMMP sampling event. Biological testing of a subset of the compliance stations confirmed that biological effects were observed in the bioassay test organisms.

On February 12, 2007, EPA and the Corps provided comments on the City's November 28, 2006, technical memorandum. On March 28, 2007, the Utilities, in cooperation with the City, provided a response to the comments provided by EPA and the Corps. The responses were discussed with the agencies in advance and the Utilities and the City received EPA approval of the plan for supplemental sampling April 12, 2007.

The EPA-approved revision to the OMMP monitoring schedule in March 2007 (PERCo 2007) outlines the schedule for physical cap integrity monitoring and recontamination sampling. This revised table replaces Table 2-2 of the OMMP. Monitoring is to be completed on an annual basis for the first 5 years and in years 7 and 10. The specific monitoring tasks vary between years. Monitoring locations are shown in Figure 2-1.

2.1 YEAR 0 OMMP ACTIVITIES

The results of physical observations and sediment sampling completed in the period from February to July 2004 are documented in the Year 0 OMMP report (DOF 2004b). Physical observations were made in May and July 2004 and sediment sampling (surface and core sampling) was completed in April 2004. The April 2004 sampling provides baseline data on the condition of the Utilities' cap soon after the cap was completed in February 2004. Analysis of the April 2004 data indicated that stormwater constituents were accumulating on the Utilities' cap and that concentrations of high molecular weight polycyclic aromatic hydrocarbons (HPAHs) and BEHP were highly correlated (R=0.99) indicating a common source.

2.2 YEAR 1 ACTIVITIES

In March 2004, EPA requested that the Utilities' make more frequent physical observation of the Utilities' Work Area than anticipated by the EPA-approved OMMP (EPA 2004). Physical observations that were made in May, July, September, and December 2004 and April 2005 are discussed in the Assessment of Utilities' Cap Recontamination and Data Summary (DOF and TtEC 2005). Because of the severe recontamination of the sediment surface on top of the Utilities' cap discovered in September 2004, supplemental sampling

was completed that was not part of the Year 1 OMMP monitoring schedule. The physical observations that were made in September and December 2004 and April 2005 as part of EPA's OMMP requirements were also used to assess the sources of sediment recontamination on the cap. Sediment and cap sampling (including both surface and core sampling) was completed in August, September, November, and December 2004. The results of the physical observations and sampling completed between August 2004 and April 2005 are documented in DOF and TtEC (2005) and indicated that the cause of recontamination (primarily north of the SR 509 Bridge) was City remedial construction work largely completed between September and December 2004. Recontamination constituents included PAHs, phthalates, pesticides, and polychlorinated biphenyls (PCBs).

The results of physical observations and sediment sampling completed in May 2005 are documented in the Year 1 OMMP report (DOF 2005). The OMMP monitoring schedule for Year 1 called for visual monitoring of the former SR 509 seep area and collection of top-down, early-warning sediment samples (0 to 2 cm) from the 14 established OMMP sampling locations (RC-1 to RC-14). Physical observation of the former SR 509 seep area was completed on June 22, 2005 and collection of the early-warning sediment samples was completed on May 11 and 12, 2005.

In addition to the samples specified in the Utilities' OMMP, supplemental "compliance" samples (0 to 10 cm) were obtained in the area of recontamination north of the bridge and analyzed by the Utilities and the City. The City also collected sediment samples from their work area in RA-19B, RA-20, and RA-22.

The sampling results indicated that SQOs were exceeded in one or more compliance (0 to 10 cm) samples. They include individual PAHs, total low molecular weight polycyclic aromatic hydrocarbons (LPAHs), total HPAHs, BEHP, 4,4'-dichlorodiphenyldichloroethylene (DDE), 4,4'-dichlorodiphenyldichloroethane (DDD), and total PCBs. The highest exceedance factors were detected in samples from stations S-15 and WC-11 located near the sheet pile wall. SQO exceedance factors ranged between 1.4 (naphthalene and 4,4'-DDD) and 8.4 (acenaphthene).

Sediment concentrations were higher than the SQOs in one or more early-warning (0 to 2 cm) samples. They include mercury, individual PAHs, total LPAHs, total HPAHs, dimethylphthalate, BEHP, 4,4'-DDD, and total PCBs. The highest exceedance factors were detected in samples from stations RC-1, RC-9, RC-11, and RC-12. SQO exceedance factors ranged between 1.3 (total PCBs) and 6.3 (BEHP).

2.3 POST-CITY REMEDIAL ACTION

Due to recontamination of the Utilities' cap by the City's construction activities, the City placed additional cap material in the northern section of the Head of the Thea Foss in December 2005 (shown in Figure 2-1). Details of the observations made and the confirmation sampling were included in the Year 2 OMMP report (TtEC 2006). In summary, the capping operation went smoothly. The Telebelt was particularly well-suited to deliver discrete volumes of sediment in a controlled manner. Observations made with a leadline and underwater camera during the operation seemed to confirm the desired thicknesses was obtained throughout the entire capping area. Removal of a high spot under the Foss Landing boat lift was necessary and completed on May 26, 2006.

2.4 YEAR 2 ACTIVITIES

The Year 2 monitoring results conducted in May and June of 2006 are documented in the Year 2 OMMP report (TtEC 2006). Year 2 monitoring included making physical observations, conducting recolonization monitoring, and collecting sediment samples in the Head of the Thea Foss Waterway.

The physical cap integrity was assessed with visual observation of the former SR 509 seep area, scour protection apron, and slope cap performed on June 14, 2006. There were no obvious signs of significant erosion besides what was noted in the Year 0 and Year 1 observations.

The assessment of the waterway cap was conducted with a hydrographic survey performed on May 10, 2006. Changes in elevation were noted as compared to the baseline survey conducted in February 2004 at the completion of the remedy. There was an increase in elevation where capping material was placed by the City in December 2005, after the single-beam survey was conducted at the north end of the project area. This high spot was removed in May 2006. There was a decrease in elevation in an area that had capping material placed a short time prior to the single-beam survey in February 2004. The reduction in elevations in this area is most likely due to consolidation of the deposited sand and gravel capping material and/or the underlying sediment over the last 1.5 years, and is consistent with the consolidation calculations made during design. EPA requested further monitoring in two areas with differences greater than 1 foot as part of the Year 3 OMMP field activities.

The effectiveness of the City's cap and the chemical quality of in-place capping materials with respect to the SQOs performance standards were assessed with collection and analysis of sediment samples collected May 11 through May 18, 2006 as follows:

- Fourteen compliance (0 to 10 cm) samples (WC01 to WC14) with collection of extra material for bioassay testing at 11 stations south of the bridge,
- Four supplemental samples from the area where additional capping material was placed by the City on the north side of the Utilities' work area following recontamination by dredging (S-15, S-17, S-19, and S-24),
- Fourteen early-warning samples (0 to 2 cm) (RC-01 to RC-14),
- Six cores (WC-01, WC-04, WC-05, WC-06, WC-10, and WC-12), and
- Thirteen discrete slope cap locations (0 to 10 cm from fine-grained areas between -1 and +6 MLLW) composited into samples SC-01 to SC-04.

Ecological performance of mitigation/restoration activities were assessed with the collection of:

- Eighteen SPI stations (WC-01 to WC-14 and S-15, S-17, S-19, and S-24), and
- Four benthic infauna stations (R-1 to R-4).

Waterway Cap Samples

A silt layer of light olive color overlying a dark olive, gray to black silt layer was observed at most waterway cap locations. Benthic fauna and flora (i.e., worms, shell fragments and/or kelp) were observed at all waterway cap locations. Oily sheens and sheen spots were noted in the top silt layer at two locations RC/WC-04 and RC/WC-14. The thickness of fine-grained material ranged from 0.5 to 17 cm throughout the waterway cap area. The deposition of fine-grained material was greatest in the central areas south of the SR 509 Bridge and north of the scour protection apron with up to 17 cm of deposition. The compliance sample locations within the City recontamination capping area (RC/WC-11 and RC/WC-12) had accumulated 1 cm of fine-grained material on top of the cap material placed in December 2005.

All of the waterway cap compliance samples (0 to 10 cm) south of the SR 509 Bridge (11 samples) and the two slope cap composites on the east side of the waterway contained samples with one or more sediment chemistry result exceeding an SQO. SQOs were exceeded in one or more compliance samples south of the bridge for individual PAHs, total HPAH, BEHP, and phenol. BEHP concentrations were higher than the SQO of 1,300

micrograms per kilogram (µg/kg) in all the compliance samples collected south of the bridge in May 2006.

Most of the maximum exceedance factors were detected in the sample from station WC-02 located in the southeast corner of the Head of the Waterway. This is a depositional area from the Twin 96ers and is adjacent to the scour protection apron. SQO exceedance factors ranged between 1.0 (benzo[a]pyrene, total HPAH, and phenanthrene) and 5.9 (BEHP).

All 15 of the early-warning samples (0 to 2 cm) contained BEHP above the SQO of 1,300 µg/kg. Samples collected at RC-01, RC-02, RC-04, and RC-13 contained concentrations of individual PAHs and/or total HPAH that exceeded the SQOs. Consistently, the concentrations of contaminants were higher in the 0 to 2 cm sample than in the 0 to 10 cm sample.

Slope Cap Samples

Slope cap samples have a different depositional pattern and do not accumulate as much silt as the waterway cap sample locations. With the exception of SC-03 and SC-04 for BEHP, contaminants were detected at concentrations well below their respective SQOs in each of the slope cap samples.

Core Samples

Cores consisted of dark olive gray silt overlying coarse sand cap material. The core collected at WC-01B contained 19 cm of silt on top of the sand cap. The bottom increments of each core contained sand cap material with very little fine-grained material. Samples from the top increments of each core were analyzed at the laboratory for chemistry. All six of the core samples contained concentrations of contaminants well below the SQOs.

Toxicity Samples

Based on criteria outlined in the March 23, 2006, Biological Testing Plan, four sampling locations were selected for bioassay testing including locations WC-02, WC-04, WC-05, and WC-06. Selected samples were subjected to two acute biological effects tests and one chronic biological effects test in accordance with the Utilities' QAPP (TtFW et al. 2003). These tests are used to more directly evaluate the toxicity of contaminated sediments to creatures that live in sediment by exposing sand fleas, mussel larvae and juvenile worms to contamination. Bioassay testing indicated that the sediment contamination had an impact on the mussel larvae in three of the four sampling locations, on the sand fleas in one of the four sampling locations, and no impact on the juvenile worms.

Recolonization

Recolonization is primarily assessed by SPI. While recolonization has definitely taken place, there were several notable findings from this initial SPI monitoring survey. Extensive burrow formations were not seen, and only one image showed evidence of infaunal reworking in the top 5 cm of the cap material at the four northernmost stations located within the City recontamination capping area. It appears that sediment quality in the southern end of the area surveyed is definitely compromised by the nature of material being discharged by the twin outfalls at the southern end of the waterway. While the cap appears to be an effective isolation barrier from upward migration of contaminants, the more recent deposition of organically enriched, fine-grained material has limited the utility of the area as suitable habitat for mature benthic communities and also eliminated the original benefit of placing the "habitat mix" as an attractive surface for fish foraging.

2.5 SUPPLEMENTAL YEAR 2 ACTIVITIES

In addition to the annual visual observation at low tide, two site visits occurred; one on January 2, 2007, and the second on February 23, 2007. Inspections were performed in conjunction with the City of Tacoma's periodic observation of City stormwater outfalls 254, 249, 248, 245, 243, 237a and b, 235, and 230 in the Thea Foss Waterway after the rainfall event on November 6, 2006 that exceeded the 100-year 24-hour design storm. The first visit was conducted on January 2, 2007, during low tide. The purpose of this site visit was to inspect the scour protection apron at the head of the waterway in front of the twin 96-inch outfalls and the outfall scour aprons in front of outfalls 235 and 243 on a negative low tide. Displacement or settlement of armoring materials or adjacent slope capping materials was assessed and documented as required by Section 3.1.2.2 of the Operation, Maintenance, and Monitoring Plan for the Head of the Thea Foss Waterway Project (TtFW et al. 2003). Details of the January 2 observations are included in the memorandum in Appendix A.1.

The scour protection adjacent to outfall 243 (at Station 73+40 on the east side of the waterway under the SR 509 Bridge) showed no signs of erosion. The condition of the scour protection apron at the south end of the waterway (at the base of outfalls 237a and 237b) was similar to what was previously noted in the Year 0, Year 1, and Year 2 low tide site observations: a small, shallow channel is present in the apron near the southeast corner of the waterway. The configuration and shallow depth of this channel appear unchanged from previous observations and the overall integrity of the cap has not been adversely impacted by the presence of this localized feature.

There were signs of displacement or subsidence in the scour protection apron in front of outfall 235 (at Station 73+20 on the west side of the waterway under the SR-509 Bridge).

Water from heavy rain in the hours preceding the January 2 site visit was flowing out of this outfall into a relatively deep pool directly in front of the outfall.

A follow-up site visit was conducted on February 23, 2007, during low tide to inspect the outfall scour apron in front of outfall 235 as a follow-up to the January 2, 2007 site visit and quantify the post-construction changes in the scour apron. The small outfall scour protection in front of Outfall 235 has been displaced outward approximately 4 to 5 feet. There is a pool in front of the outfall ranging in depth from 12 inches to 24 inches deep. The pooling and small outfall scour protection material displacement appears to be the result of high velocity discharge or high flows from the outfall. There was no evidence suggesting that the underlying cap is being affected or that the concrete apron has been undermined. It appears that slope protection rock is still in place beneath the pool, covered by a coarse sand and gravel layer. Given the stable appearance of the conditions at the time, it was determined that no corrective action was required. The conditions will continue to be monitored over time. Photos and details of the February 23 site observations are included in the memoranda in Appendix A.2.

2.6 YEAR 3 ACTIVITIES

TtEC was contracted by the Utilities to implement the third year of the OMMP program by making physical observations and collecting sediment samples in the Head of the Thea Foss Waterway. The Year 3 OMMP sampling program was designed to meet the following objectives:

1. Assess the cap integrity with physical monitoring consisting of visual observations and collecting cores and/or prodding the sand cap.
2. Assess the effectiveness of the City's placement of the additional capping material in the area of recontamination within the Utilities' Work Area.
3. Provide data to assess the chemical quality of in-place capping materials with respect to the SQOs performance standards. Assess the overall change in contaminant concentrations in surface sediment since the baseline conditions were established in April 2004.
4. Determine the approximate area where SQOs are exceeded at the point of compliance (0 to 10 cm).
5. Provide additional data to assess the top down recontamination of capping materials.

Objective No. 1 was met by conducting a visual observation of the scour protection apron and slope cap on May 16, 2007 and the former SR 509 seep area on May 16 and 17, 2007. The Utilities also collected qualitative core samples at two locations to verify the thickness

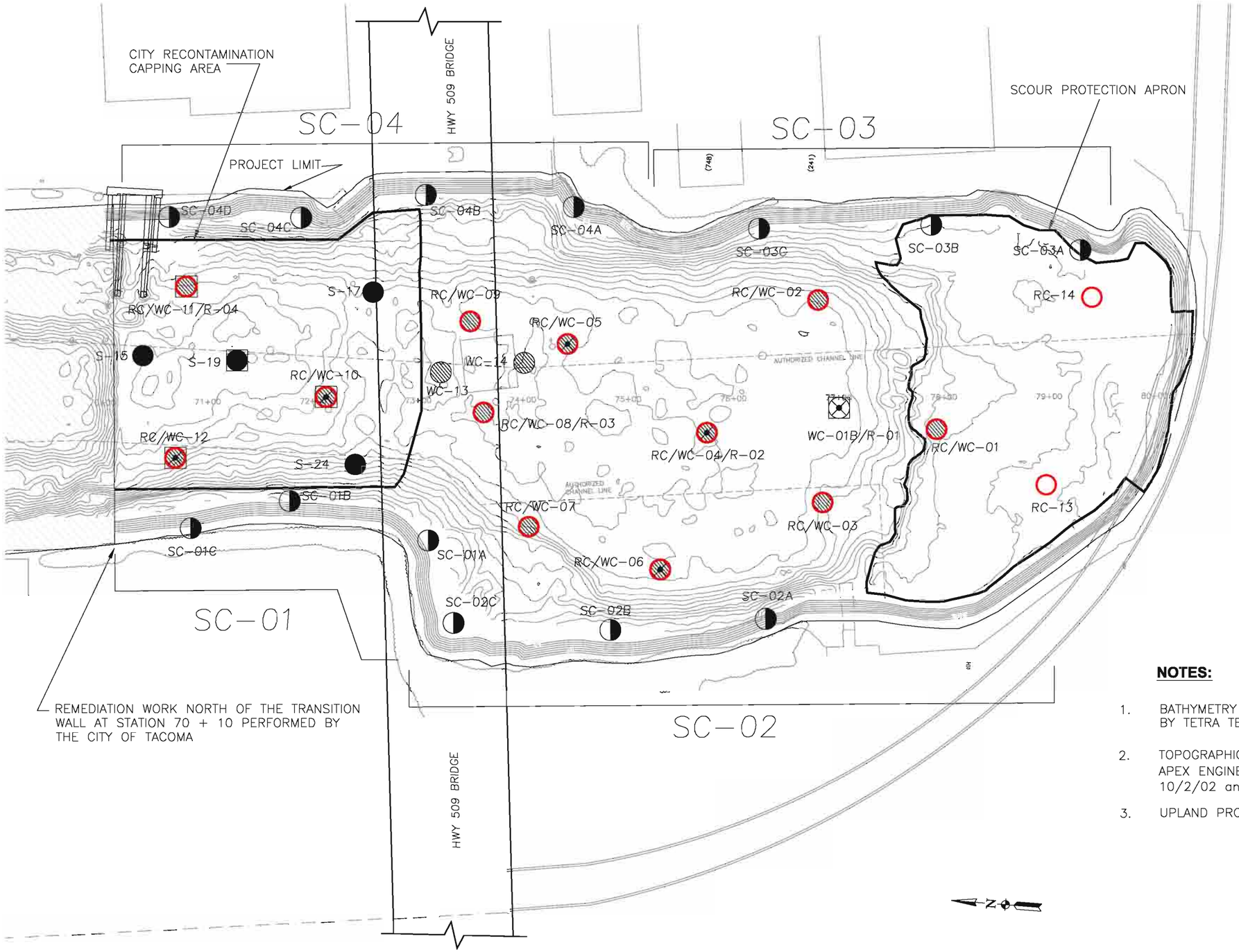
of the sand cap. This work was conducted at the request of EPA and the Corps because a comparison of the bathymetry between Year 0 and Year 2 had indicated that there had been a greater than one foot change in cap elevation. One core was located on the west bank near Outfall 235; the other core was located in the central basin. This work was completed on May 17, 2007; details of physical monitoring are discussed in Section 3.

Objectives 2 through 5 were met with collection and analysis of two types of sediment samples, early warning recontamination samples (0-2 cm) collected on behalf of the Utilities and compliance samples (0 to 10 cm) collected on behalf of the City. The Utilities and the City coordinated the Year 3 OMMP sampling requirements and a single sampling event was conducted from May 16, 2007, through May 17, 2007. All laboratory analysis was performed by Analytical Resources, Incorporated (ARI). The Utilities received the early warning sampling results from ARI on June 8, 2007, and the data was independently validated. The Utilities transmitted the validated early warning results to the City on July 5, 2007. The City conducted a quality assurance review of the compliance samples and transmitted the data to the Utilities on July 10, 2007. The Utilities did not conduct an independent quality assurance review of the compliance data received from the City. The City will submit a separate report of the compliance data to EPA.

Table 2-1. OMMP Schedule (Revised March 2007 [PERCo 2007])

	Year 0[2,6]	Year 1[6]	Year 2[3,6]	Year 3[6]	Year 4[6]	Year 5[6]	Year 6[6]	Year 7[4,6]	Year 8[6]	Year 9[6]	Year 10[6]
Assumed Sediment Deposition											
Amount (cm)[1]	0	1.5	3	4.5	6	7.5	9	10.5	12	13.5	15
MONITORING TASK											
Physical Cap Integrity	x		x		x			x			x
Recontamination Sampling											
Compliance Sampling (0-10 cm)	x		X[7]	X[8]	X[7,9]			x			x
"Top Down" (0-2 cm)	x	x	x	x	x	x		x			x
"Bottom Up" Migration (0-3 ft)	x		x		x			x			x
"Visual" SR509 Seep Monitoring [5]		x	x	x	x	x		x			x
Recolonization Monitoring			x		x			x			x

[1] Work completed by Hart Crowser suggests a sediment deposition rate of 1 to 2 cm/year.
[2] Completed soon after cap placement as part of CQAP and OMMP.
[3] First 5-year review (Based on EPS's review cycle). Adjust monitoring schedule based on first 5 years of data.
[4] Second 5-year review
[5] To be completed during daylight low tides (June/July)
[6] Significant natural events may trigger additional monitoring activity. These events include a 50-year 24-hour storm event, one percent flood discharge (commonly called the 100-year flood event) or greater, or the occurrence of a design level seismic event (i.e., 4.5 magnitude or greater)
[7] Samples will be collected and analyzed from four additional locations (i.e., S-15, S-17, S-19, and S-24) within the area of additional cap material placement during Year 2 and Year 4 monitoring. The additional samples from Stations S-15, S-17, S-19, and S-24 are in addition to the three samples that are to be collected from the existing sample stations (i.e. WC-10, WC-11, and WC-12) within the area of additional cap material placement. Results from the four additional sample locations together with three existing sample locations will be used to monitor the effectiveness of the additional cap material placement.
[8] EPA directed the City to collect compliance monitoring samples from the 14 existing sample locations (WC01-WC14) as well as four additional locations (i.e., S-15, S-17, S-19, and S-24) during Year 3 monitoring.
[9] The results from compliance sampling and analysis within the area of additional cap material placement during Year 2, 3, and 4 will be used to evaluate whether sample collection and analysis from the additional locations (i.e., footnote g) or additional monitoring events (i.e., footnote h) are warranted during subsequent monitoring years.



LEGEND:

- MAJOR CONTOUR LINES
- CITY OF TACOMA WORK AREA
- RC "EARLY WARNING – TOP DOWN SAMPLE" (0–2cm)
- SC SLOPE COMPLIANCE COMPOSITE (0–10cm)
- WC WATERWAY CAP COMPLIANCE SAMPLE (0–10 cm)
- WC EARLY WARNING SUBSURFACE CORE
- SPI SAMPLE
- SUPPLEMENTAL SAMPLE LOCATION

RC	RECONTAMINATION
WC	WATER CAP
SC	SLOPE CAP
R	RECOLONIZATION (BENTHIC INFAUNA)
SPI	SEDIMENT PROFILE IMAGERY

NOTES:

1. BATHYMETRY SURVEY UP TO ELEVATION +5 MLLW COMPLETED BY TETRA TECH EC ON MAY 10, 2006
2. TOPOGRAPHIC DATA SHOWN ABOVE +5 MLLW WAS PROVIDED BY APEX ENGINEERING LLC, DATED 2/7/02, 3/8/02, 5/16/02, 10/2/02 and 10/12/02.
3. UPLAND PROJECT LIMIT IS +12 FEET MLLW.

GRAPHIC SCALE
50' 0 25' 50' 100'
(IN FEET)

Thea Foss Waterway

Head of The Thea Foss Waterway
Post-Construction Monitoring

TETRA TECH EC, INC.

Figure 2-1
OMMP Monitoring Location Plan
May 2007

P:\2562_THEA FOSS\THEA FOSS\OMMP\YEAR 3 MAY 07\CAD\FOSSFIGURE-MAY 07 REVISED\FOSSFIGURE2-1.DWG
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2-11

3. PHYSICAL OBSERVATIONS

Physical observations for Year 3 OMMP monitoring included a visual inspection of the cap at low tide and collection of cores at two locations where the Year 2 bathymetry showed a difference in elevation of more than 1 foot. The purpose of the physical observations was to assess the cap integrity. The visual inspection assessed the slope cap and outfall scour cap protection and the cores assessed the cap thickness in portions of the waterway cap.

3.1 VISUAL INSPECTION

A visual inspection of the cap was made on May 16, 2007, during a predicted low tide of –3.25 feet MLLW and the physical observations are documented in Appendix B. Overall, the May 2007 observations were similar to previous site visits that indicated the following:

- The scour protection apron is functioning as intended. No obvious signs of significant erosion were observed. As previously noted in the Year 0, Year 1, and Year 2 observations, a small, shallow channel is present in the apron near the southeast corner of the waterway. The configuration and shallow depth of this channel appear unchanged from previous observations and the overall integrity of the cap has not been adversely impacted by the presence of this localized feature.
- Side slopes show no visible evidence of slope erosion, sloughing, etc.
- Gas bubbles occur throughout the head of the waterway during lower tides; however, no rising non-aqueous phase liquid sheens were observed in the former SR 509 seep area or elsewhere in the Utilities' Work Area during the Year 3 field investigation and cap inspection activities on May 16 and 17, 2007.
- While surface sheens were observed at times in the vicinity of the Foss Landing Marina, no sheens were observed during the site visit in May.
- The scour protection adjacent to Outfall 235 (at Station 73+20 on the west side of the waterway under the SR 509 Bridge) shows no further signs of erosion or displacement beyond what was noted during January and February 2007 site visits.
- At the former Standard Chemical Site, a baker tank is discharging into the stormwater system just upstream of Outfall 235.

3.2 WATERWAY CAP INSPECTION

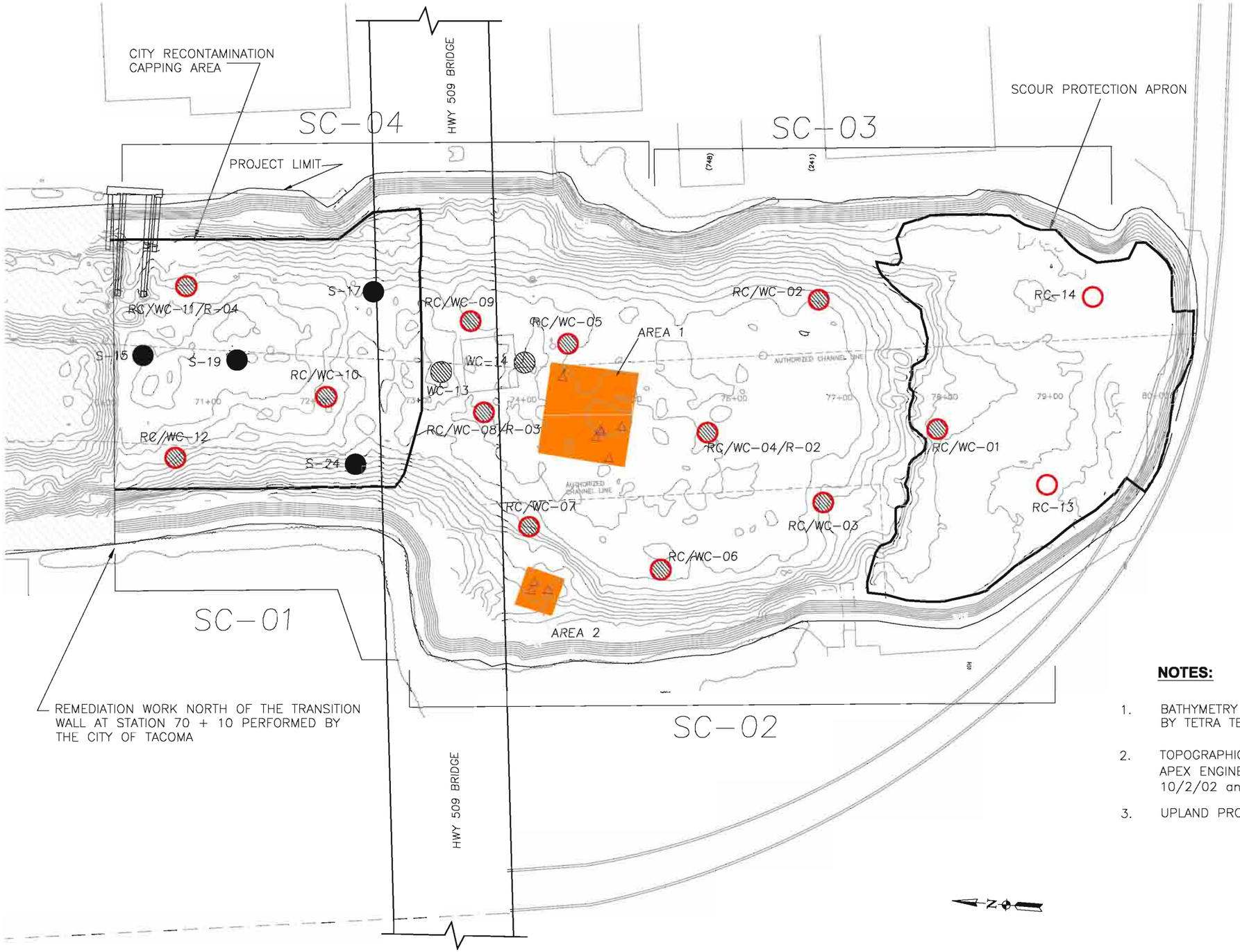
The May 2006 multibeam survey was compared to the baseline single-beam survey conducted in February 2004. The Year 2 OMMP report detailed the difference in elevation from the two surveys. TtEC qualitatively evaluated the thickness of the waterway cap in two areas that were shown to have greater than 1 foot difference between the two surveys. The purpose of the survey was to document the thickness of the sand cap to verify that the cap was approximately 3 feet thick. The request for visual inspection and documentation of cap thickness came from EPA and the Corps to satisfy a requirement in the OMMP that any change in depth more than 1 foot would be investigated to determine if the change was related to erosion of the cap. The primary equipment utilized to evaluate cap thickness in the two cap areas was a slide hammer core, a piston core, and a 10-foot or 20-foot length of rebar marked off in 1-foot intervals. Field notes and photos from the cap thickness evaluation are included in Appendix C.

The first area inspected was in the central waterway area. The location (Area 1) is shown on Figure 3-1. Multiple attempts at multiple locations within this area were made using the slide hammer corer to collect a core to evaluate cap thickness of at least 3 ft in length. However, a successful 3-foot core was not collected in the corer due to resistance at approximately 2 to 2.5 feet. Alternatively, a section of rebar was pushed into the sand cap to assess how thick the sand was before hitting silt or refusal. An average cap thickness of 4.2 feet of sand was judged to be present in the middle of the waterway by feeling and hearing the sand scrape on the metal rebar when inserting and pulling it out of the sand cap. In addition, it was documented in the core attempts and noted in the resistance with the rebar that there was a layer of fine-grained material on top of the cap. This layer was approximately 6 inches thick. Figure 3-2 shows a schematic of the material section encountered in the central waterway (Area 1).

The second area inspected was along the west shoreline, south of SR 509 Bridge. The sample location (Area 2) is shown on Figure 3-1. The piston corer was used to collect several attempts at this location. The second attempt with the piston core could not penetrate more than 1.5 feet. Multiple probes with the rebar indicated sand for greater than 3 feet by feeling and hearing the sand against the rebar when pushed into the cap and pulled out of the cap. The third attempt of the piston core penetrated 3 feet with recovery of material of 2.8 feet. The core contained 2.5 feet of sand cap material with silt below (see Appendix C photos). No surface layer of fine-grained material was noted at this location. Figure 3-2 shows a schematic of the material section encountered in the west bank (Area 2).

The qualitative evaluation of the cap thickness confirmed that the apparent change in cap thickness noted by the bathymetric surveys was not due to erosion and that the original cap

thickness of 3 feet has been maintained in both the areas evaluated. The difference in elevations is likely due to consolidation (as predicted during design) or uncertainty between bathymetry techniques.



LEGEND:

- MAJOR CONTOUR LINES
- CITY OF TACOMA WORK AREA
- RC "EARLY WARNING – TOP DOWN SAMPLE" (0–2cm)
- WC WATERWAY CAP COMPLIANCE SAMPLE (0–10 cm)
- SUPPLEMENTAL CITY AREA SAMPLE
- CAP THICKNESS EVALUATION AREA
- CAP THICKNESS EVALUATION LOCATION

RC RECONTAMINATION
WC WATER CAP
S SUPPLEMENTAL CITY AREA SAMPLE

NOTES:

1. BATHYMETRY SURVEY UP TO ELEVATION +5 MLLW COMPLETED BY TETRA TECH EC ON MAY 10, 2006
2. TOPOGRAPHIC DATA SHOWN ABOVE +5 MLLW WAS PROVIDED BY APEX ENGINEERING LLC, DATED 2/7/02, 3/8/02, 5/16/02, 10/2/02 and 10/12/02.
3. UPLAND PROJECT LIMIT IS +12 FEET MLLW.

Thea Foss Waterway

Head of The Thea Foss Waterway
Post-Construction Monitoring

TETRA TECH EC, INC.

Figure 3-1
YEAR 3 OMMP Monitoring Locations
May 2007

P:\2562_THEA FOSS\THEA FOSS\OMMP\YEAR 3 MAY 07\CAD\FOSSFIGURE-MAY 07 REVISED\FOSSFIGURE 3-1.DWG
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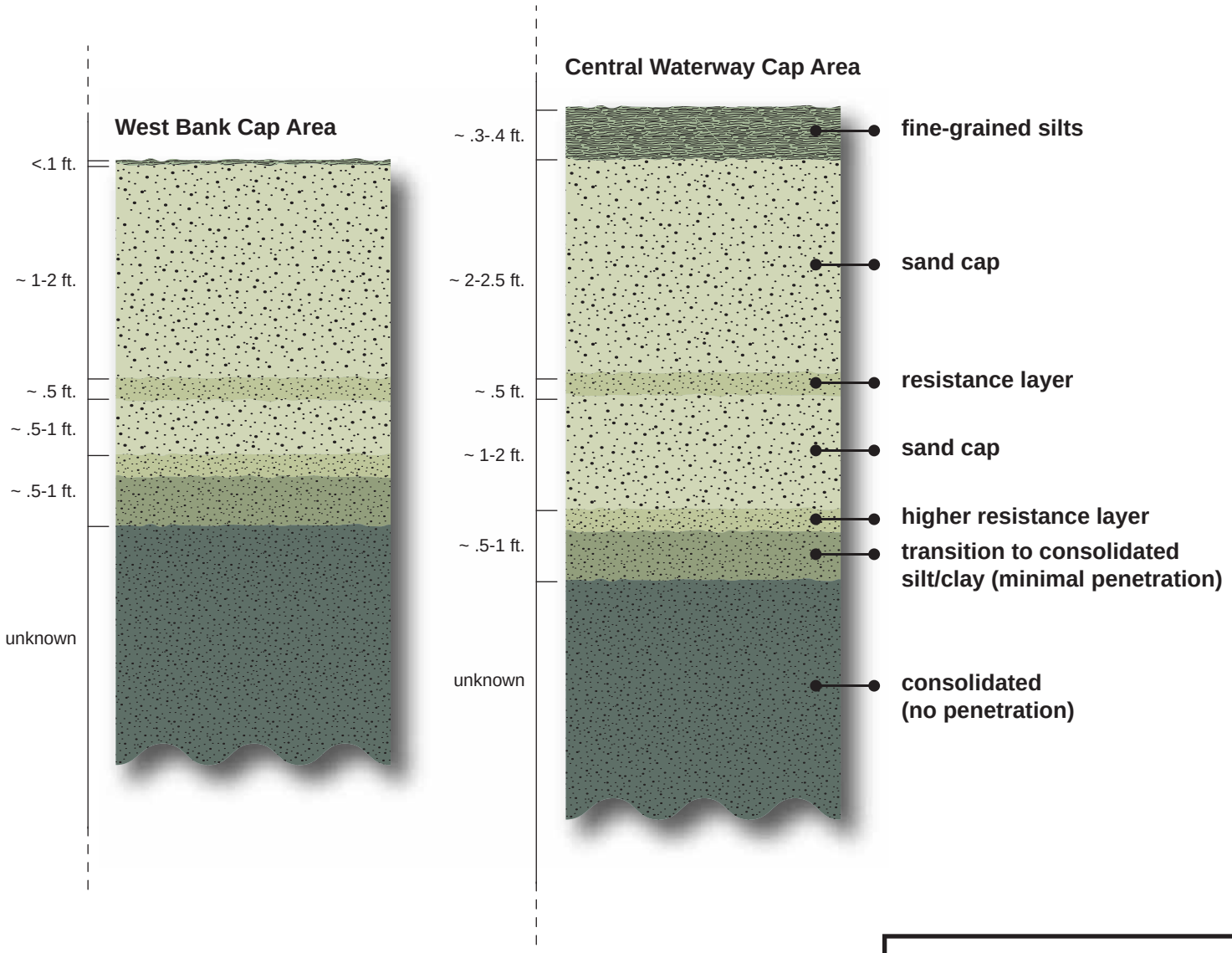
3-5

Typical Section



Note: Typical material sections based on visual observations of cores and results of sediment probes. Scales represent range of condition encountered in field samples.

Head of The Thea Foss Waterway
Post-Construction Monitoring

TETRA TECH EC, INC.

Figure 3-2
Cap Material Section Schematics
July 2007

4. SEDIMENT SAMPLES

TtEC collected 14 surface sediment samples (RC; 0 to 2 cm deep) from OMMP locations (RC/WC-01 through RC/WC-12, RC-13, and RC-14) on behalf of the Utilities plus one field split sample at RC-08. Floyd Snider collected the compliance samples (WC; 0 to 10 cm deep from OMMP locations [RC/WC-01 through RC/WC-12, WC-13, and WC-14]) and four supplemental locations (S-15, S-17, S-19, and S-24) on behalf of the City plus one field split sample at S-15. Year 3 sample locations are shown in Figure 3-1.

Summary of Year 3 OMMP Samples

Sample	Full SQO Chemical Analytes[1/]	Partial SQO list (PAHs and phthalates)[2/]	Partial SQO List[3/]
Waterway Cap Compliance (WC; 0-10 cm grab)[4/]	3	11	
"Top-Down" (RC; 0 to 2 cm grab)[5/]			14
City Cap Area (0 to 10 cm grabs)[4/]	4		

[1/] Semivolatile organic compounds, metals (mercury, zinc, lead), PCBs, TOC, grain size, and DDT compounds.
[2/] PAHs and phthalates
[3/] PAHs, BEHP, metals (mercury, zinc, lead), PCBs, TOC, grain size, and TPH diesel and motor oil.
[4/] Samples collected and analyzed by City of Tacoma.
[5/] Samples collected and analyzed by Utilities.

4.1 SAMPLING AND ANALYSIS

In all, 34 sediment grab samples were obtained, including quality control (QC) samples, and were hand delivered to ARI for analysis by Jennifer Hawkins of Tetra Tech EC on behalf of the Utilities. Jessi Massingale of Floyd Snider collected the 0 to 10 cm surface sediment samples on behalf of the City.

4.1.1 Field Methods

Sampling was conducted from a vessel using a 0.1 m^2 van Veen stainless-steel grab sampler for the early-warning and waterway cap compliance samples. The van Veen sampler retrieved relatively undisturbed sediment samples representative of in situ sediment conditions. The vessel was provided and operated by Sound Vessels, Inc.

Surface sediment was collected following Puget Sound Estuary Program (PSEP)/Puget Sound Dredged Disposal Analysis (PSDDA) procedures, including collecting sediment from the center of the sampler, avoiding material that touched the sampler sides, and homogenizing each sample in a stainless-steel bowl using a stainless-steel spoon. Samples at RC/WC-01, RC-13, and RC-14 were collected at low tide using stainless-steel bowls and

spoons following PSEP procedures. Sampling equipment was provided by TtEC and was decontaminated in the field. A separate set of decontaminated sampling equipment (i.e., stainless-steel bowls and spoons) was used at each location. The grab sampler was decontaminated before and after each sample location with Alconox®, site water, and distilled water rinse. Samples and split samples were collected from the homogenized sediment in the stainless-steel bowl.

Sample information was recorded for each sample on log sheets, included in Appendix C. Sample collection data and sediment descriptions are summarized in Appendix D.

Fourteen early-warning samples (0 to 2 cm) were collected at 14 OMMP locations (RC/WC-01 through RC/WC-12 and RC-13 and RC-14). Waterway cap compliance samples (0 to 10 cm) were collected at 14 OMMP locations (RC/WC-01 through RC/WC-12 and WC-13 and WC-14) and at four supplemental locations in the area where additional capping material was placed by the City (S-15, S-17, S-19, and S-24) (Figure 3-1).

Digital pictures were taken during field efforts of sampling and procedures. Pictures and the photo log are included on a CD contained in Appendix C.

To verify the performance of field sampling activities, QC samples were collected for laboratory analysis. Field QC sampling (field splits) and rinsate blanks were collected to check sampling and analytical accuracy and precision. A total of two field splits were collected at location RC/WC-08/R-04 and S-15: one split for the early-warning samples and one split for the compliance samples. Field splits were sampled from the same stainless-steel bowl as the original sample. Two rinsate blanks were collected to represent collection of the RC samples and WC samples.

4.1.2 Chemistry Analysis

All chemical analyses were conducted at ARI. Analyses of RC samples included a partial list of SQO compounds. The partial list included PAHs and BEHP, metals (lead, zinc, mercury), PCBs, total organic carbon, total petroleum hydrocarbons, and grain size. Analyses of samples collected from the area where additional capping material was placed (WC-10, WC-11, WC-12, S-15, S-17, S-19, and S-24) included the full list of SQO compounds. WC samples collected from the area beneath and south of the SR 509 bridge were analyzed for PAHs and phthalates.

4.1.3 Data Validation of Chemistry Results

R. Farlow of DMD, Inc. validated the Utilities' chemistry data results from ARI. The validation report is included in Appendix E. This analytical/validation team has been responsible for the sediment analyses since implementation of the Utilities' OMMP in April 2004. Consistent analytical protocols and the same instruments were used from April 2004 to the present. For the May 2007 OMMP analyses, DMD completed the equivalent of a QA-1 review.

Sample results reported in Appendices E and F are determined to be in general compliance with method and quality assurance project plan (QAPP) requirements. Some deviations from specified performance goals are associated with matrix effects from contaminated samples. Sample extracts/digestates were rerun/reanalyzed when QC performance goals were not initially met. Continuing deviations in subsequent analyses were identified and flagged, generally resulting in identifying associated values as estimates with the "J" qualifier code. All reported data for Year 3 OMMP results listed in Appendices E and F are considered usable for the intended purposes of the project. The laboratory data reports are provided in Appendix G.

Data validation of the compliance (WC) and supplemental (S) samples collected by the City was performed by City personnel. The results of the City's validation process are included in the report prepared by the City and are not repeated here. The City data are included in this report for completeness.

4.2 SEDIMENT SAMPLE DESCRIPTIONS

Visual inspection of surface samples indicates that fine-grained material has been deposited on top of the Utilities' cap since completion of remedial construction. Appendix D summarizes the locations and descriptions for each grab and core sample collected.

Representative photos are included in Appendix C.2 (on CD).

4.2.1 Waterway Cap Compliance Samples (0 to 10 cm)

Compliance samples were collected for two reasons during the Year 3 OMMP: to monitor the area of additional capping material (seven samples), and to evaluate trends of BEHP and PAH in the area beneath and south of the SR 509 Bridge.

Area South of the Bridge

Eleven samples consisting of the top 0 to 10 cm were collected at OMMP locations in the waterway cap beneath and south of the SR 509 Bridge (RC/WC-01 to RC/WC-09 and

WC-13 and WC-14). These compliance samples generally consisted of olive black silt over either sand or gravel (see Appendix D). The portion of silt versus sand or gravel in the samples varied depending on the thickness of the accumulated fine-grained deposits. A silt layer of light olive color overlying a dark olive, gray to black silt layer was observed at most locations. Benthic fauna and flora (i.e., worms, shell fragments and/or kelp) were observed at all locations.

Descriptions and thickness of fine-grained material were documented on each of the log sheets included in Appendix C.1 and summarized in Appendix D. Oily sheens and sheen spots were noted in the top silt layer at two locations RC/WC-01 and RC/WC-08. The thickness of fine-grained material ranged from 7 cm to greater than 13 cm throughout the waterway cap area (Figure 4-1). The deposition of fine-grained material was greatest in the central areas south of the SR 509 Bridge and north of the scour protection apron with 13 cm or more of deposition. Based on the stratigraphy of the grab samples, it is evident that the fine-grained material has accumulated on top of the sand cap and is increasing in depth each year. The source of the fine-grained material is from the stormwater outfalls.

Area North of the Bridge

Seven samples were collected from the area where additional capping material was placed by the City in December 2005 (OMMP locations RC/WC-10, RC/WC-11, RC/WC-12, and supplemental locations S-15, S-17, S-19, and S-24). Oily sheens and sheen spots were noted in the top silt layer at RC/WC-11. No oily sheens or sheen spots were observed in the other 0 to 10 cm samples. The thickness of fine-grained material ranged from 1 cm to 4 cm overlying coarse sand cap material. Benthic fauna and flora were not observed at sample locations S-17 and RC/WC-11. The fines content of the samples ranged between 3.9 percent and 8.3 percent.

4.2.2 Recontamination/Early-Warning Samples (0 to 2 cm)

Early-warning samples were obtained from 14 locations within the Utilities' Work Area. Sampling occurred at OMMP locations RC-1 to RC-14 (Figure 3-1). The samples generally consisted of olive to black silt with percent fines ranging between 23.5 percent and 52.9 percent (Appendix F). The thickness of fine-grained material at these locations is the same as reported for the compliance samples and ranged from 1 cm to greater than 13 cm throughout the waterway cap area (Figure 4-1).

4.3 CHEMICAL QUALITY

The following discussion summarizes the analytical results of sediment samples collected in May 2007 and compares those results to the SQOs. Table 4-1 includes results for parameters that exceed the SQOs in one or more Year 3 samples. Table 4-1 also includes the exceedance factor (the ratio of the result to the SQO) for results that exceed the SQO (EF of 1 or greater, as results that are equal to the SQO are considered exceedances). Parameters not included in Table 4-1 did not exceed the SQOs in any Year 3 sample at any location.

Appendix F includes all sediment sample results from all monitoring years with detected results that exceed the SQOs in bold font. Exceedances include concentrations rounded to two significant figures that are equal to the SQO.

4.3.1 Waterway Cap Compliance Samples

South of the Bridge

The waterway cap compliance samples (0 to 10 cm grabs) from the WC locations beneath and south of the SR 509 Bridge were analyzed for TOC and selected semivolatile organic compounds (SVOCs) (PAHs, phthalates, and phenols). BEHP concentrations were higher than the SQO of 1,300 µg/kg in all the compliance samples collected south of the bridge in May 2007. In addition, SQOs were exceeded in the sample at WC-02 for individual PAHs and Total HPAH. This is a depositional area adjacent to the scour protection apron from the Twin 96ers. None of the Year 3 compliance samples from this area contained phenol at a concentration exceeding its SQO of 420 µg/kg. The maximum concentration of phenol found in the samples south of the bridge was 140 µg/kg at WC-02.

The exceedance factor for each SQO exceedance is included in Table 4-1. The highest exceedance factors were detected in the sample from station WC-02. SQO exceedance factors ranged between 1.0 (benzo[a]anthracene) and 3.8 (BEHP).

North of the Bridge

The waterway cap compliance samples (0 to 10 cm) and supplemental samples from the area north of the SR 509 Bridge were analyzed for TOC, metals, SVOCs, DDT compounds, and PCB Aroclors. SQOs were not exceeded in any of the compliance and City area supplemental samples north of the SR 509 Bridge in the additional cap placement area. BEHP concentrations ranged between 300 µg/kg and 790 µg/kg and HPAH concentrations ranged between 780 µg/kg and 1,800 µg/kg. The fines contents of these samples ranged

between 3.9 percent and 8.3 percent indicating that the samples were composed primarily of capping material.

No phenol concentrations exceeded the SQO in samples north of the bridge. The maximum concentration of phenol in the samples north of the bridge was 23 µg/kg.

4.3.2 Recontamination/Early-Warning Samples

Recontamination samples include the early-warning"/top-down surface (0 to 2 cm) grabs from all RC locations. Early-warning samples were analyzed for TOC, TPH, metals, PCBs, PAHs, and BEHP. All 14 of the early-warning samples (0 to 2 cm) contained BEHP concentrations above the SQO of 1,300 µg/kg (Table 4-1). The sample collected at RC-02 contained a zinc concentration of 539 milligrams per kilogram (mg/kg), above the SQO of 410 mg/kg. Samples collected at RC-01, RC-02, RC-08, RC-13, and RC-14 contained concentrations of individual PAHs and/or total HPAH that exceeded the SQOs. Consistently, the concentrations of contaminants were higher in the 0 to 2 cm sample than in the 0 to 10 cm sample.

The exceedance factor for each SQO exceedance is included in Table 4-1. The highest exceedance factors were detected in the sample from station RC-01, RC-02, and RC-13. SQO exceedance factors ranged between 1.3 (chrysene at RC-13) and 10.8 (BEHP at RC-01).

4.3.3 Contaminant Distribution and Trends

Since the Utilities' cap was installed, fine-grained sediment has accumulated on the top of cap. By May 2007, approximately 7 cm to more than 13 cm of fine-grained sediment had accumulated within the small boat turning basin south of the bridge as illustrated on Figure 4-1. Lesser thicknesses (1 to 4 cm) were present within the area capped by the City in December 2005. At most locations sediment thicknesses increased between approximately 0.5 cm and 2 cm from May 2006 to May 2007. The greatest increase was at station RC/WC-7 where the change in thickness was approximately 5 cm. There is insufficient data at station RC/WC-2 for both Year 2 and Year 3 to document the true thickness of fine grained material. In both years, the penetration of the grab sampler was shallower than the thickness of fine-grained sediment.

Compliance Samples

Compliance sample concentrations of BEHP and HPAH south of the SR 509 Bridge appear to have generally declined between 2006 and 2007. The average concentration of BEHP declined from approximately 3,600 µg/kg to 2,700 µg/kg, while the average concentration

of HPAH declined from approximately 9,700 µg/kg to 7,800 µg/kg. The change in concentrations represents declines of approximately 20 percent to 25 percent.

Compliance sample concentrations of BEHP and HPAH north of the SR509 Bridge varied between 2006 and 2007. The average concentration of BEHP declined from approximately 730 µg/kg to 600 µg/kg (approximately 18 percent), while the average concentration of HPAH increased from approximately 955 µg/kg to 1,300 µg/kg (approximately 37 percent).

Recontamination/Early-Warning Samples

Higher concentrations of contaminants are associated with the fine-grained material. The early warning samples tend to have higher concentrations than the compliance samples. Zinc, phenanthrene, individual HPAHs, sum of HPAHs and BEHP were detected at concentrations above the SQOs in one or more samples. Most of the exceedances occurred in samples collected near the head of the waterway (RC-02, RC-13 and RC-14). Similar to previous sampling rounds, BEHP exceeded its SQO throughout the Utilities' Work Area. The concentrations for selected contaminants are depicted in Figures 4-2 through 4-13.

Figure 4-14 illustrates average concentrations in early warning samples collected within the Utilities Work Area (RC-01 to RC-14) from 2004 to 2007. Over the past 4 years, the highest average concentrations of lead, mercury, LPAH, HPAH, and PCBs in the Utilities' Work Area were found in 2005 after the dredging recontamination. Concentrations of these constituents declined in 2006. Average concentrations of zinc and BEHP were highest in 2007. Between 2006 and 2007, constituent concentrations increased within the Utilities' Work Area. Increases ranged between approximate 13 percent (HPAH) and 39 percent (zinc).

Figure 4-15 illustrates average concentrations in early-warning samples collected within the turning basin (RC-1 to RC-7) from 2004 to 2007. Constituent concentrations of lead, mercury, LPAH, HPAH, and PCBs in samples from the turning basin were also highest in samples collected in 2005 while concentrations of zinc and BEHP were highest in 2007. Between 2006 and 2007, constituent concentrations generally increased between approximately 2.2 percent and 45 percent, except for average HPAH concentrations that declined approximately 12 percent to 13 percent. The greatest increases were for mercury (31 percent) and zinc (45 percent). Additional discussions of contaminant trends are included in Appendix H.

Table 4-1. SQO Exceedances Year 3 OMMP May 2007

Parameter	Zn		Phenanthrene		Fluoranthene		Pyrene		Benzo(a) anthracene		Chrysene		Benzo(b+k) fluoranthenes		Benzo(a) pyrene		Indeno(1,2,3 - cd)pyrene		Dibenz(a,h) anthracene		Benzo(g,h,i) perylene		HPAH		bis(2-Ethyl hexyl) phthalate	
SQO	410		1,500		2,500		3,300		1,600		2,800		3,600		1,600		690		230		720		17,000		1,300	
Units	mg/kg	EF	µg/kg	EF	µg/kg	EF	µg/kg	EF	µg/kg	EF	µg/kg	EF	µg/kg	EF	µg/kg	EF	µg/kg	EF	µg/kg	EF	µg/kg	EF	µg/kg	EF	µg/kg	EF
Compliance (0-10 cm)																										
RC/WC-01			680		1,500		1,100		540		750		1,600		580		220		53 J		210		6,500 J		**2,300**	**1.8**
RC/WC-02			**2,100**	**1.4**	**4,800**	**1.9**	**3,300**	**1.0**	**1,600**	**1.0**	2,200	**0.8**	**4,900**	**1.4**	**1,700**	**1.1**	600	**0.9**	**230**	**1.0**	570	**0.8**	**20,000**	**1.2**	**4,900**	**3.8**
RC/WC-03			340		900		770		330		480		1,100		410		160		39 J		150		4,400 J		**1,800**	**1.4**
RC/WC-04/R-02			440		940		1,000		420		600		1,400		510		190		40 J		200		5,300 J		**2,300**	**1.8**
RC/WC-05			740		1,900		1,600		720		1,000		2,300		850		530		110 J		600		9,600 J		**4,000**	**3.1**
RC/WC-06			520		1,400		1,200		470		720		1,700		590		210		85 U		220		6,500		**2,800**	**2.2**
RC/WC-07			700		1,800		1,400		660		940		2,100		760		460		90 J		490		8,700 J		**3,600**	**2.8**
RC/WC-08/R-03			530		1,100		1,000		440		630		1,600		600		260		86		280		6,000		**2,000**	**1.5**
RC/WC-09			450		1,100		950		380		560		1,400		500		230		48		240		5,300		**2,200**	**1.7**
RC/WC-10	49		94		210		180		82		130		260		98		72		24		80		1,100		410	
RC/WC-11/R-04	53		67		170		160		70		110		230		82		54		12 J		64		950 J		640	
RC/WC-12	62		190		320		280		130		200		400		160		88		18 J		90		1,700 J		640	
WC-13			710		1,400		1,400		590		960		2,100		840		320		69 J		340		8,000 J		**2,700**	**2.1**
WC-14			400		980		910		380		520		1,400		490		220		45		230		5,200		**2,100**	**1.6**
S-15	55		87		200		160		73		120		250		94		55		14 J		57		1,000 J		500	
S-15 dup	52		91		230		180		81		140		290		100		56		13 J		59		1,100 J		590	
S-17	58		100		220		210		95		150		320		120		59		16 J		60		1,300 J		620	
S-19	55		82		130		150		64		88		190		81		39		20 U		38		780		300	
S-24	69		150		350		300		140		210		460		160		72		18 J		73		1,800 J		790	
Early Warning (0-2 cm)																										
RC/WC-01	380		**1,500**	**1.0**	**2,800**	**1.1**	2,000		900		1600		3,000		960		380		93 J		410		12,000 J		**14,000**	**10.8**
RC/WC-02	**539**	**1.3**	**2,500**	**1.7**	**5,000**	**2.0**	**4,700**	**1.4**	**2,000**	**1.3**	**3100**	**1.1**	**6,900**	**1.9**	**2,300**	**1.4**	**870**	**1.3**	**390**	**1.7**	**900**	**1.3**	**26,000**	**1.5**	**9,500**	**7.3**
RC/WC-03	113		570		1,400		1,300		540		790		1,900		620		260		61 J		270		7,100 J		**2,600**	**2.0**
RC/WC-04/R-02	227		930		2,300		2,000		840		1300		2,800		1,000		410		82 J		420		11,000 J		**5,100**	**3.9**
RC/WC-05	220		680		1,800		1,500		640		960		2,000		740		400		83 J		390		8,500 J		**4,000**	**3.1**
RC/WC-06	227		910		2,400		2,100		860		1300		3,100		990		440		84 J		460		12,000 J		**5,600**	**4.3**
RC/WC-07	173		690		1,600		1,500		640		960		2,000		770		380		77 J		400		8,300 J		**3,700**	**2.8**
RC/WC-08/R-03	184		890		1,900		1,900		800		1200		2,500		1,000		600		**270**	**1.2**	650		11,000		**4,300**	**3.3**
RC/WC-08/R-03 dup	194		1,000		2,400		2,300		920		1400		3,100		1,100		420		93 J		440		12,000 J		**5,100**	**3.9**
RC/WC-09	221		860		2,300		1,900		800		1300		2,800		950		410		100 J		410		11,000 J		**6,200**	**4.8**
RC/WC-10	102		310		720		660		280		450		1,000		340		160		35 J		170		3,800 J		**1,600**	**1.2**
RC/WC-11/R-04	195		630		1,500		1,400		610		1000		2,300		750		350		79		380		8,300		**6,100**	**4.7**
RC/WC-12	109		500		1,100		980		420		620		1,400		510		190		48 J		190		5,400 J		**2,200**	**1.7**
RC-13	256		**2,800**	**1.9**	**6,200**	**2.5**	**5,300**	**1.6**	**2,400**	**1.5**	**3500**	**1.3**	**7,800**	**2.2**	**2,700**	**1.7**	**1,200**	**1.7**	**240**	**1.0**	**1,100**	**1.5**	**30,000**	**1.8**	**7,300**	**5.6**
RC-14	209		**1,600**	**1.1**	**3,400**	**1.4**	2,600		1,200		1800		**4,100**	**1.1**	1,400		560		130		540		16,000		**4,200**	**3.2**

Notes:
Bold font indicates exceedance of SQO
EF = exceedance factor
mg/kg = milligram per kilogram
µg/kg = microgram per kilogram
J = result is estimated
OMMP = Operation, Maintenance, and Monitoring Plan
SQO = sediment quality objective

NOTES:

1. BATHYMETRY SURVEY UP TO ELEVATION +5 MLLW COMPLETED BY TETRA TECH EC ON MAY 10, 2006
2. TOPOGRAPHIC DATA SHOWN ABOVE +5 MLLW WAS PROVIDED BY APEX ENGINEERING LLC, DATED 2/7/02, 3/8/02, 5/16/02, 10/2/02 and 10/12/02.
3. UPLAND PROJECT LIMIT IS +12 FEET MLLW.

Thea Foss Waterway

Head of The Thea Foss Waterway
Post-Construction Monitoring

TETRA TECH EC, INC.

Figure 4-1
Thickness (cm) of Fine-grained Material

May 2007

P:\2562_THEA FOSS\THEA FOSS\OMMP\YEAR 3 MAY 07\CAD\FOSSFIGURE-MAY 07 REVISED\FOSSFIGURE 4 - 1.DWG
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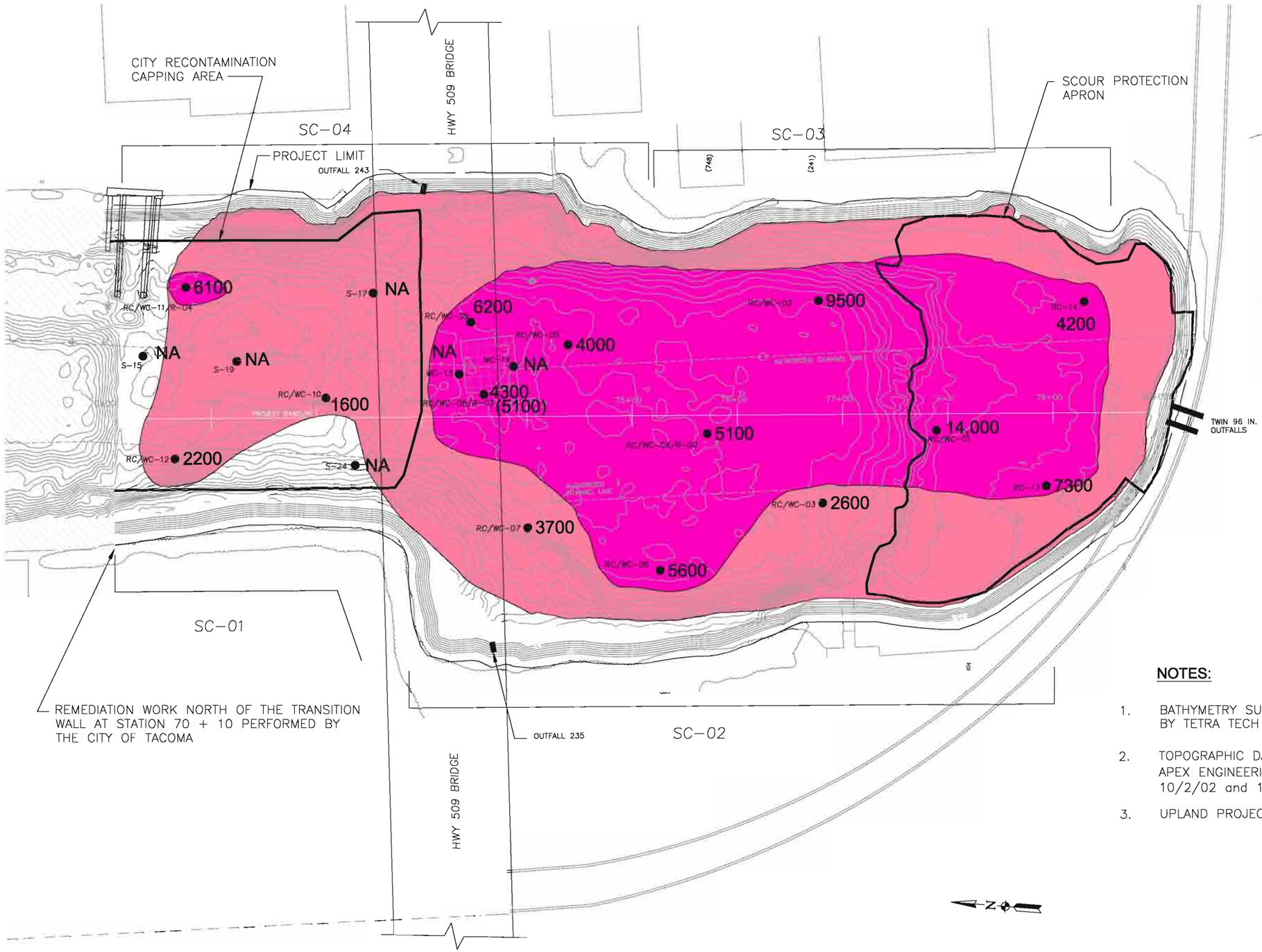
4-11



LEGEND:

- MAJOR CONTOUR LINES
- CITY OF TACOMA WORK AREA
- IMPERMEABLE CAP
- [BEHP] > 3,900 µg/kg
- BEHP SQO = 1,300 µg/kg
- [BEHP] > 1,300 to 3,900 µg/kg
- BEHP = BIS (2-Ethylhexyl) phthalate
- 2600 = BEHP CONCENTRATION IN µg/kg
- RC/WC-03
- NA = NOT AVAILABLE

NOTES:

1. BATHYMETRY SURVEY UP TO ELEVATION +5 MLLW COMPLETED BY TETRA TECH EC ON MAY 10, 2006
2. TOPOGRAPHIC DATA SHOWN ABOVE +5 MLLW WAS PROVIDED BY APEX ENGINEERING LLC, DATED 2/7/02, 3/8/02, 5/16/02, 10/2/02 and 10/12/02.
3. UPLAND PROJECT LIMIT IS +12 FEET MLLW.

GRAPHIC SCALE
50' 0 25' 50' 100'
(IN FEET)

Thea Foss Waterway

Head of The Thea Foss Waterway
Post-Construction Monitoring

TETRA TECH EC, INC.

Figure 4-2
BEHP Concentration
0-2 cm Sediment
May 2007

P:\2562_THEA FOSS\THEA FOSS\OMMP\YEAR 3 MAY 07\CAD\FOSSFIGURE-MAY 07 REVISED\FOSSFIGURE 4-2.DWG
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4-13

LEGEND:

MAJOR CONTOUR LINES

CITY OF TACOMA WORK AREA

IMPERMEABLE CAP

[BEHP] > 3,900 µg/kg

BEHP SQO = 1,300 µg/kg

BEHP = Bis(2-Ethylhexyl) phthalate

[BEHP] > 1,300 to 3,900 µg/kg

1800 = BEHP CONCENTRATION IN µg/kg
RC/WC-03

NA = NOT AVAILABLE

NOTES:

1. BATHYMETRY SURVEY UP TO ELEVATION +5 MLLW COMPLETED BY TETRA TECH EC ON MAY 10, 2006
2. TOPOGRAPHIC DATA SHOWN ABOVE +5 MLLW WAS PROVIDED BY APEX ENGINEERING LLC, DATED 2/7/02, 3/8/02, 5/16/02, 10/2/02 and 10/12/02.
3. UPLAND PROJECT LIMIT IS +12 FEET MLLW.

GRAPHIC SCALE
50' 0 25' 50' 100'
(IN FEET)

Thea Foss Waterway

Head of The Thea Foss Waterway
Post-Construction Monitoring

TETRA TECH EC, INC.

Figure 4-3
BEHP Concentration
0-10 cm Sediment
May 2007

P:\2562_THEA FOSS\THEA FOSS\OMMP\YEAR 3 MAY 07\CAD\FOSSFIGURE-MAY 07 REVISED\FOSSFIGURE 4-3.DWG
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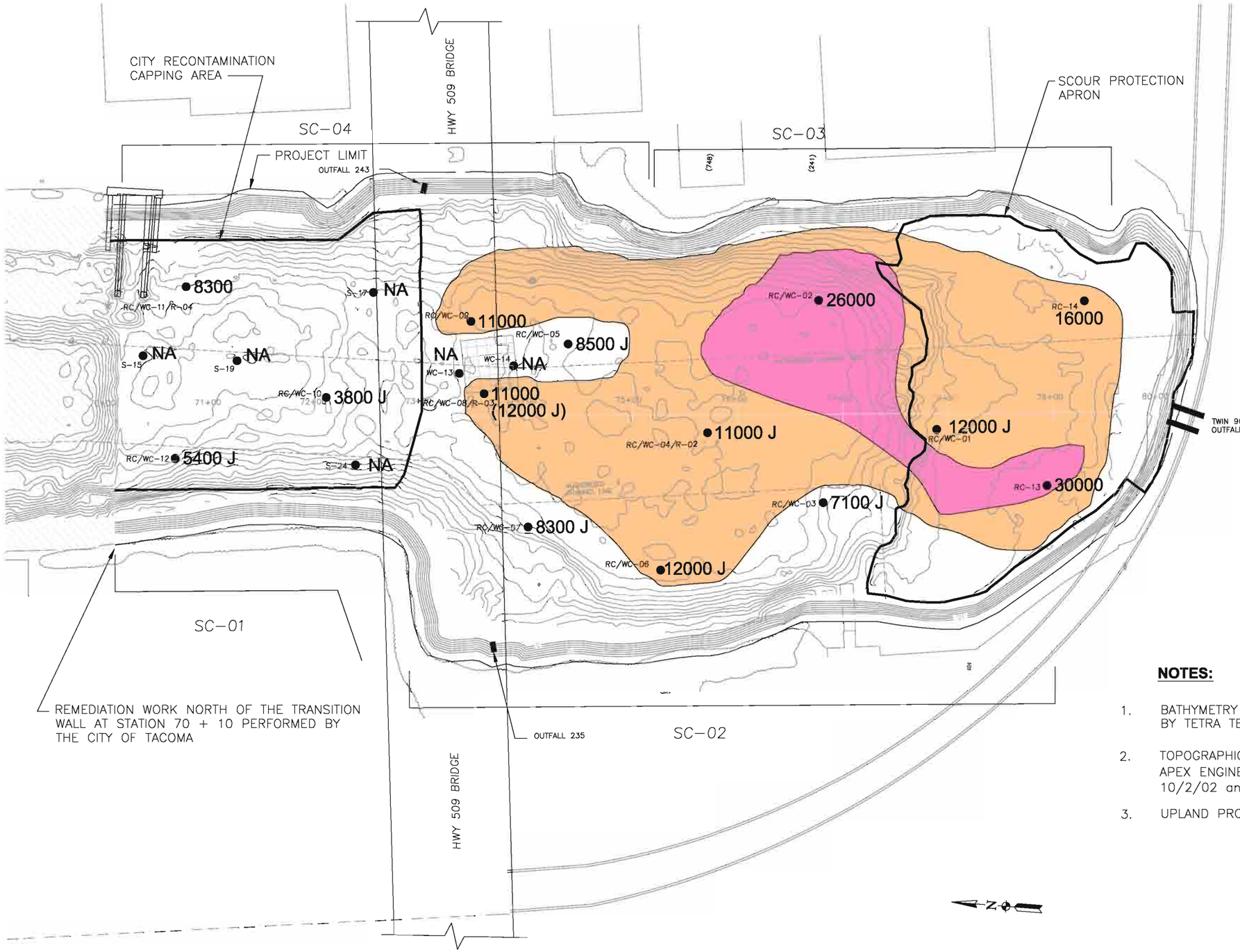
4-15



LEGEND:

MAJOR CONTOUR LINES

CITY OF TACOMA WORK AREA

IMPERMEABLE CAP

[HPAH] > 17,000 µg/kg

HPAH SQO = 17,000 µg/kg

[HPAH] > 10,000 to 17,000 µg/kg

HPAH = High molecular weight Polycyclic Aromatic Hydrocarbons

7100 J = HPAH CONCENTRATION IN µg/kg

RC/WC-03

NA = NOT AVAILABLE

J = ESTIMATED VALUE

NOTES:

1. BATHYMETRY SURVEY UP TO ELEVATION +5 MLLW COMPLETED BY TETRA TECH EC ON MAY 10, 2006
2. TOPOGRAPHIC DATA SHOWN ABOVE +5 MLLW WAS PROVIDED BY APEX ENGINEERING LLC, DATED 2/7/02, 3/8/02, 5/16/02, 10/2/02 and 10/12/02.
3. UPLAND PROJECT LIMIT IS +12 FEET MLLW.

N

GRAPHIC SCALE

50' 0 25' 50' 100'

(IN FEET)

Thea Foss Waterway

Head of The Thea Foss Waterway
Post-Construction Monitoring

TETRA TECH EC, INC.

Figure 4-4
HPAH Concentration
0-2 cm Sediment
May 2007

P:\2562_THEA FOSS\THEA FOSS\OMMP\YEAR 3 MAY 07\CAD\FOSSFIGURE-MAY 07 REVISED\FOSSFIGURE 4-4.DWG
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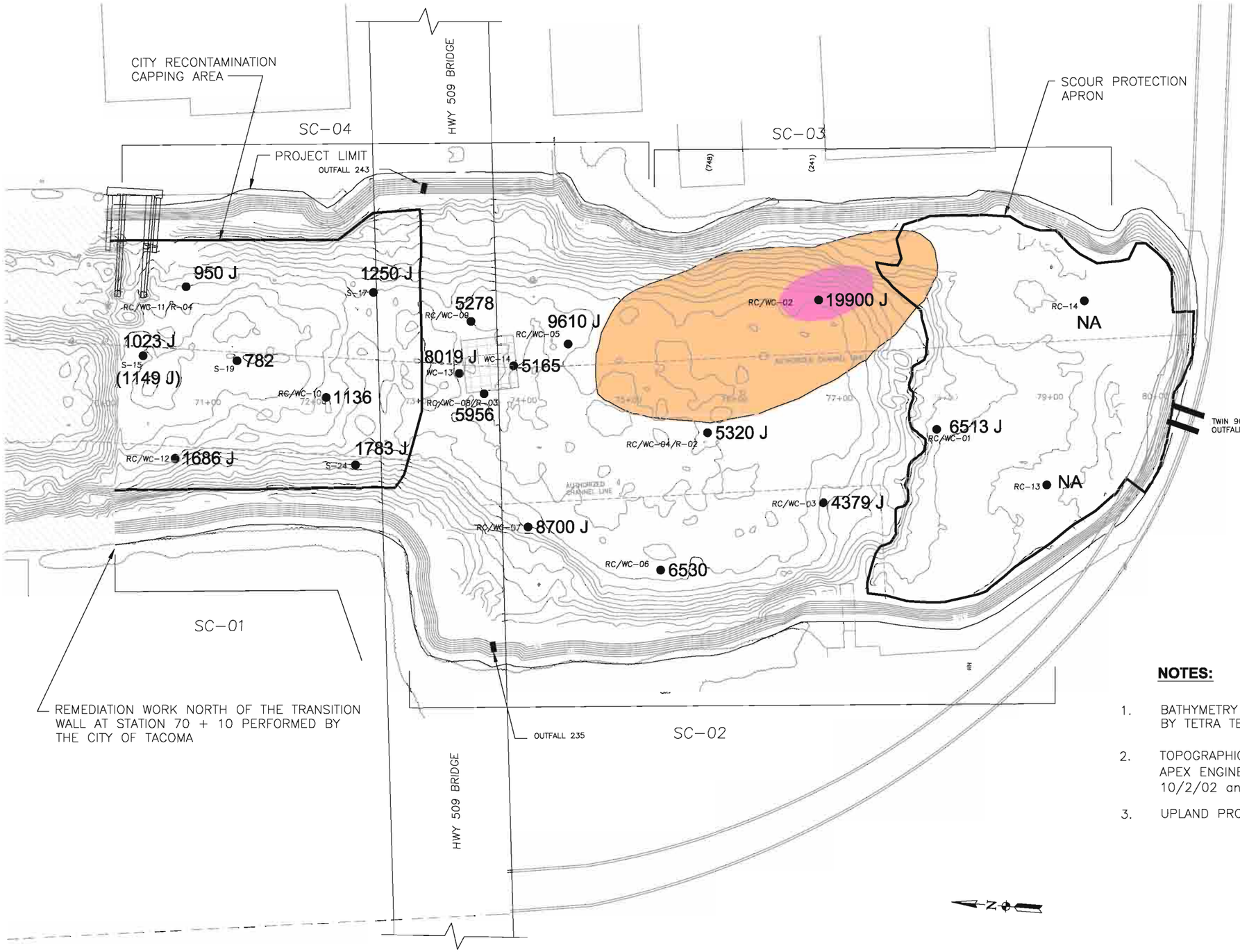
4-17



LEGEND:

MAJOR CONTOUR LINES

CITY OF TACOMA WORK AREA

IMPERMEABLE CAP

[HPAH] > 17,000 µg/kg

HPAH SQO = 17,000 µg/kg

HPAH = High molecular weight Polycyclic Aromatic Hydrocarbons

[HPAH] > 10,000 to 17,000 µg/kg

4379 J = HPAH CONCENTRATION IN µg/kg
RC/WC-03

NA = NOT AVAILABLE

J = ESTIMATED VALUE

NOTES:

1. BATHYMETRY SURVEY UP TO ELEVATION +5 MLLW COMPLETED BY TETRA TECH EC ON MAY 10, 2006
2. TOPOGRAPHIC DATA SHOWN ABOVE +5 MLLW WAS PROVIDED BY APEX ENGINEERING LLC, DATED 2/7/02, 3/8/02, 5/16/02, 10/2/02 and 10/12/02.
3. UPLAND PROJECT LIMIT IS +12 FEET MLLW.

Thea Foss Waterway

Head of The Thea Foss Waterway
Post-Construction Monitoring

TETRA TECH EC, INC.

Figure 4-5
HPAH Concentration
0-10 cm Sediment
May 2007

P:\2562_THEA FOSS\THEA FOSS\OMMP\YEAR 3 MAY 07\CAD\FOSSFIGURE-MAY 07 REVISED\FOSSFIGURE 4-5.DWG
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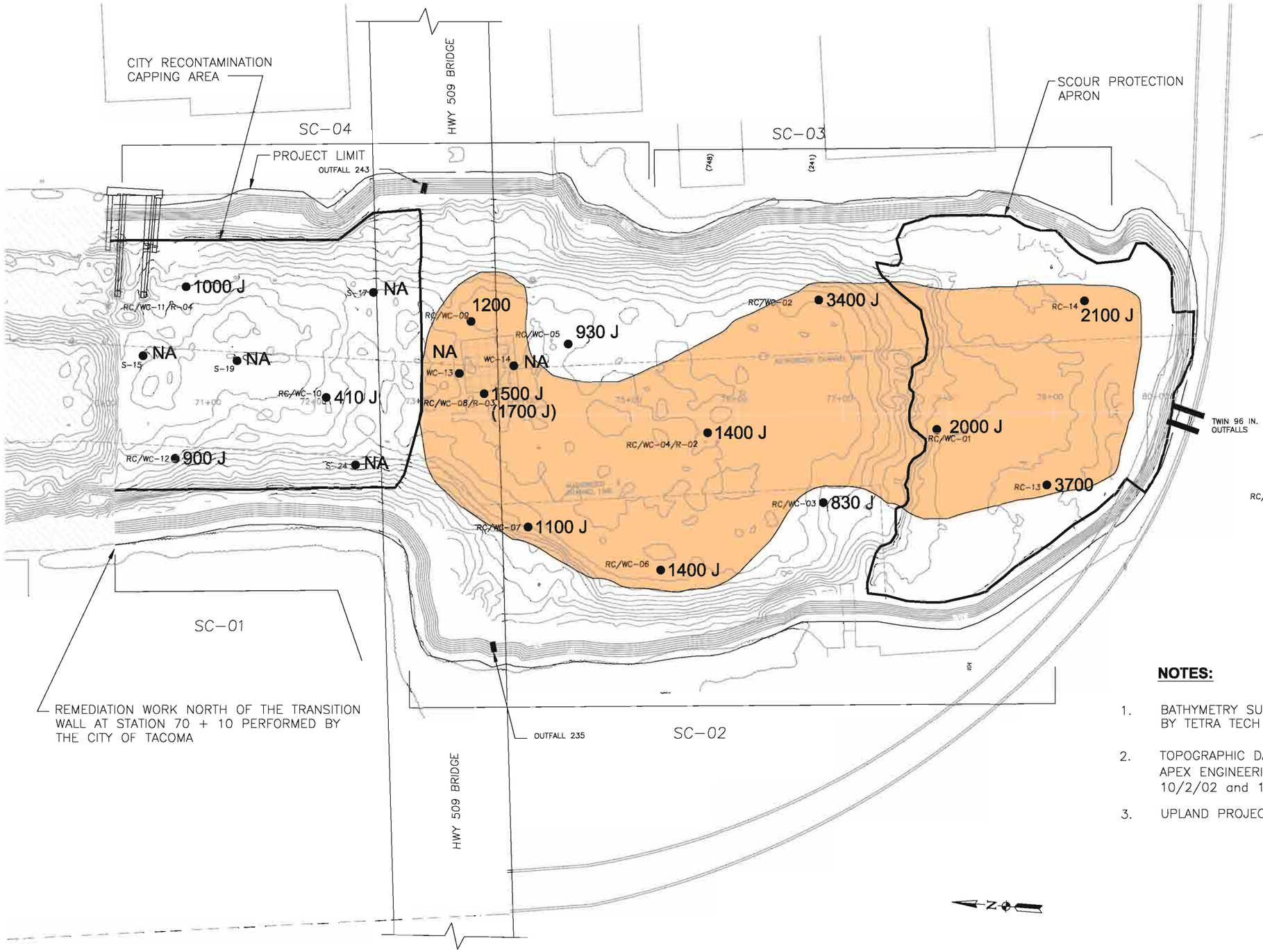
4-19



LEGEND:

MAJOR CONTOUR LINES

CITY OF TACOMA WORK AREA

IMPERMEABLE CAP

[LPAH] > 5,200 μg/kg

LPAH SQO = 5,200 μg/kg

[LPAH] > 1,000 to 5,200 μg/kg

LPAH = Low molecular weight Polycyclic Aromatic Hydrocarbons

830 J = LPAH CONCENTRATION IN μg/kg (RC/WC-03)

NA = NOT AVAILABLE

J = ESTIMATED VALUE

NOTES:

1. BATHYMETRY SURVEY UP TO ELEVATION +5 MLLW COMPLETED BY TETRA TECH EC ON MAY 10, 2006
2. TOPOGRAPHIC DATA SHOWN ABOVE +5 MLLW WAS PROVIDED BY APEX ENGINEERING LLC, DATED 2/7/02, 3/8/02, 5/16/02, 10/2/02 and 10/12/02.
3. UPLAND PROJECT LIMIT IS +12 FEET MLLW.

GRAPHIC SCALE
50' 0 25' 50' 100'
(IN FEET)

Thea Foss Waterway

Head of The Thea Foss Waterway
Post-Construction Monitoring

TETRA TECH EC, INC.

Figure 4-6
LPAH Concentration
0-2 cm Sediment
May 2007

P:\2562_THEA FOSS\THEA FOSS\OMMP\YEAR 3 MAY 07\CAD\FOSSFIGURE-MAY 07 REVISED\FOSSFIGURE 4-6.DWG
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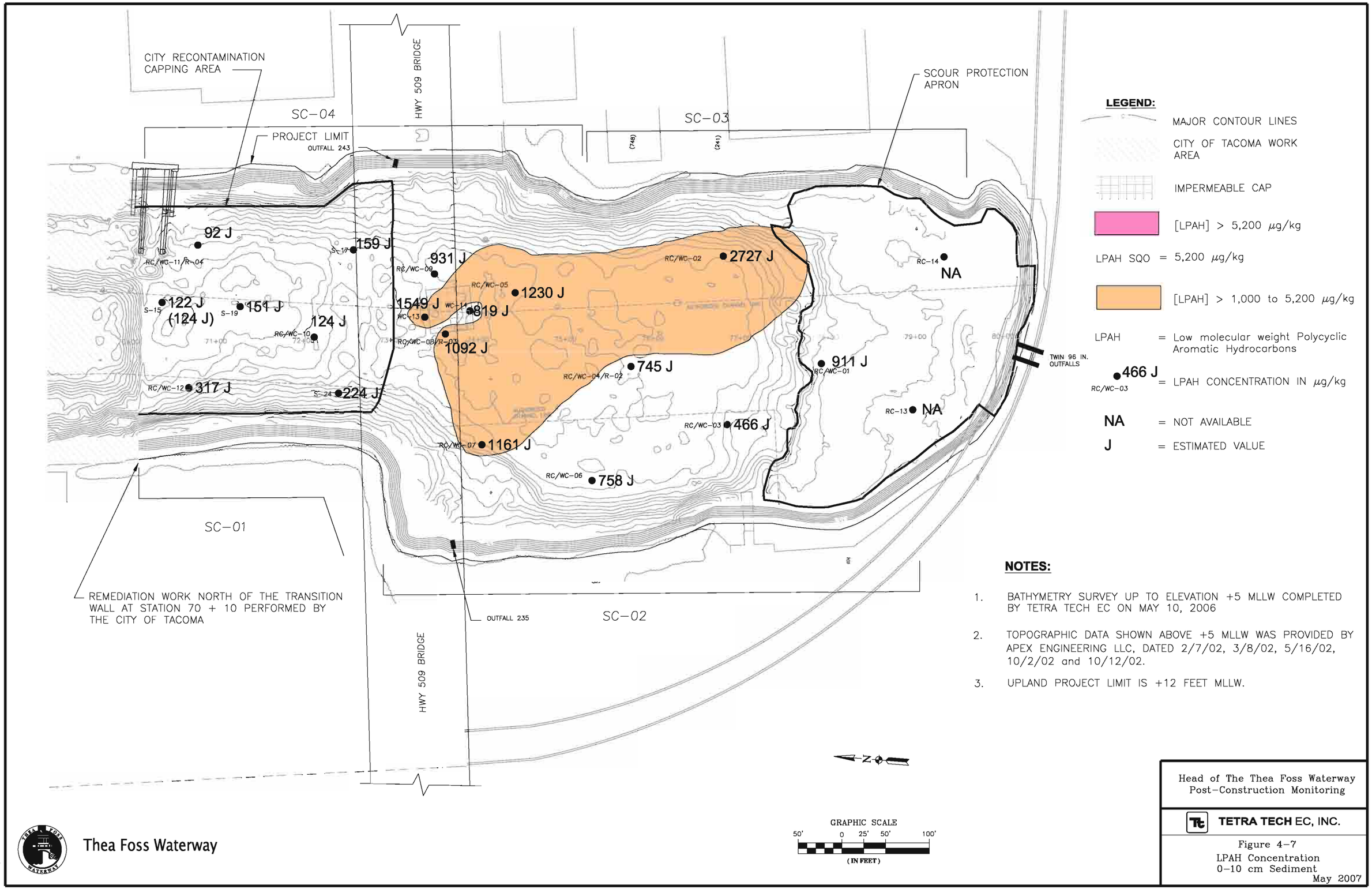
4-21



NOTES:

1. BATHYMETRY SURVEY UP TO ELEVATION +5 MLLW COMPLETED BY TETRA TECH EC ON MAY 10, 2006
2. TOPOGRAPHIC DATA SHOWN ABOVE +5 MLLW WAS PROVIDED BY APEX ENGINEERING LLC, DATED 2/7/02, 3/8/02, 5/16/02, 10/2/02 and 10/12/02.
3. UPLAND PROJECT LIMIT IS +12 FEET MLLW.

Thea Foss Waterway

Head of The Thea Foss Waterway
Post-Construction Monitoring

TETRA TECH EC, INC.

Figure 4-7
LPAH Concentration
0-10 cm Sediment
May 2007

P:\2562_THEA FOSS\THEA FOSS\OMMP\YEAR 3 MAY 07\CAD\FOSSFIGURE-MAY 07 REVISED\FOSSFIGURE 4-7.DWG
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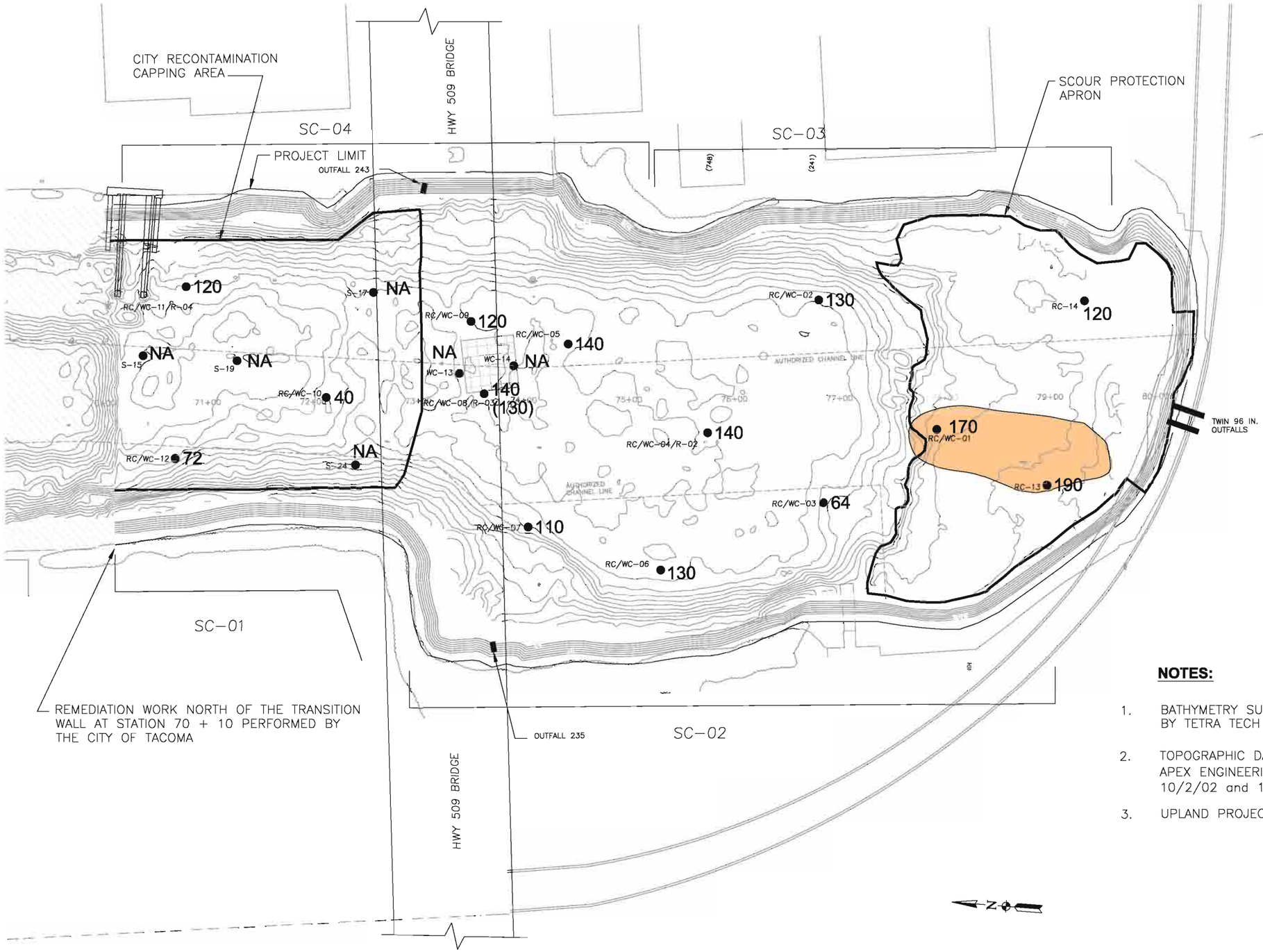
4-23



LEGEND:

- MAJOR CONTOUR LINES
- CITY OF TACOMA WORK AREA
- IMPERMEABLE CAP
- [PCB] > 300 µg/kg
- PCB SQO = 300 µg/kg
- [PCB] > 150 to 300 µg/kg
- TOTAL PCBs = Total Polychlorinated Biphenyls
- 130 (RC/WC-02) = TOTAL PCB CONCENTRATION IN µg/kg
- NA = NOT AVAILABLE

NOTES:

1. BATHYMETRY SURVEY UP TO ELEVATION +5 MLLW COMPLETED BY TETRA TECH EC ON MAY 10, 2006
2. TOPOGRAPHIC DATA SHOWN ABOVE +5 MLLW WAS PROVIDED BY APEX ENGINEERING LLC, DATED 2/7/02, 3/8/02, 5/16/02, 10/2/02 and 10/12/02.
3. UPLAND PROJECT LIMIT IS +12 FEET MLLW.

Thea Foss Waterway

Head of The Thea Foss Waterway
Post-Construction Monitoring

TETRA TECH EC, INC.

Figure 4-8
Total PCB Concentration
0-2 cm Sediment
May 2007

P:\2562_THEA FOSS\THEA FOSS\OMMP\YEAR 3 MAY 07\CAD\FOSSFIGURE-MAY 07 REVISED\FOSSFIGURE 4-8.DWG
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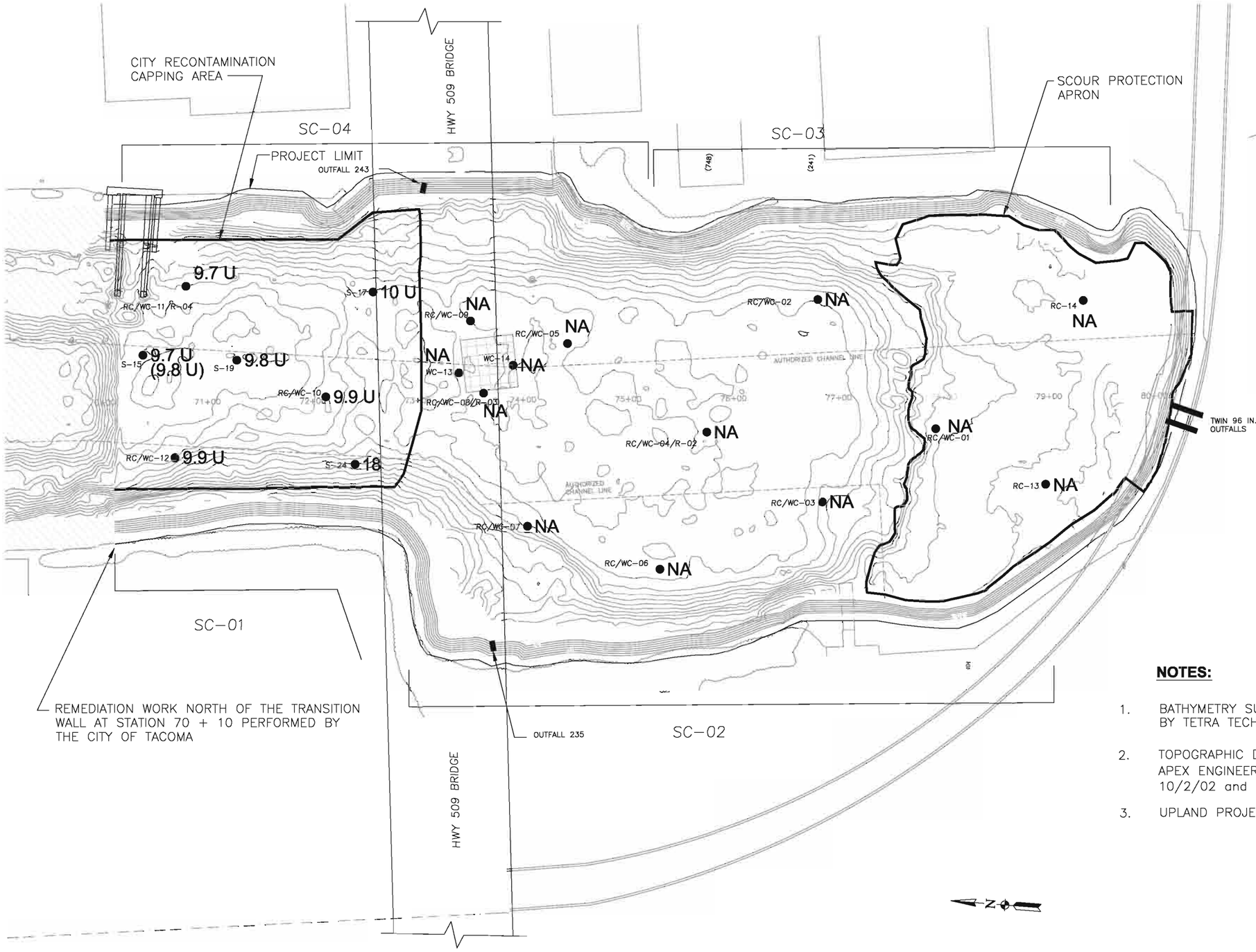
4-25



LEGEND:

MAJOR CONTOUR LINES

CITY OF TACOMA WORK AREA

IMPERMEABLE CAP

[PCB] > 300 μg/kg

PCB SQO = 300 μg/kg

[PCB] > 150 to 300 μg/kg

TOTAL PCBs = Total Polychlorinated Biphenyls

9.9 U
RC/WC-10 = TOTAL PCB CONCENTRATION IN μg/kg

NA = NOT AVAILABLE

U = UNDETECTED AT THE REPORTING LIMIT

NOTES:

1. BATHYMETRY SURVEY UP TO ELEVATION +5 MLLW COMPLETED BY TETRA TECH EC ON MAY 10, 2006
2. TOPOGRAPHIC DATA SHOWN ABOVE +5 MLLW WAS PROVIDED BY APEX ENGINEERING LLC, DATED 2/7/02, 3/8/02, 5/16/02, 10/2/02 and 10/12/02.
3. UPLAND PROJECT LIMIT IS +12 FEET MLLW.

GRAPHIC SCALE
50' 0 25' 50' 100'
(IN FEET)

Thea Foss Waterway

Head of The Thea Foss Waterway
Post-Construction Monitoring

TETRA TECH EC, INC.

Figure 4-9
Total PCB Concentration
0-10 cm Sediment
May 2007

P:\2562_THEA FOSS\THEA FOSS\OMMP\YEAR 3 MAY 07\CAD\FOSSFIGURE-MAY 07 REVISED\FOSSFIGURE 4-9.DWG
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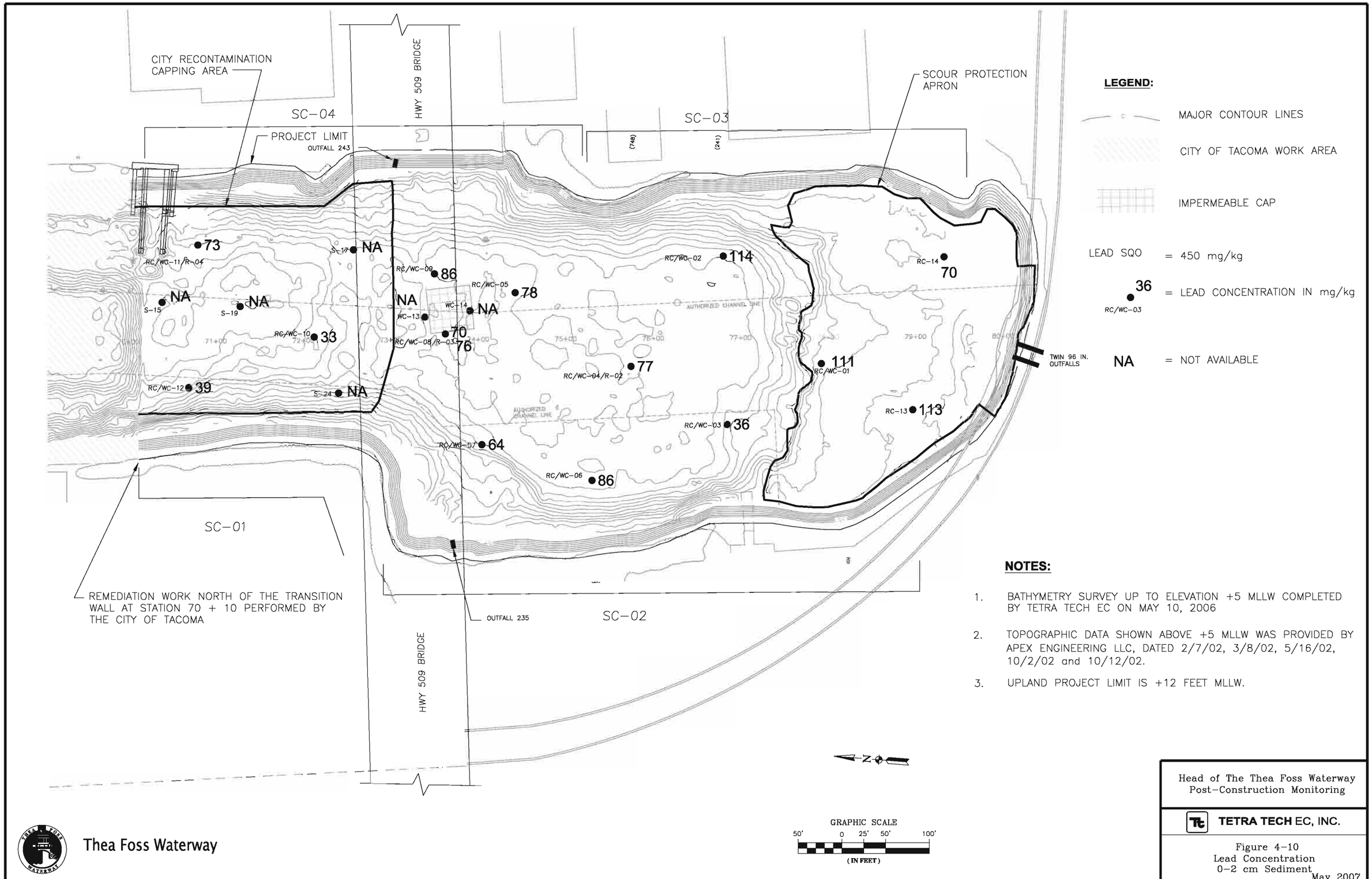
4-27



P:\2562_THEA FOSS\THEA FOSS\OMMP\YEAR 3 MAY 07\CAD\FOSSFIGURE-MAY 07 REVISED\FOSSFIGURE 4-10.DWG
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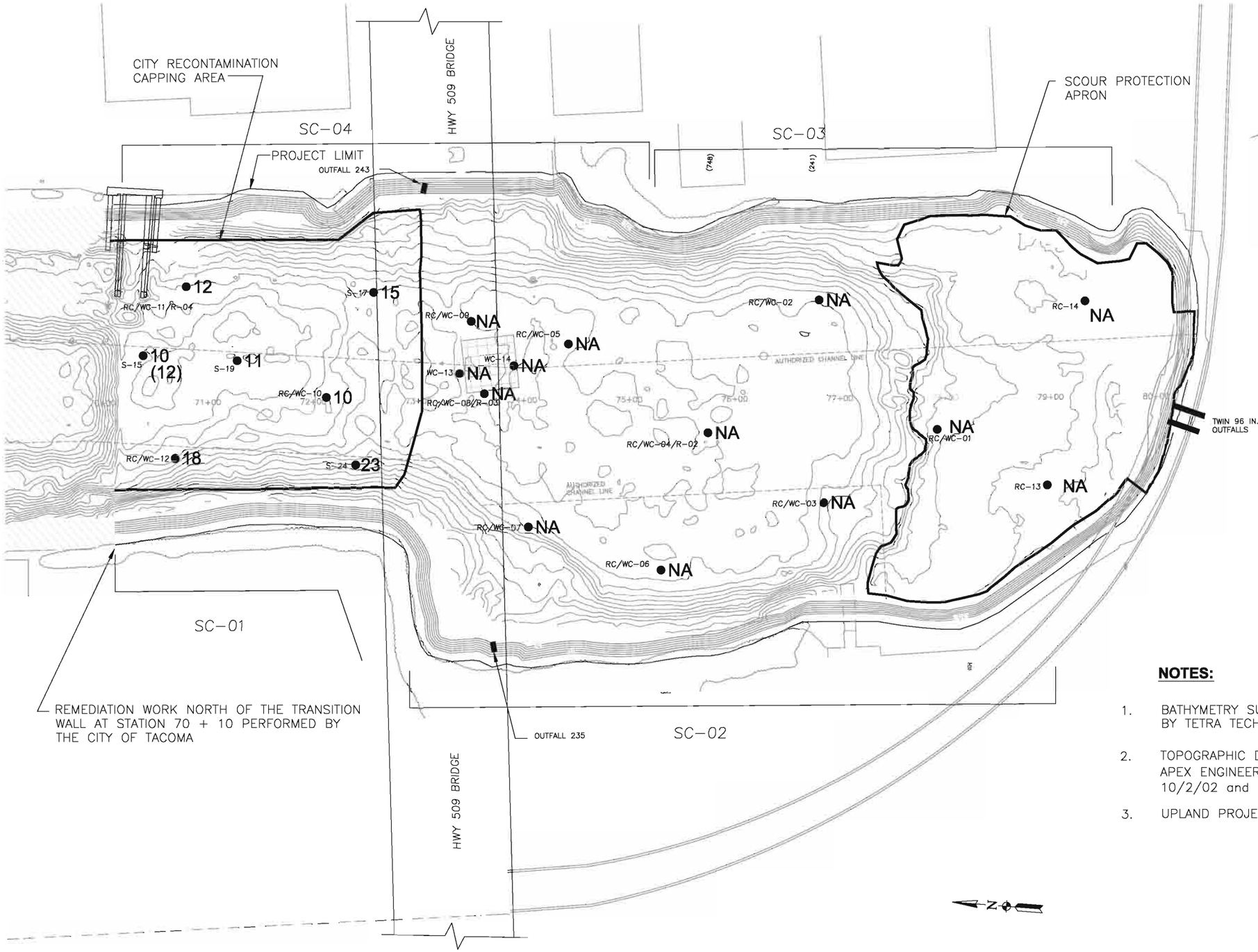
4-29



LEGEND:

MAJOR CONTOUR LINES

CITY OF TACOMA WORK AREA

IMPERMEABLE CAP

LEAD SQO = 450 mg/kg

NA = LEAD CONCENTRATION IN mg/kg
RC/WC-03

NA = NOT AVAILABLE

NOTES:

1. BATHYMETRY SURVEY UP TO ELEVATION +5 MLLW COMPLETED BY TETRA TECH EC ON MAY 10, 2006
2. TOPOGRAPHIC DATA SHOWN ABOVE +5 MLLW WAS PROVIDED BY APEX ENGINEERING LLC, DATED 2/7/02, 3/8/02, 5/16/02, 10/2/02 and 10/12/02.
3. UPLAND PROJECT LIMIT IS +12 FEET MLLW.

GRAPHIC SCALE
50' 0 25' 50' 100'
(IN FEET)

Thea Foss Waterway

Head of The Thea Foss Waterway
Post-Construction Monitoring

TETRA TECH EC, INC.

Figure 4-11
Lead Concentration
0-10 cm Sediment
May 2007

P:\2562_THEA FOSS\THEA FOSS\OMMP\YEAR 3 MAY 07\CAD\FOSSFIGURE-MAY 07 REVISED\FOSSFIGURE 4-11.DWG
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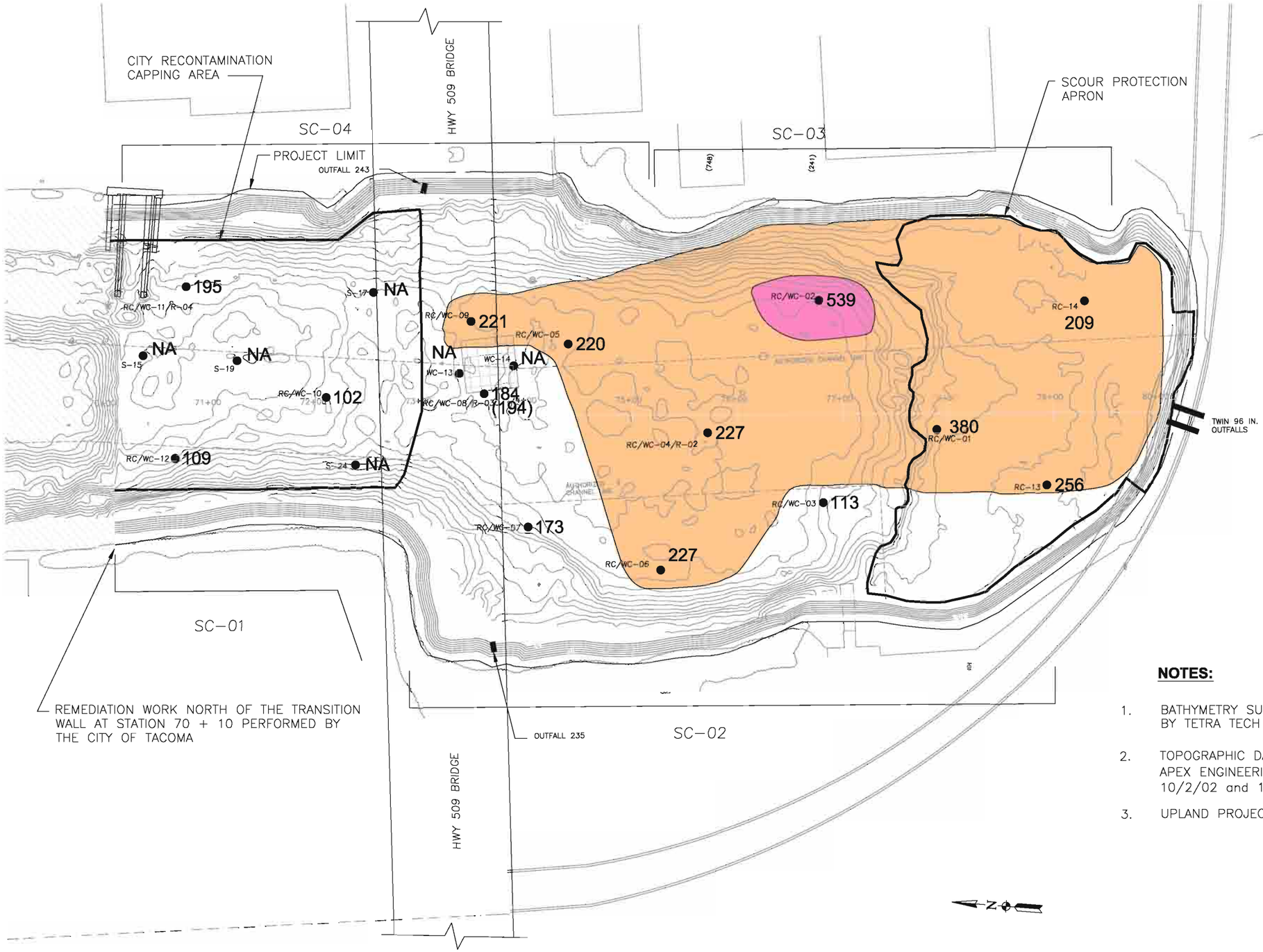
4-31



LEGEND:

MAJOR CONTOUR LINES

CITY OF TACOMA WORK AREA

IMPERMEABLE CAP

[ZINC] > 410 mg/kg

[ZINC] > 200 TO 410 mg/kg

ZINC SQO = 410 mg/kg

539 = ZINC CONCENTRATION IN mg/kg
RC/WC-02

NA = NOT AVAILABLE

NOTES:

1. BATHYMETRY SURVEY UP TO ELEVATION +5 MLLW COMPLETED BY TETRA TECH EC ON MAY 10, 2006
2. TOPOGRAPHIC DATA SHOWN ABOVE +5 MLLW WAS PROVIDED BY APEX ENGINEERING LLC, DATED 2/7/02, 3/8/02, 5/16/02, 10/2/02 and 10/12/02.
3. UPLAND PROJECT LIMIT IS +12 FEET MLLW.

GRAPHIC SCALE
50' 0 25' 50' 100'
(IN FEET)

Thea Foss Waterway

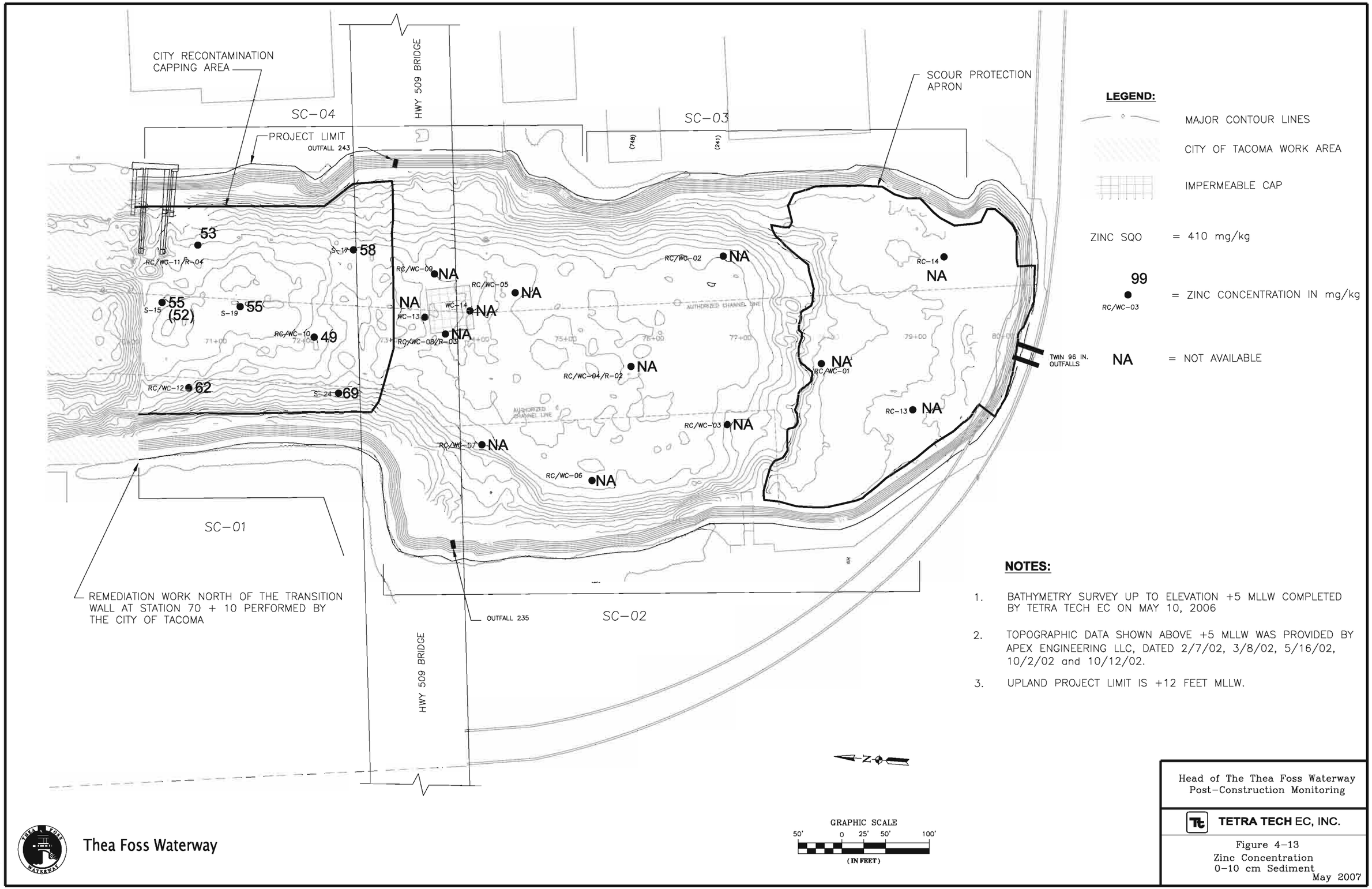
Head of The Thea Foss Waterway
Post-Construction Monitoring

TETRA TECH EC, INC.

Figure 4-12
Zinc Concentration
0-2 cm Sediment
May 2007

P:\2562_THEA FOSS\THEA FOSS\OMMP\YEAR 3 MAY 07\CAD\FOSSFIGURE-MAY 07 REVISED\FOSSFIGURE 4-12.DWG
PLOT/UPDATE: JUL 17 2007 12:15:39

4-33



NOTES:

1. BATHYMETRY SURVEY UP TO ELEVATION +5 MLLW COMPLETED BY TETRA TECH EC ON MAY 10, 2006
2. TOPOGRAPHIC DATA SHOWN ABOVE +5 MLLW WAS PROVIDED BY APEX ENGINEERING LLC, DATED 2/7/02, 3/8/02, 5/16/02, 10/2/02 and 10/12/02.
3. UPLAND PROJECT LIMIT IS +12 FEET MLLW.

Head of The Thea Foss Waterway
Post-Construction Monitoring

TETRA TECH EC, INC.

Figure 4-13
Zinc Concentration
0-10 cm Sediment
May 2007

P:\2562_THEA FOSS\THEA FOSS\OMMP\YEAR 3 MAY 07\CAD\FOSSFIGURE-MAY 07 REVISED\FOSSFIGURE 4-13.DWG
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4-35

Figure 4-14. Average Concentrations of Early Warning Samples RC-01 to RC-14

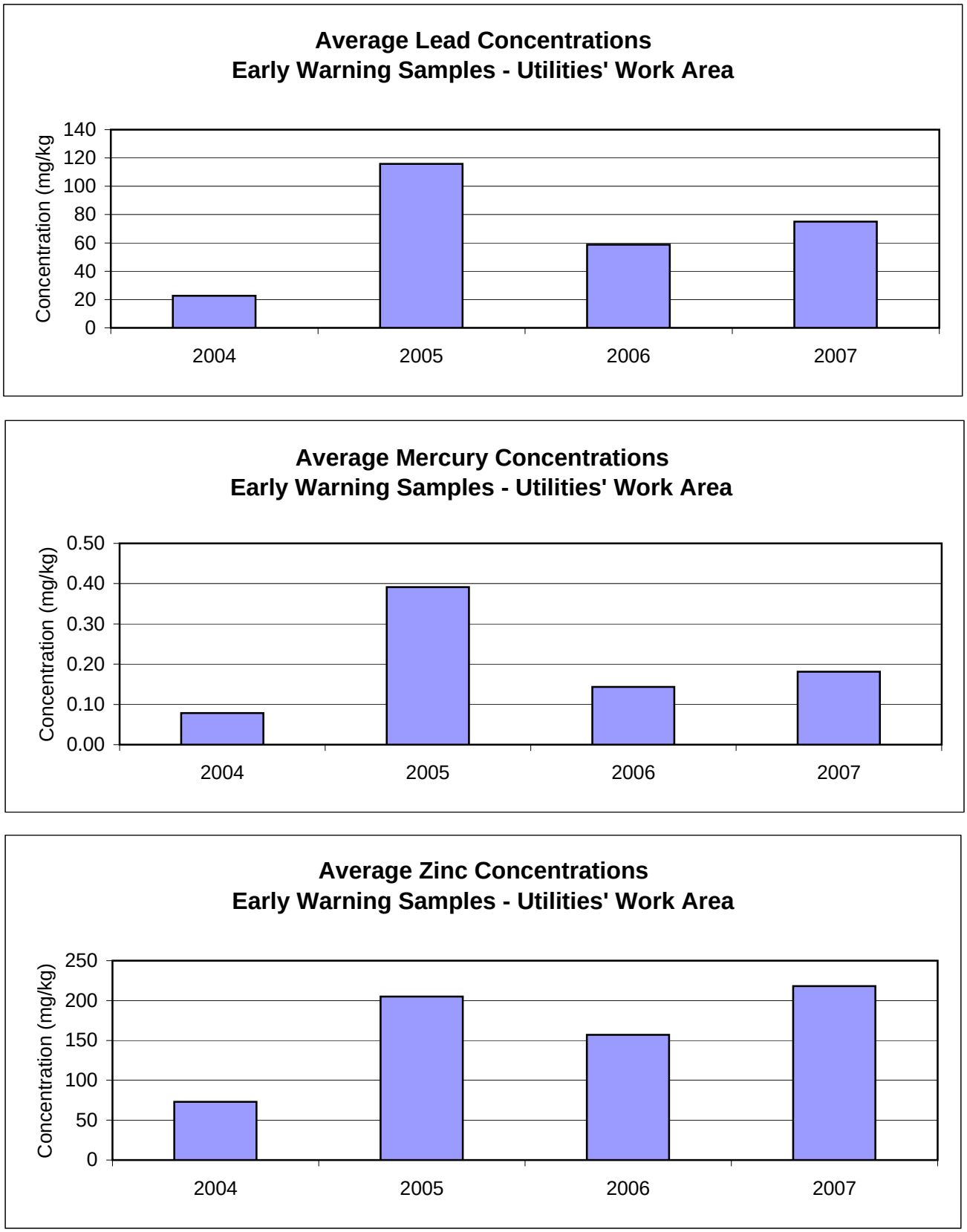
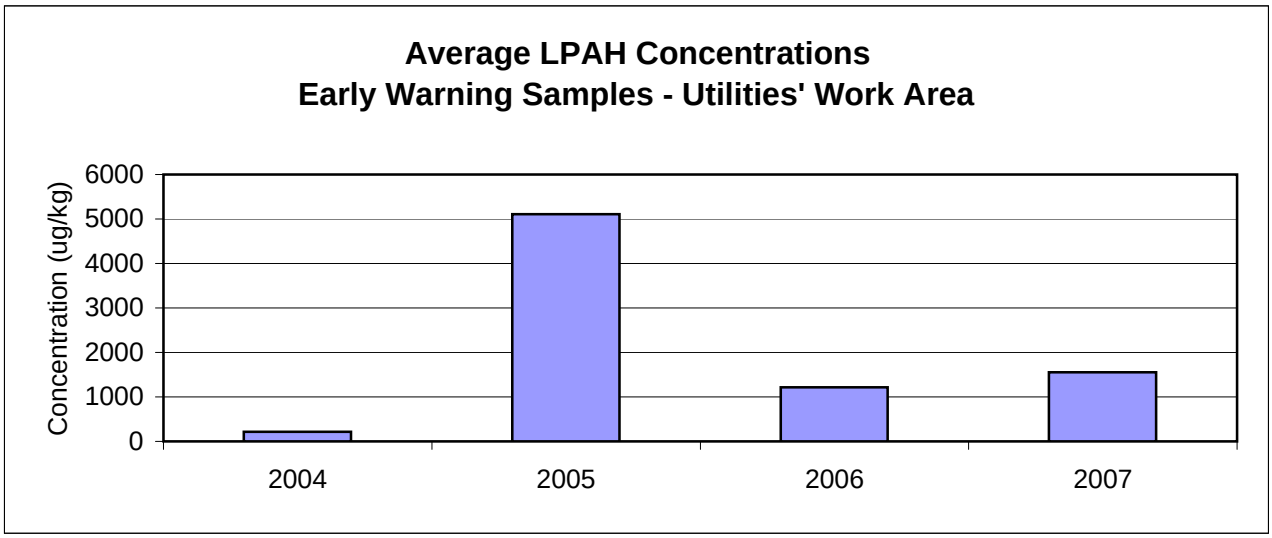
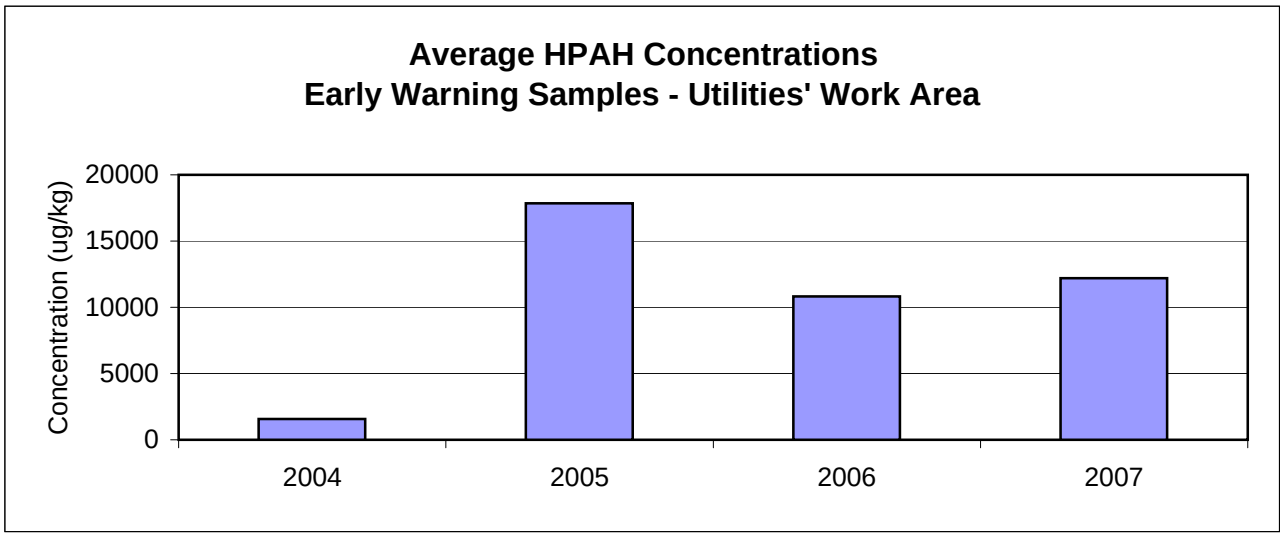


Figure 4-14. Average Concentrations of Early Warning Samples RC-01 to RC-14 (continued)





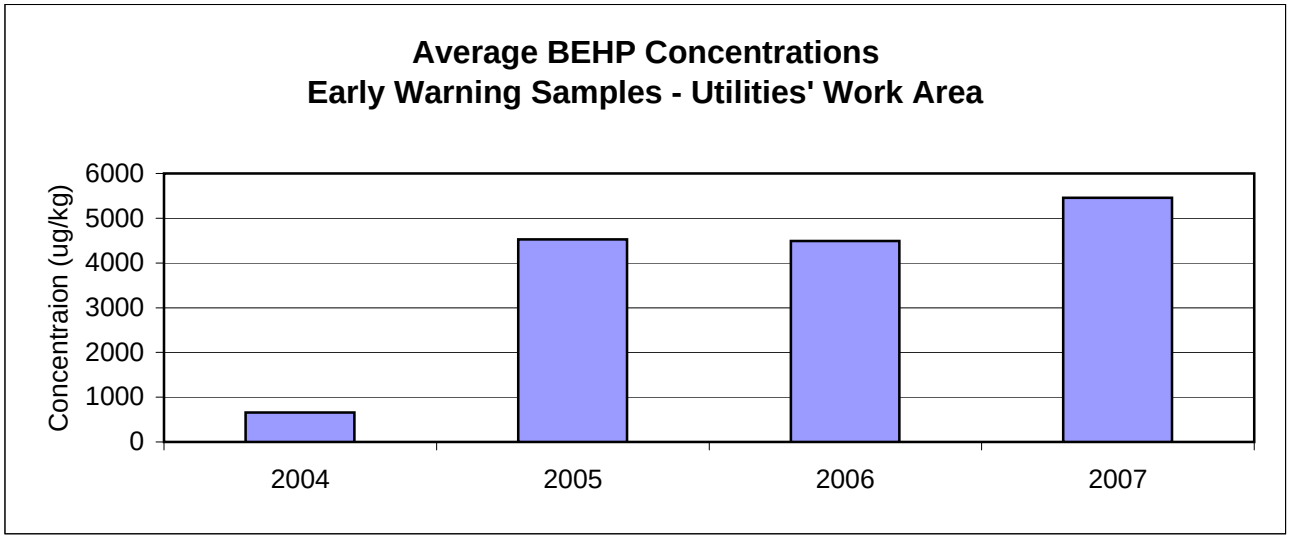


Figure 4-14. Average Concentrations of Early Warning Samples RC-01 to RC-14 (continued)

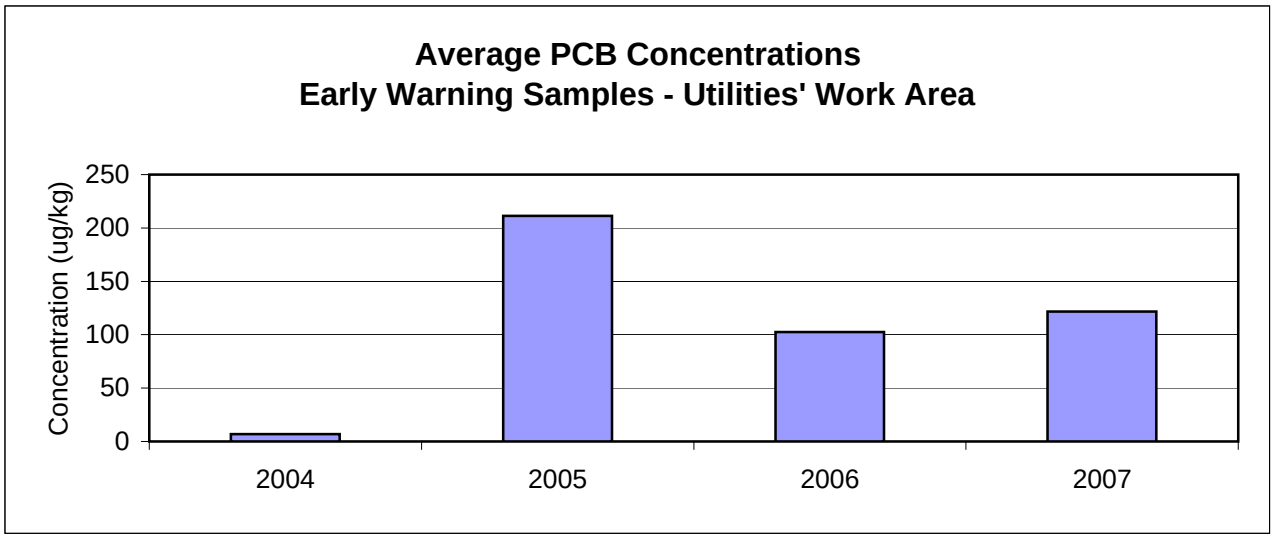
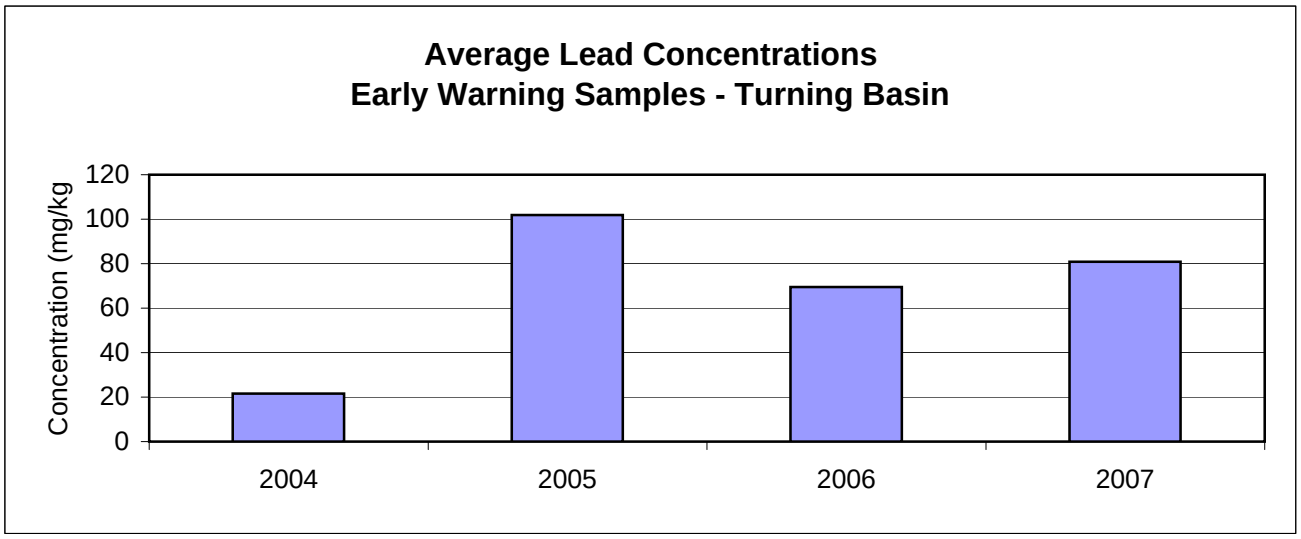
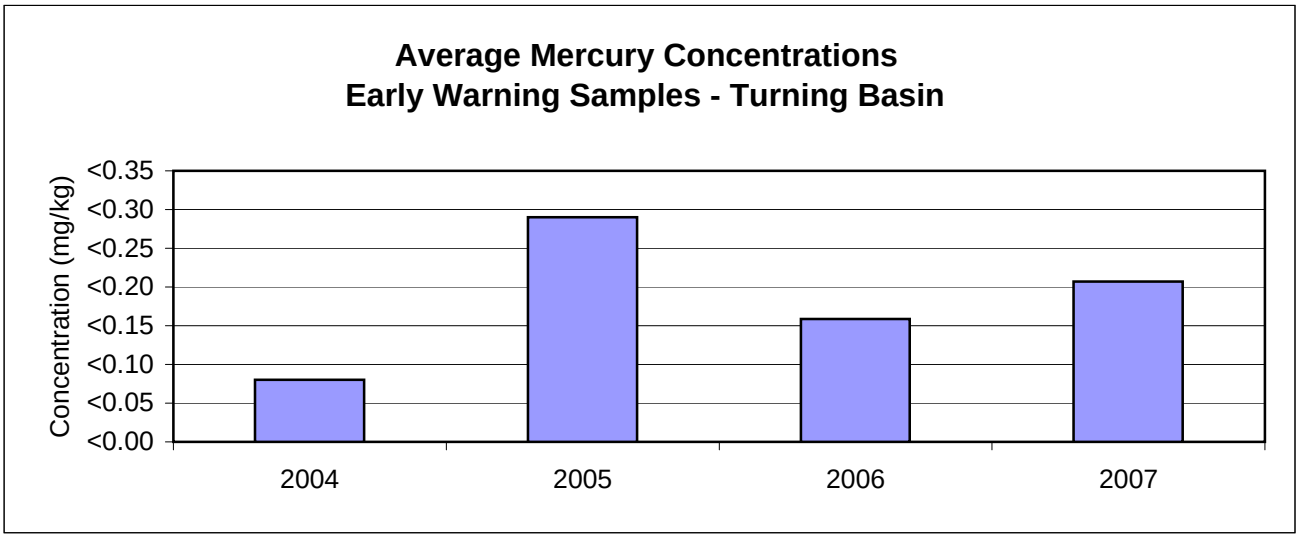


Figure 4-15. Average Concentrations of Early Warning Samples in Turning Basin (RC-01 to RC-07)





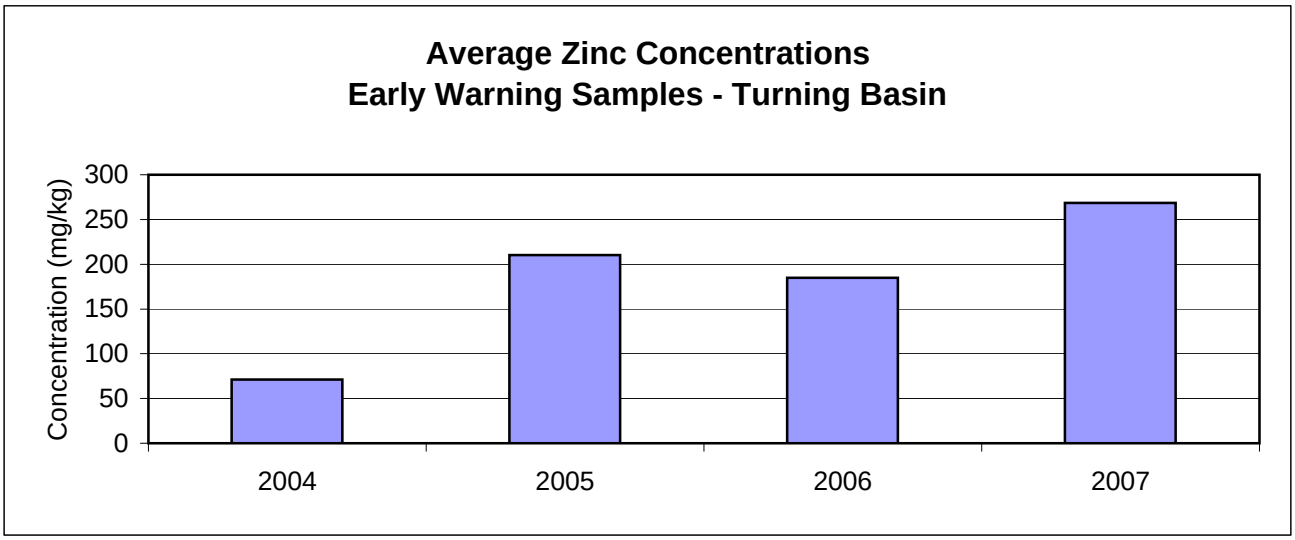
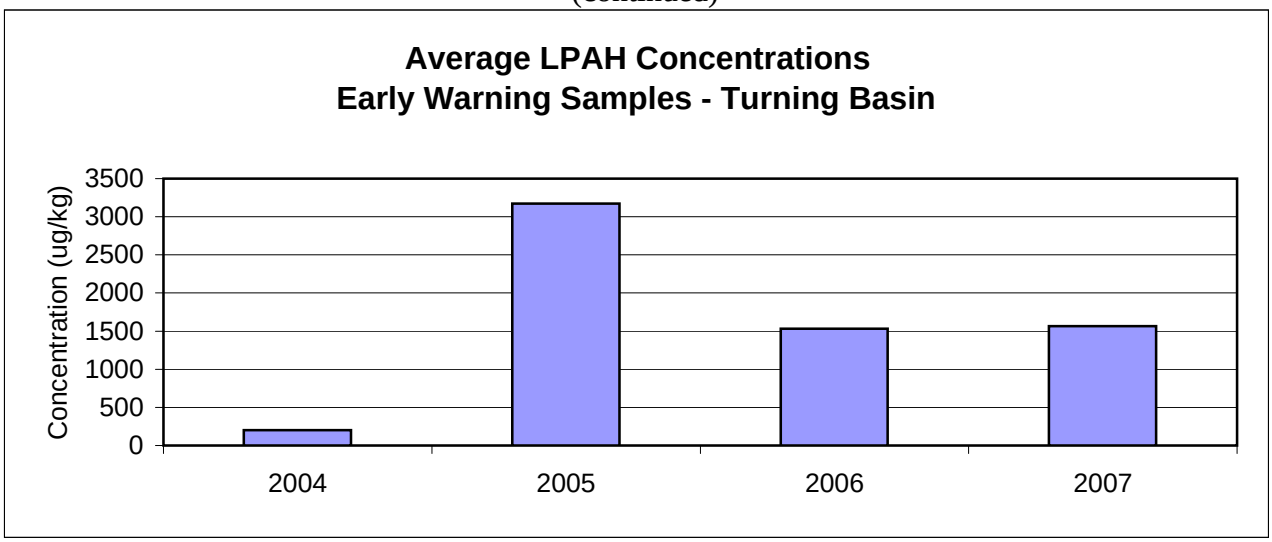
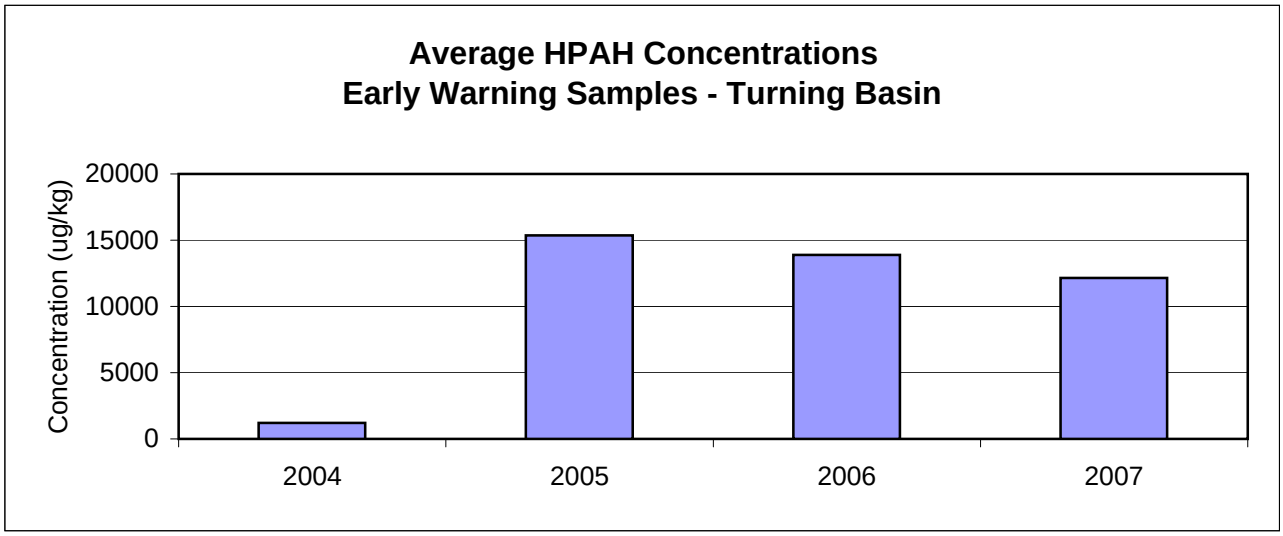


Figure 4-15. Average Concentrations of Early Warning Samples in Turning Basin (RC-01 to RC-07) (continued)





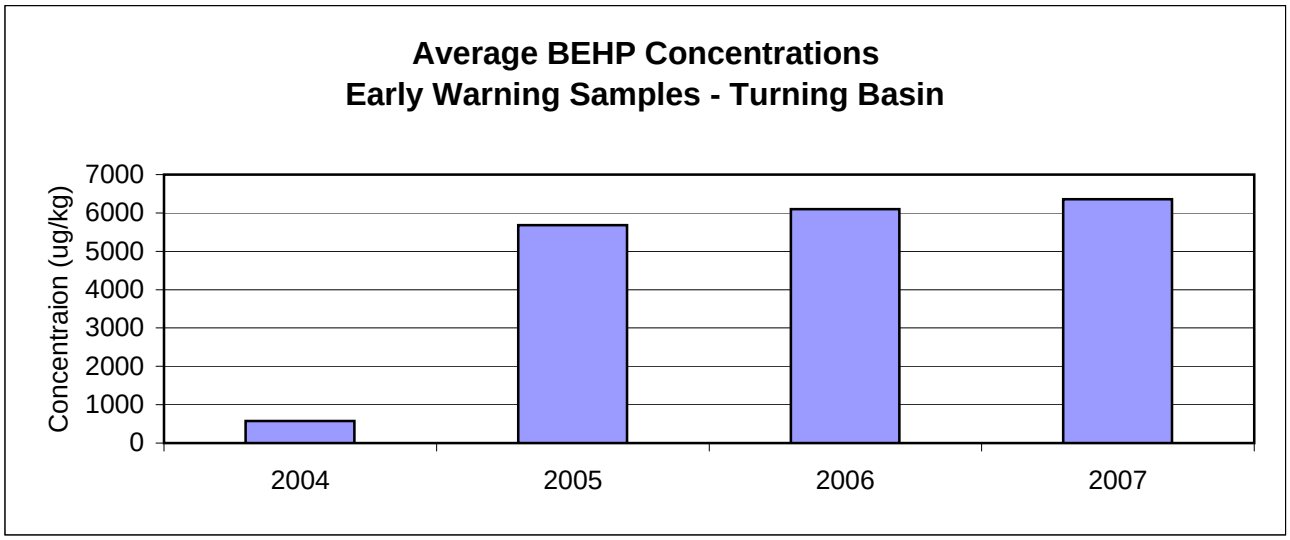
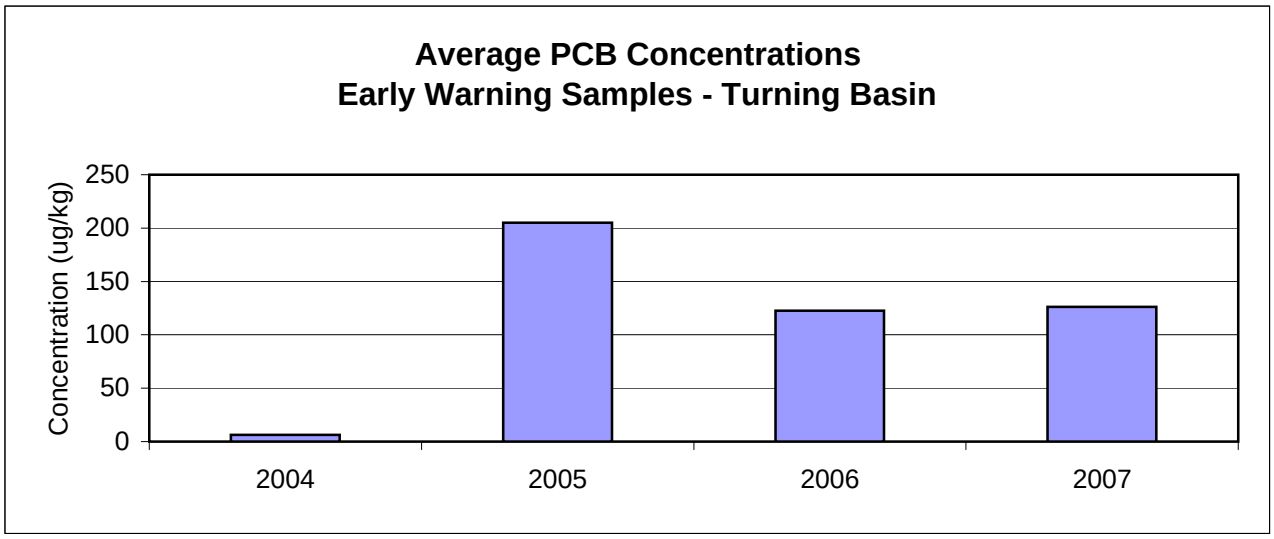


Figure 4-15. Average Concentrations of Early Warning Samples in Turning Basin (RC-01 to RC-07) (continued)



5. RECONTAMINATION EVALUATION AND INTERPRETATION

Year 3 early-warning data indicate that the top of the Utilities' cap has been recontaminated at levels above the Commencement Bay-Nearshore/Tideflats SQOs. BEHP exceeds the SQOs by the greatest degree and over the widest area. Several individual PAHs, total HPAHs, and zinc also exceed their respective SQOs at one or more locations. The greatest exceedance of the SQOs occurs at location RC-01; BEHP was measured at 14,000 µg/kg with an exceedance factor of 10.8.

A temporary dredging recontamination source was identified in late 2004 (DOF 2005). The area impacted by the dredging recontamination was capped in December 2005 and the Utilities' OMMP was revised to account for the presence of this recontamination.

An additional source of recontamination is on-going stormwater outfalls. The results of an evaluation of a variety of data documenting the conclusion that the recontamination sources are stormwater outfalls that discharge to the head of the waterway were documented in Appendix J of the Year 2 OMMP report (DOF 2006) and in Appendix H.

Figure 5-1 illustrates how thicknesses of accumulated sediment varied between April 2004 and May 2007. At most locations south of the bridge, the greatest thickness of accumulated sediment was measured in May 2007. Thicknesses of fine-grained sediment were lower north of the bridge where capping work was completed by the City in 2005 to resolve the dredging recontamination issue. The change in fine-grained sediment thicknesses between May 2006 and May 2007 is illustrated on Figure 5-2. At most locations sediment thicknesses increased between approximately 0.5 cm and 2 cm. The greatest increase was at station RC/WC-7 where the change in thickness was approximately 5 cm.

As noted in previous reports, the accumulated fine-grained sediment is distinctly different from the more granular underlying capping material. The capping material, based on grain size analyses of core samples, has a fines content (herein defined as particle sizes less than 62.5 microns) generally less than 4 percent. This compares with a fines content of up to 58 percent for accumulated sediment in the Utilities' Work Area.

The source of accumulated fine-grained sediment above the capping material is predominantly stormwater that discharges to the head of the waterway. This finding is based on comparison of the chemical quality of the accumulated fine-grained sediment with stormwater sediment (collected by in-line sediment traps) that discharges to the waterway. Stormwater sediment contains a typical suite of chemicals. These chemicals include

petroleum hydrocarbons, metals, and organic chemicals such as PAHs and phthalates. Pesticides and PCBs are also commonly detected in stormwater sediments.

Previous analyses (DOF 2006) documented a high correlation between HPAHs and BEHP in surface sediment samples collected within the Utilities' Work Area and a similarity in trends between the surface sediment and stormwater sediment discharged to the head of the waterway. HPAH and BEHP concentration data for early warning samples analyzed between 2004 and 2006 are plotted along with the results of the May 2007 analyses on Figure 5-3. Most of the 2007 sample results plot on the previously established trend using the 2004 to 2006 analytical results. Using the 2004 to 2007 data[1], correlations of R=0.83 and R^2=0.69 are estimated. High correlation and similar concentration trends between HPAHs and BEHP in early-warning sediment samples between April 2004 and May 2007 indicate a similar source. The HPAH and BEHP trend relationship in early-warning sediment samples is similar to the trend relationship of stormwater sediment samples collected near the end of the Twin 96 outfalls. These data indicate that the Twin 96 outfalls are the primary source of PAHs and BEHP to the Head of the Thea Foss Waterway.

Additional details of this evaluation are included in Appendix H.

[1] Samples collected in 2005 that were highly impacted from the dredging recontamination (RC8 to RC12) were excluded from this analysis.

Figure 5-1. Thickness of Fine-Grained Sediment in Utilities' Work Area

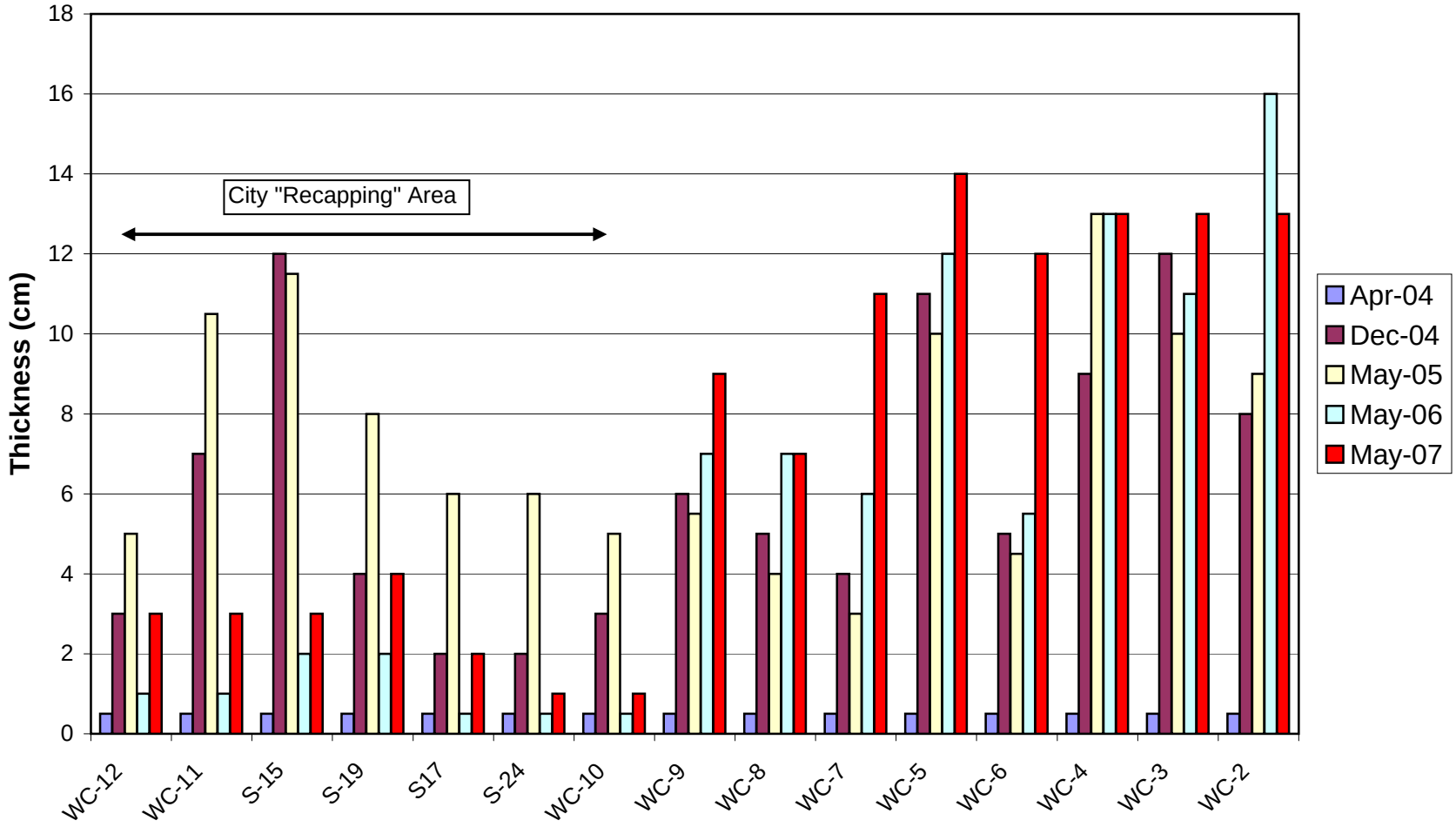
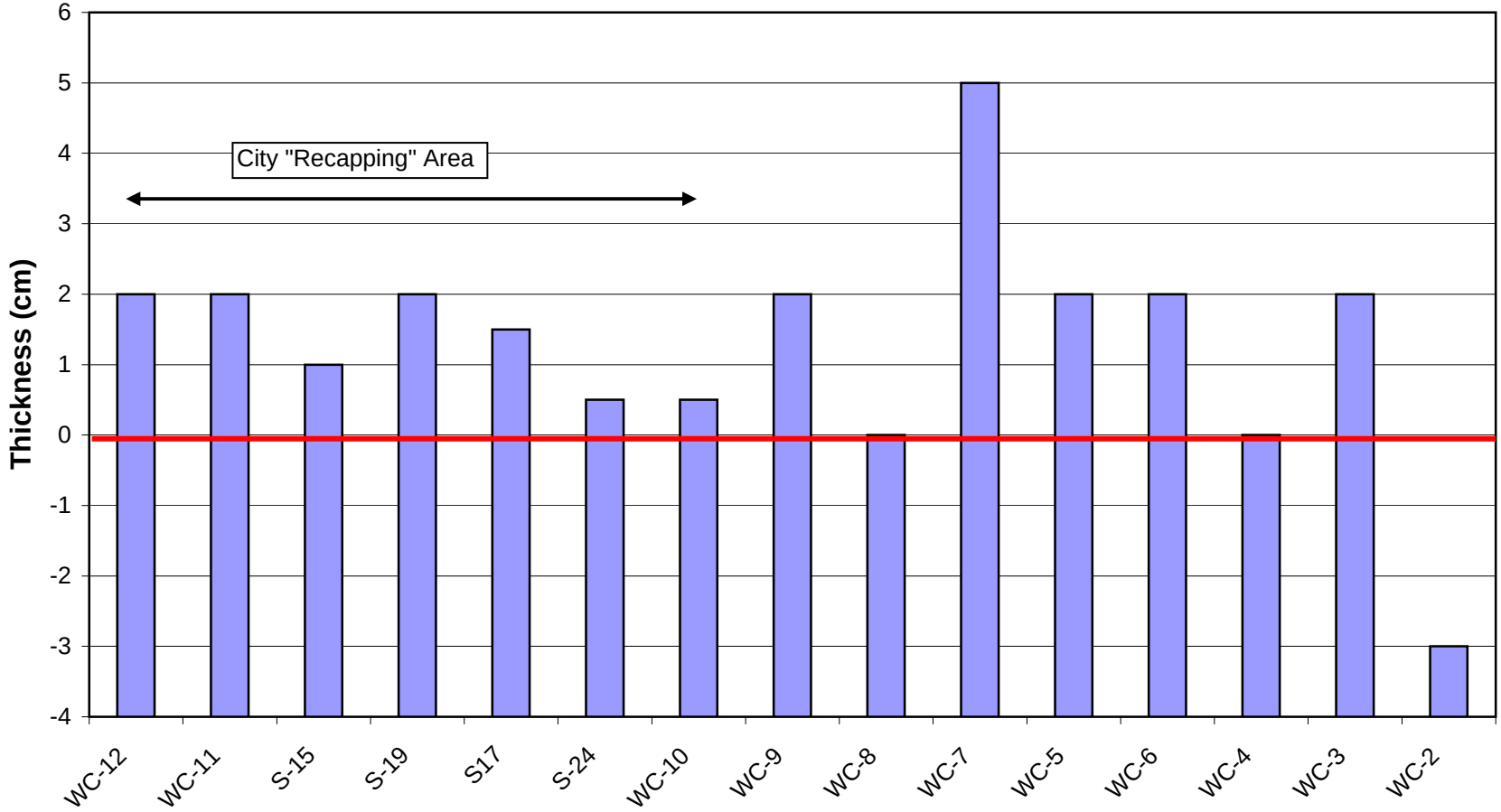
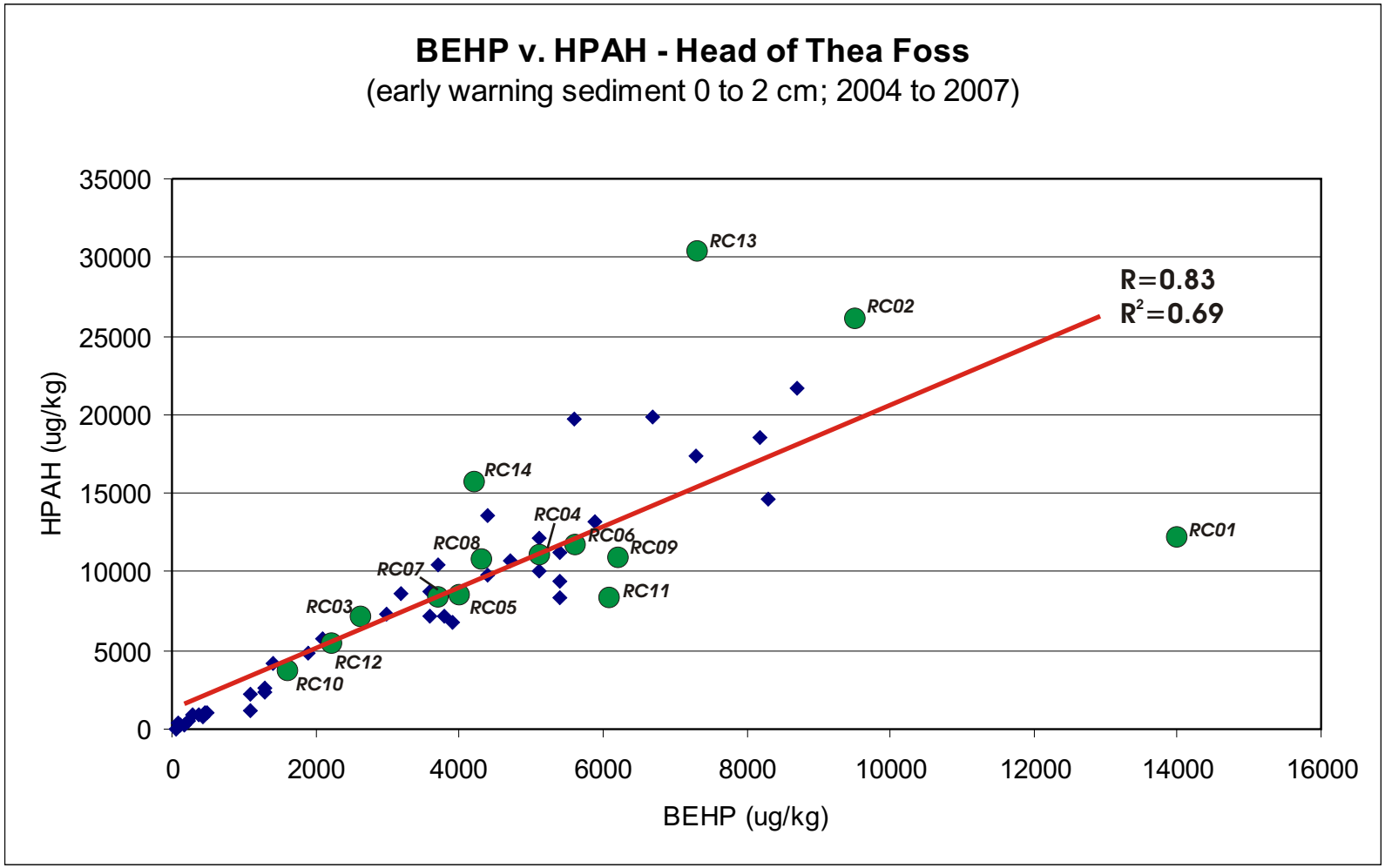


Figure 5-2. Change in Thickness of Fine-Grained Sediment in Utilities' Work Area--May 2006 to May 2007





May 2007 Sample

2004 to 2006 Samples

Ref: Early Warning Sediment 04 to 07.cdr

Head of Thea Foss Waterway
Tacoma, Washington

HPAH vs. BEHP Sediment Conc.
2004 to 2007 Early Warning Samples

FIGURE 5-3

6. SUMMARY

Remediation of the Utilities' Work Area was completed with final placement of capping material in February 2004. OMMP sampling was completed in April 2004 (Year 0 – baseline), May 2005 (Year 1), May 2006 (Year 2), and May 2007 (Year 3). The Utilities' sampling in 2007 consisted of collecting early-warning top-down recontamination samples (0 to 2 cm). The City collected and analyzed compliance samples (0 to 10 cm) from locations throughout the Utilities' Work Area. Physical observations for Year 3 OMMP monitoring included a visual inspection of the cap at low tide and collection of cores at two locations where the Year 2 bathymetry showed a difference in elevation of more than 1 foot.

Results of the Year 3 OMMP early warning and compliance sampling indicate that recontamination of the cap in the Utilities' Work Area continues to occur and is from "top-down" sources. This determination is based on the following:

- Early-warning samples contain SQO exceedances of BEHP throughout the Utilities' Work Area. All 14 of the Year 3 early-warning samples (0 to 2 cm) contained BEHP concentrations above the SQO of 1,300 µg/kg. PAHs exceed SQOs at locations at the southern end of the head of the waterway (i.e., RC-01, RC-02, RC-13, RC-14). Fine-grained sediment continues to accumulate on the top of the cap from the stormwater outfalls.
- The additional cap material placed by the City in the area north of the bridge appears to be effectively isolating the recontamination caused by dredging activities. Compliance samples (0 to 10 cm) collected in the area of additional placement did not exceed the SQOs. However, this area is accumulating fine-grained material and is being re-contaminated from top-down sources. The concentrations of metals, PAHs, and BEHP in early-warning (0 to 2 cm) samples increased from 2006 to 2007 and, in the case of BEHP in 2007, exceeded the SQO in the additional cap placement area.
- Comparison of the analytical results of the compliance samples to the SQOs indicates that in Year 3, BEHP exceeded its SQO (1,300 µg/kg) at all stations located below and south of the SR 509 Bridge. BEHP concentrations ranged between approximately 2,000 µg/kg to 4,900 µg/kg. PAH concentrations (phenanthrene, most individual HPAHs, and sum of HPAHs) also exceeded the SQOs at station WC-02, located in the turning basin near the scour protection apron. The highest BEHP concentration (4,900 µg/kg) and highest HPAH concentration (20,000 µg/kg) were co-located at station WC-02. Compliance sample

concentrations of BEHP and HPAH south of the SR 509 Bridge appear to have generally declined between 2006 and 2007. The average concentration of BEHP declined from approximately 3,600 µg/kg to 2,700 µg/kg, whereas the average concentration of HPAH declined from approximately 9,700 µg/kg to 7,800 µg/kg.

- Sufficient data are not available to reliably assess long-term trends in sediment contaminant concentrations. Variations in stormwater sediment volumes and concentrations discharged to the waterway coupled with sediment mixing and stabilization of the impacts of the 2004 dredging recontamination obscure the potential trends in the data provided by the two sample sets (2006 and 2007) collected after the dredging recontamination and capping occurred. Additional OMMP sampling rounds will be necessary to assess the longer term sediment quality trends in the Utilities' Work Area.
- Overall, the May 2007 physical and visual observations indicated that the scour protection apron is functioning as intended. No obvious signs of significant erosion were observed. Side slopes show no visible evidence of slope erosion, sloughing, etc. Visual observations during low tides of the former SR 509 seep area indicate the impermeable cap is preventing the upward migration of tar that would cause visual sheens.
- The qualitative evaluation of the cap thickness in Year 3 confirmed that the apparent change in cap thickness noted by the bathymetric surveys was not due to erosion and that the original cap thickness of 3 feet has been maintained in both of the areas evaluated.

7. RECOMMENDATIONS FOR REVISING THE OMMP

To address the issue of top-down recontamination caused by the City's dredging activities, the scope of the work for the Year 4 OMMP has been expanded to include the collection of four supplemental compliance samples from the area where the City placed additional capping material on the north end of the Utilities' Work Area. The need for further assessment or modifications to the OMMP to address elevated levels of phthalates and PAHs on top of the cap will be discussed and determined between the City and EPA.

The evaluation of bottom-up recontamination with the analysis of core samples at the bottom of the cap is required in the Year 4 monitoring. Core penetration through the cap has been problematic due to the coarse sand cap material. A vibrocore has been used to collect the cores in the past. Therefore, a modification to the coring method is recommended for the Year 4 sampling. A vibratory hammer coring device (e.g., Bill Jaworski's core) will be used.

The recording of the thickness of the fine-grained material deposited on top of the cap has become routine during OMMP monitoring. Consistently, measurement of the thickness has been recorded in the van Veen grab sampler. During Years 2 and 3 measurements at RC/WC-02 indicated that the fine-grained sediment thickness was greater than 17 cm and 13 cm, respectively (the sample collected in the grab sample did not reach the sand cap material). Because the maximum penetration of the grab sampler is 17 cm, it is recommended that a true measurement of the fine-grained sediment thickness at locations with deep deposits be documented using a hand-corer device such as a piston core. Anticipated locations that will need to be supplemented with coring include RC/WC-02, RC/WC-07, and WC-14.

8. REFERENCES

DOF (Dalton, Olmsted & Fuglevand, Inc.). 2004a. Remedial Action Construction Report, Head of The Thea Foss Waterway Remediation Project, Tacoma, Washington. Prepared for Puget Sound Energy and PacifiCorp Environmental Remediation Company. June 9, 2004.

DOF. 2004b. Results of Year 0 Operation, Maintenance and Monitoring Plan Sampling, Head of Thea Foss Waterway Remediation, Tacoma, Washington. Prepared for Puget Sound Energy and PacifiCorp Environmental Remediation Company. August 27, 2004.

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DOF. 2006. Year 2 Assessment of Utilities' Cap Recontamination, Head of the Thea Foss Waterway Project, Tacoma, Washington. Prepared by Dalton, Olmsted, and Fuglevand, Inc. for PacifiCorp Environmental Remediation Company and Puget Sound Energy. October 2006.

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EPA. 2004. Letter from the EPA to PacifiCorp Environmental Remediation Company, titled "Confirmation/Baseline Year "0" Sampling (QAP/OMMP)-RA23 and RA24

in Thea Foss Waterway, Commencement Bay/Nearshore Tideflats, Tacoma, Washington." March 8, 2004.

PERCo. 2006. Letter to EPA from Jacqueline Wetzsteon "Response to the U.S. Army Corps of Engineers' April 13, 2006 Comments on the Remediation Project Sampling Plans for the Head of the Thea Foss Waterway." April 28, 2006.

PERCo. 2007. Letter to EPA from Jacqueline Wetzsteon "Response to Comments on the November 28, 2006 Supplemental Sampling Proposal for the Head of the Thea Foss Waterway." March 28, 2007.

TtEC (Tetra Tech EC, Inc.). 2006. Results of Year 2 Operations, Maintenance, and Monitoring Sampling, Head of the Thea Foss Waterway Remediation Project. Tacoma, Washington. November 2006.

TtFW (Tetra Tech FW, Inc.); Dalton, Olmsted & Fuglevand, Inc.; and Geoengineers, Inc. 2003. Operations, Maintenance, and Monitoring Plan, Head of the Thea Foss Waterway Remediation Project, Tacoma, Washington. July 2003.

APPENDIX A

YEAR 2 SUPPLEMENTAL SITE VISITS

APPENDIX A.1

SITE VISIT JANUARY 2, 2007, MEMORANDUM

TETRA TECH EC, INC.

Memorandum

Date: January 29, 2007

To: Jacqueline Thiell Wetzsteon, PacifiCorp

From: Pamela Sargent, P.E.

RE: Site Observations
January 2, 2006
Head of the Thea Foss Waterway Project

This technical memorandum presents a summary of the observed site conditions within the Head of the Thea Foss Waterway, Tacoma, Washington (Figure 1). The observations were made by Pamela Sargent, Principal Environmental Engineer for Tetra Tech EC, Inc. (TtEC). She visited the site between approximately 7:30 and 10:30 pm PST on January 2, 2007. During this period, a low tide of -2.6 feet Mean Lower Low Water (MLLW) was predicted for 10:13 pm PST (Figure 2). This visit was made with representatives of the City of Tacoma (Jim Oberlander, Rick Fuller, Dana Deleon, Lorna Sutton, and Alicia Lawver) and Jeff Barney representing Citizens for a Healthy Bay (CHB).

The purpose of this site visit was to inspect the scour protection apron placed at the head of the waterway in front of the twin 96-inch outfalls and the outfall scour aprons in front of outfalls 235 and 243 on a negative low tide after the rainfall event on November 6, 2006 that exceeded the 100-year 24-hour design storm and to document any displacement or settlement of armoring materials or adjacent slope capping materials as required by Section 3.1.2.2 of the Operation, Maintenance and Monitoring Plan for the Head of the Thea Foss Waterway Project (Tetra Tech FW, Inc. 2003). This site visit was performed in conjunction with the City of Tacoma's periodic observation of City stormwater outfalls 254, 249, 248, 245, 243, 237a and b, 235, and 230 in the Thea Foss Waterway. Observations regarding the seismic upgrade work on the East 23rd Street Bridge by the City of Tacoma's contractor were made during this site walk and are included in the memorandum.

Field Observations – January 2, 2007

Condition of the Scour Protection Apron Placed at the Head of the Waterway:

The condition of the scour protection apron at the south end of the waterway is shown in Figure 3. Water was flowing out of outfalls 237a and 237b during the site visit from heavy rain in the hours preceding the site visit. The discharge from these outfalls was spreading out over the

apron and flowing northward towards the turning basin. As previously noted in the Year 0, Year 1, and Year 2 low tide site observations, a small, shallow channel is present in the apron near the southeast corner of the waterway. The configuration and shallow depth of this channel appear unchanged from previous observations and the overall integrity of the cap has not been adversely impacted by the presence of this localized feature. No corrective action is proposed at this time. However, this feature should continue to be monitored during future low tide events for changes. Some miscellaneous debris (clothing, a sediment trap, and some sample tubing) were present on the scour apron in front of outfalls 237a and 237b at the very head of the waterway. A layer of olive and gray silt is present over the apron in the southeast and southwest "corners" of the waterway.

General Condition of Outfall Scour Apron in Front of Outfall 243:

The scour protection adjacent to outfall 243 (at Station 73+40 on the east side of the waterway under the SR-509 Bridge) shows no signs of erosion (Figures 4 and 5). Water was flowing out of this outfall from heavy rain in the hours preceding the site visit. There is extensive barnacle growth on the "duckbill" check valve attached to outfall 243. Jim Oberlander from City of Tacoma Environmental Services noted that the area between the bottom of the check valve and the outfall scour protection is beginning to fill in. There appears to be adequate remaining clearance so that the operation of the check valve is not affected and therefore, no corrective action is proposed at this time. However, the clearance between the bottom of the check valve and the outfall scour protection should continue to be monitored during future low tide events to verify that the operation of the check valve is not compromised.

General Condition of Outfall Scour Apron in Front of Outfall 235:

There are signs of displacement or subsidence in the scour protection apron in front of outfall 235 (at Station 73+20 on the west side of the waterway under the SR-509 Bridge). Water from heavy rain in the hours preceding the site visit was flowing out of this outfall into a relatively deep pool directly in front of the outfall. The project design drawings called for the landward edge of the scour apron to match the outfall inlet elevation. Some minor pooling of water was noted during the Year 2 OMMP site visit (June 2006) but this pooling appears to be more substantial than that noted in June 2006 (Figure 7).

It is recommended that as-built photos and topography/bathymetry in the area around outfall 235 be reviewed and the depth of the pool be measured on the next daytime negative low tide so that the post-construction changes in the scour apron for outfall 235 can be quantified. Information regarding the internal condition of outfall 235 and associated upstream stormwater piping (such as recent inspection videos) was requested from the City of Tacoma Environmental Services on January 16, 2007. Several factors may be impacting the stability of the scour pad such as groundwater seepage under the outfall, stormwater seepage under the outfall via a leek in the stormwater piping, excessive scour from recent extreme rainfall events. Once the information discussed above is gathered, recommendations regarding the outfall 235 scour protection apron can be developed. A tentative site inspection is scheduled for Friday February 23, 2007 during a daytime negative tide.

General Condition of the Waterway Slopes Exposed at Low Tide:

A photograph of the east bank slopes exposed during low tide is shown in Figure 6. No slope erosion or sloughing was observed. As previously noted in the Year 0 and Year 1 site observation memoranda, the coarser slope cap materials are covered with algae and barnacles. A layer of olive and gray silt is present over capping material on the lower portions of the east and west bank slopes.

General Observations:

The weather was clear during this nighttime low-tide field visit. Gas bubbles were observed throughout the head of the waterway but no sheens were observed in the former SR-509 seep area. Algae and barnacles are present on coarser slope cap and scour protection materials.

Observations of the East 23rd Street Bridge Seismic Upgrade Work Area:

Scaffolding for the seismic upgrade of the bridge was in place at the time of this site visit but no nighttime work was being performed. The scaffolding was set up under the bridge (behind the top of the cap) as previously discussed with the City of Tacoma on November 1, 2006. Visual inspection of the slope and cap between Berg Scaffolding and the twin-96-inch outfalls did not show evidence of disturbance from the ongoing bridge work.

Figures

Figure 1 – Head of the Thea Foss Waterway – South of Station 70+10 (Utilities' Work Area)

Figure 2 – Commencement Bay Tides – January 2, 2007

Figure 3 – Scour Protection Apron for Outfalls 237a and b (Looking North from the East 23rd Street Bridge)

Figure 4 – Outfall 243 Scour Protection Apron

Figure 5 – Close-up of Outfall 243 Check Valve

Figure 6 – East Bank Slope Cap (Looking South)

Figure 7 – Close-up of Outfall 235 and the Pool in Front of Outfall 235

FIGURES

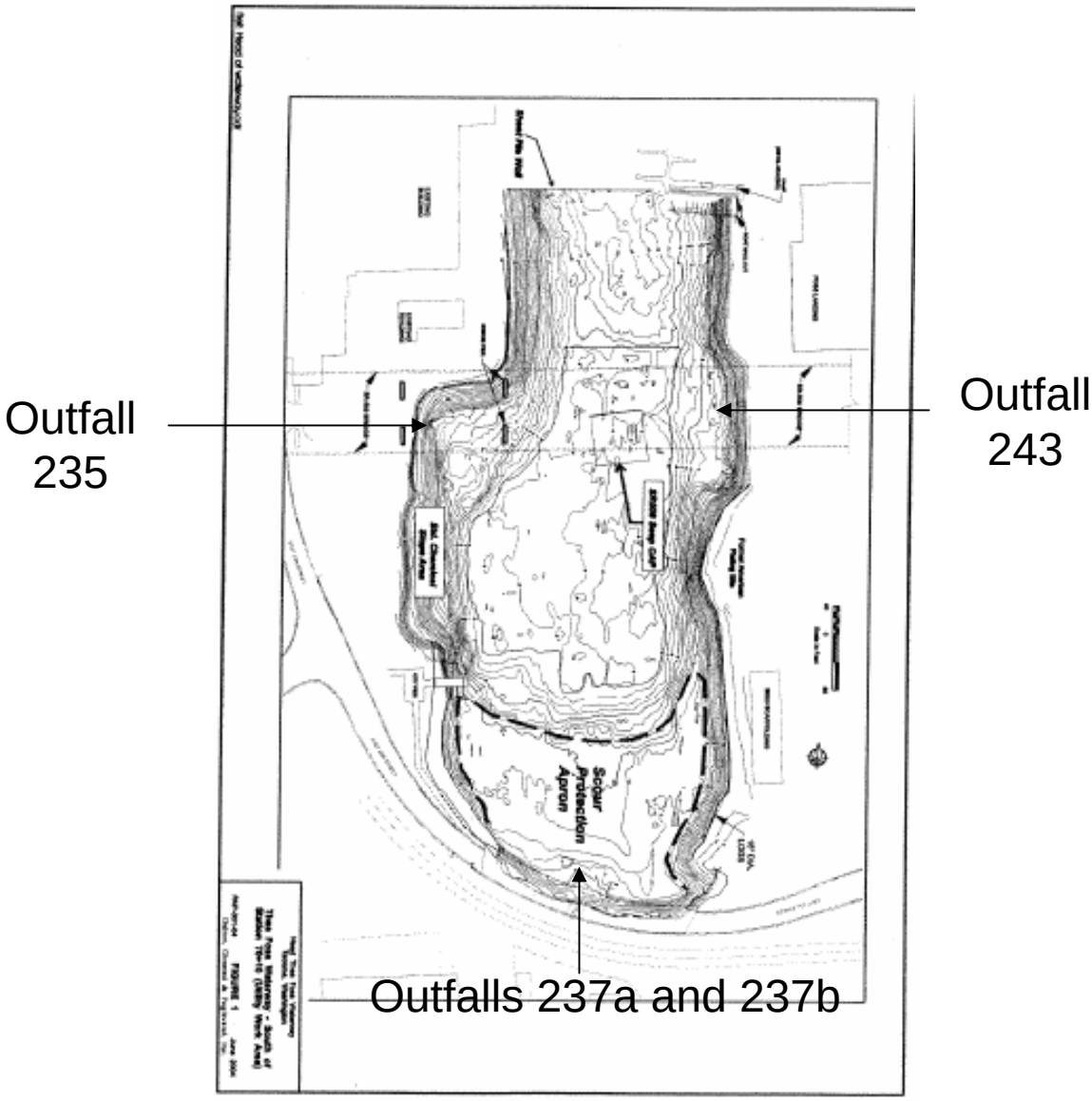

Figure 1 – Head of the Thea Foss Waterway Utilities' Work Area

TETRA TECH EC, INC.

TETRA TECH EC, INC.

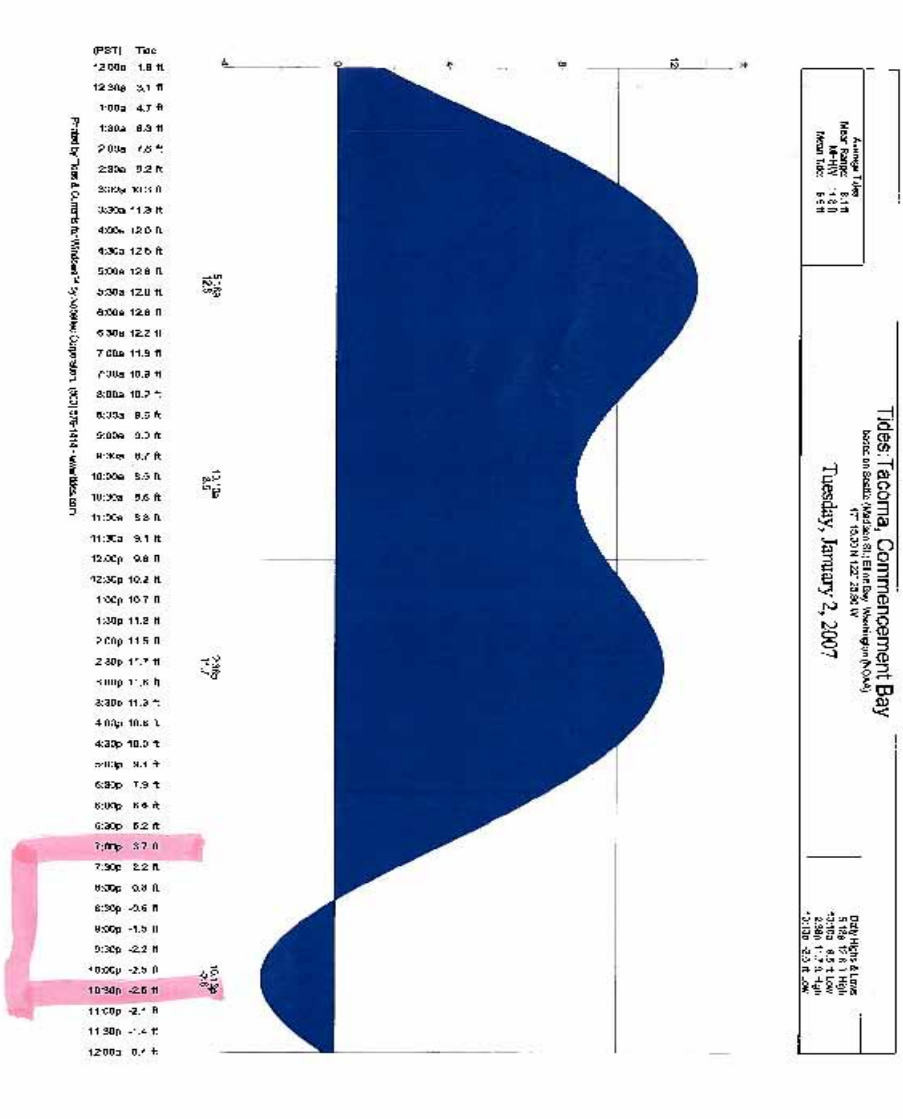

Figure 2 – Commencement Bay Tides
January 2, 2007

Figure 3 – Scour Protection Apron
For Outfalls 237a & b – looking North from E 23rd St. Bridge

Figure 4 – Outfall 243 Scour Protection Apron

TETRA TECH EC, INC.

Figure 5 – Close-up of Outfall 243 Check Valve

Figure 6 – East Bank Slope Cap
(Looking South)

TETRA TECH EC, INC.

Figure 7 –
Close-up of Outfalls 235 and
the Pool in Front of Outfall 235

TETRA TECH EC, INC.

APPENDIX A.2

SITE VISIT FEBRUARY 23, 2007, MEMORANDA

TETRA TECH EC, INC.

Memorandum

Date: February 28, 2007

To: Jacqueline Thiell Wetzsteon, PacifiCorp

From: Pamela M. Sargent, P.E.

RE: Site Observations
February 23, 2007
Head of the Thea Foss Waterway Project

This technical memorandum presents a summary of the observed site conditions within the Head of the Thea Foss Waterway, Tacoma, Washington. The observations were made by Pamela Sargent, Principal Environmental Engineer for Tetra Tech EC, Inc. (TtEC). She visited the site between approximately 3:15 and 5:15 pm PST on February 23, 2007. During this period, a low tide of -0.1 feet Mean Lower Low Water (MLLW) was predicted for 3:40 pm PST (Figure 2). This visit was made with Jackie Thiell Wetzsteon from PacifiCorp Environmental Remediation Corporation, Mary Henley from the City of Tacoma, Terry Olmstead of Dalton, Olmstead, and Fuglevand, and Iain Wingard of Floyd Snider (acting as a consultant to the City of Tacoma).

The purpose of this site visit was to inspect the outfall scour apron in front of outfall 235 as a follow-up to the January 2, 2007 site visit and quantify the post-construction changes in the scour apron.

Field Observations – February 23, 2007

General Condition of Outfall Scour Apron in Front of Outfall 235:

The small outfall scour protection in front of Outfall 235 (at Station 73+20 on the west side of the waterway under the SR-509 Bridge) has been displaced outward approximately 4 to 5 feet. There is a pool in front of the outfall ranging in depth from 12” to 24” deep. The pooling and small outfall scour protection material displacement appears to be the result of high velocity discharge or high flows from the outfall.

The project design drawings called for the landward edge of the scour apron to match the outfall inlet elevation and for the capping and armoring to consist of three layers (from the top down) as follows:

- 2’ of small outfall scour protection
- 12” of slope armor

- 18” of slope cap material

The purpose of the small outfall scour protection that has been displaced is to dissipate the energy from the flow from the outfall. Therefore, it is recommended that the area around Outfall 235 be monitored during annual OMMP for further changes in pool depth or small outfall scour protection material displacement. Repairs to this area may be warranted if further changes occur to ensure the integrity of the underlying slope cap.

A photo of the current condition of the scour protection in front of outfall 235 are presented below.

OUTFALL 235 AT 1530 ON FEBRUARY 23, 2007

General Observations:

There is an inlet to the stormwater system upstream of outfall 235 at the City of Tacoma’s project site just upslope of outfall 235. A photo of this inlet is presented below.

INLET TO STORMWATER SYSTEM JUST UPSTREAM AND UPSLOPE OF OUTFALL 235

Dalton, Olmsted & Fuglevand, Inc. *Environmental Consultants*

10827 NE 68th Street • Kirkland, Washington 98030
Telephone (425) 827-4588 (FAX 425-739-9885)

MEMORANDUM

TO: Jackie Wetzsteon - PacifiCorp

FROM: Terry Olmsted
Sr. Consulting Geologist, Dalton, Olmsted & Fuglevand, Inc.

DATE: February 28, 2007

SUBJECT: Observations at Outfall 235, February 23, 2007
Head of Thea Foss Waterway Project

REF. NO: PAP-001-01

On Friday, February 23, 2007, I met with Jackie Wetzsteon of PacifiCorp, Pam Sargent of TetraTech, Mary Henley of the City of Tacoma, and Iain Wingard, consultant to the City, to view conditions at Outfall 235. The site visit was between about 3:30 and 4:00 PM. During this period, the tide (predicted) was at about 0 feet, Mean Lower Low Water (MLLW), giving a good view of the outfall conditions above tide level.

The purpose of the field meeting was to evaluate conditions reported by TetraTech in their memorandum of January 29, 2007, that referred to "*signs of displacement or subsidence in the scour protection apron in front of outfall 235 (at Station 73+20 on the west side of the waterway under the SR-509 Bridge)*".

Basically, a shallow pool has developed in front of the concrete apron of Outfall 235 that was observed by TetraTech during their field visit of January 2, 2007. The pool is symmetrical about the outfall and apron, and is approximately 6-inches to 15-inches below the top of the apron. At the time of my visit, flow from the outfall was very low. See the attached photographs of the observed conditions.

Facing Outfall 235

View from S. Side

View from N. Side

View into pool at apron of Outfall 235

View into pool at apron of Outfall 235

At the time of the Head of the Thea Foss remediation (2004), the slope protection rock was placed at approximately the same level or slightly above the lip of the concrete apron.

Based on the symmetry of the feature around the outfall and its physical appearance, the observed pool was likely caused by flows from Outfall 235 during one or more of the

significant storm events of the recent past, which scoured out a portion of the slope protection rock, and deposited it a few feet ahead to form the pool. There was no evidence that I observed suggesting the underlying cap is being affected or that the concrete apron is being undermined. It appears that there is still slope protection rock in place beneath the pool, covered by a coarse sand and gravel layer. No evidence of soil piping downstream of the outfall flow was observed.

Given the stable appearance of the conditions at the time of my visit, in my opinion, no corrective action is required at this time. I recommend that the feature be observed during future OMMP events to verify and document that conditions are not changing significantly over time.

Please call if you have any further questions,

Terry L. Olmsted

Terry Olmsted

APPENDIX B

YEAR 3 SITE OBSERVATIONS

(Site Photographs Located on Enclosed CD)

TETRA TECH EC, INC.

Memorandum

Date: June 8, 2007

To: Jacqueline Thiell Wetzsteon, PacifiCorp

From: Pamela Sargent

RE: Site Observations
May 16, 2006
Head of the Thea Foss Waterway Project

This technical memorandum presents a summary of the observed site conditions within the Head of the Thea Foss Waterway, Tacoma, Washington (Figure 1). The observations were made by Pamela Sargent, Principal Environmental Engineer, for Tetra Tech EC, Inc. (TtEC). She visited the site between approximately 10:30 am and 12:15 pm PDT on May 16, 2007 with supplemental observations made of the former SR 509 seep area on May 17, 2007. During this period, a low tide of -3.25 feet Mean Lower Low Water (MLLW) was predicted for 11:12 am PDT.

The purpose of this site visit was to observe the:

- General condition of the scour protection apron placed at the head of the waterway,
- General condition of the waterway slopes exposed at low tides,
- Former SR-509 seep area for evidence of sheens,

and to document the observed site conditions during the lowest daytime tides of the year as part of the Year 3 Operation, Maintenance and Monitoring activities for the Head of the Thea Foss Waterway Project.

Field Observations – May 16, 2007

Condition of the Scour Protection Apron Placed at the Head of the Waterway:

The condition of the scour protection apron at the south end of the waterway is shown in Figures 2 to 6. Water was flowing out of outfalls 237a and 237b during the site visit (Figure 7). The discharge from these outfalls was spreading out over the apron and flowing northward towards the turning basin. As previously noted in the Years 0, 1, and 2 low tide site observations, a small, shallow channel is present in the apron near the southeast corner of the waterway (Figure 7). The configuration and shallow depth of this channel appear unchanged from previous observations and the overall integrity of the cap has not been adversely impacted by the presence

of this localized feature. No corrective action is proposed at this time. However, this feature should continue to be monitored during future low tide events for changes.

General Condition of the Waterway Slopes Exposed at Low Tide:

Photographs of the east and west bank slopes exposed during low tide are shown in Figures 8 to 13. No slope erosion or sloughing was observed. As previously noted in the Years 0, 1 and 2 site observation memoranda, the coarser slope cap materials are covered with algae and barnacles. Mussels are also present on these materials. A layer of olive and gray silt is present over capping material on the lower portions of the east and west bank slopes.

Observations in the Vicinity of the Former SR-509 Seep Area:

Gas bubbles were observed in the vicinity of the former SR-509 seep area during the site visit but no sheens were observed in the former SR-509 seep area.

General Observations:

- The weather was partly sunny with light winds during this field visit.
- Extensive gas bubbles were observed throughout the head of the waterway but no sheens were observed (Figure 14).
- Crabs, starfish, a 12-14" salmon, geese, ducks, seagulls and terns observed at site during the site visit.
- Some miscellaneous debris (traffic cones, bicycles, plastic bottles, and clothing) was present at the site.
- Two bags of sand blast grit still remained on site at the north end of the bridge from the seismic retrofitting of the East 23rd Street Bridge (Figure 15).
- 2 pieces of pipe scaffolding were observed in the water near Outfalls 237a and 237b.
- Small quantities of sandblast grit (or something similar) were present on the sidewalk of the East 23rd Street Bridge (over the south end of the project site) (Figure 16).
- The new pilings installed under the east end of the SR-509 bridge are all starting to lean slightly in various directions (i.e. not vertical).
- The scour protection adjacent to outfall 243 (at Station 73+40 on the east side of the waterway under the SR-509 bridge) shows no signs of erosion or displacement (Figures 17 to 20). Water was flowing out of Outfall 243 during the site visit. The tideflex valve™ at the end of Outfall 243 is extensively covered with barnacles and at the time of the site visit there was a small diameter, approximately 20-foot long pile with cable or rope attached to end entangled in the metal clip at the top of the tideflex valve™ (Figure 17). The City of Tacoma was notified about this derelict pile (notified Rick Fuller via phone on May 16, 2007). The pile was gone when City personnel went to investigate the following day.
- A black shiny, oil-like substance was noted on the slope between Outfall 243 and Foss Landing localized around high tide line (Figure 18). There was no noticeable smell associated with the substance and this substance produced an orange to rust color slime on blue gloves when touched.

- The scour protection adjacent to Outfall 235 (at Station 73+20 on the west side of the waterway under the SR-509 bridge) shows no further signs of erosion or displacement beyond what was noted during January and February 2007 site visits (Figure 19). Water was flowing out of Outfall 235 during the site visit.
- As previously noted during January and February 2007 site visits, the small outfall scour protection in front of Outfall 235 (at Station 73+20 on the west side of the waterway under the SR-509 Bridge) has been displaced outward approximately 4 to 5 feet. There is a pool in front of the outfall ranging in depth from 12" to 24" deep. The pooling and small outfall scour protection material displacement appears to be the result of high velocity discharge or high flows from the outfall. As recommended, the area around Outfall 235 will be monitored during annual OMMP for further changes in pool depth or small outfall scour protection material displacement. Repairs to this area may be warranted if further changes occur to ensure the integrity of the underlying slope cap.
- At the former Standard Chemical Site, a baker tank is discharging into the stormwater system just upstream of Outfall 235 (Figure 20). Water in the pool in front of Outfall 235 was cloudy and a bit foamy (Figure 21).

Figures

Figure 1 – Head of the Thea Foss Waterway – Utilities' Work Area (Looking North from East 23rd Street Bridge)

Figure 2 – Looking South Across Scour Apron at Area Just East of the Twin 96-inch Outfalls

Figure 3 – Looking South Towards East 23rd St Bridge - East Side of Twin 96-inch Outfalls

Figure 4 – Looking South Towards East 23rd St Bridge - West of the Twin 96-inch Outfalls

Figure 5 – Looking South at Twin 96-inch Outfalls

Figure 6 – Looking SE across the Scour Apron at the SE Corner of the Site

Figure 7 – Twin 96-inch Outfalls – Outfalls 237A and 237B

Figure 8 – At Outfall 243 Looking North along the East Side of the Waterway

Figure 9 – East Side of the Waterway Including Outfall 243 (From Just South of the SR-509 Bridge)

Figure 10 – Looking ENE Across Northern End of Scour Apron to East Slopes in Front of Berg Scaffolding (From just South of the City Pier).

Figure 11 – Looking SE from Just South of the City Pier Across Scour Apron

Figure 12 – Looking North Along West Side of Waterway from City Pier

Figure 13 – Looking South Along West Slope from SR-509 Bridge towards the City Pier

Figure 14 – Low Tide Gas Bubbles - Adjacent to the Central Portion of the Bottom of the Slope at the Former Standard Chemical Site

Figure 15 – Contractor Supplies and Equipment at West End of East 23rd St Bridge at SE Corner of Project Area

Figure 16 – Sandblast Grit on Sidewalk on East 23rd Street Bridge
Figure 17 – Close Up of Outfall 243
Figure 18 – Oil-Like Substance of Slope just North of Outfall 243
Figure 19 – Close-up of Outfall 235
Figure 20 – Baker Tank Discharge to Stormwater Inlet Just Upstream of Outfall 235
Figure 21 - Close-up of Pool In Front of Outfall 235 Showing Cloudy Water

FIGURES

Figure 1 – Head of the Thea Foss Waterway Utilities' Work Area (Looking North from the East 23rd Street Bridge)

TETRA TECH EC, INC.

Figure 2 – Looking South Across Scour Apron at Area Just East of the Twin 96-inch Outfalls

Figure 3 – Looking South Towards East 23rd St Bridge - East Side of Twin 96-inch Outfalls

TETRA TECH EC, INC.

Figure 4 – Looking South Towards East 23rd St Bridge - West of the Twin 96-inch Outfalls

Figure 5 – Close-up of Outfalls 237a & 237b Looking South

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Figure 6 - Looking SE across the
Scour Apron at the SE Corner of the Site

TETRA TECH EC, INC.

Figure 7 –
Close-up of Outfalls 237a and 237b
Looking Southwest

TETRA TECH EC, INC.

Figure 8 – At Outfall 243 Looking North along the East Side of the Waterway

Figure 9 – East Side of the Waterway Including Outfall 243 (From Just South of the SR-509 Bridge)

TETRA TECH EC, INC.

Figure 10 – Looking ENE Across North End of Scour Apron to East Slopes in Front of Berg Scaffolding

Figure 11 – Looking SE from Just South of the City Pier Across Scour Apron

TETRA TECH EC, INC.

Figure 12 – Looking North Along West Side of Waterway from City Pier

Figure 13 – Looking South Along West Slope from SR-509 Bridge towards the City Pier

TETRA TECH EC, INC.

Figure 14 – Low Tide Gas Bubbles - Adjacent to the Central Portion of the Bottom of the Slope - Former Standard Chemical Site

Figure 15 – Contractor Supplies and Equipment at West End of East 23rd St Bridge at SE Corner of Project Area

TETRA TECH EC, INC.

Figure 16 – Sandblast Grit on Sidewalk on East 23rd Street Bridge

Figure 17 – Close-up of Outfall 243

TETRA TECH EC, INC.

Figure 18 – Oil-Like Substance of Slope just North of Outfall 243

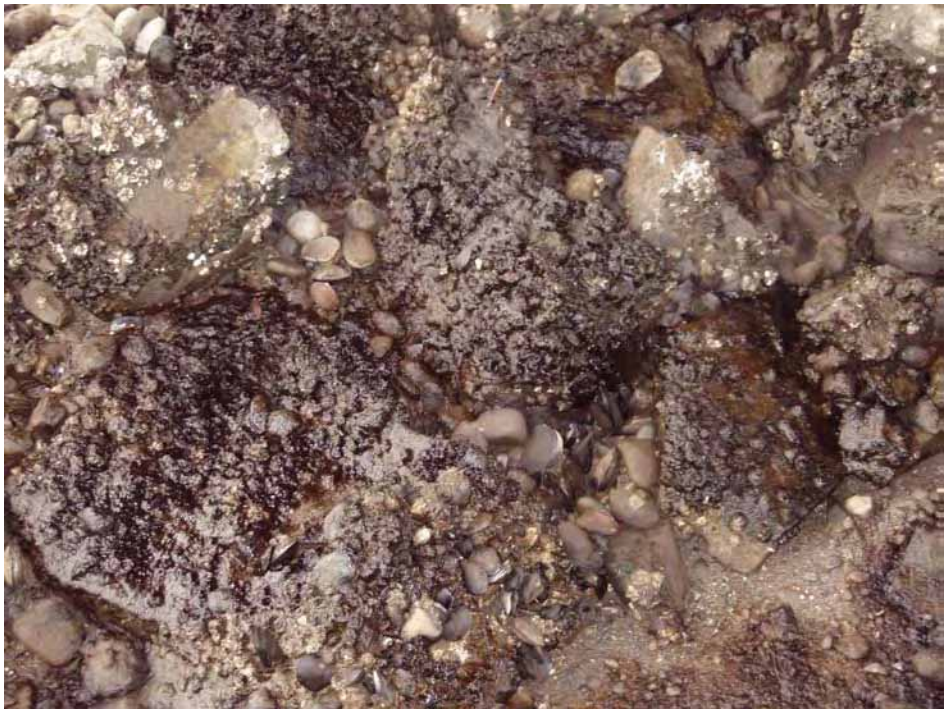

Figure 19 – Close-up of Outfall 235

TETRA TECH EC, INC.

Figure 20 – Baker Tank Discharge to Stormwater Inlet Just Upstream of Outfall 235

Figure 21 – Close-up of Pool In Front of Outfall 235 Showing Cloudy Water

TETRA TECH EC, INC.

APPENDIX C

FIELD NOTES

APPENDIX C.1

LOG BOOK AND SAMPLE LOG FORMS

May 16 2007 Crew [illegible] Year 3 sampling

7:00 Jen Hamilton [illegible]

Jon Schwartz at [illegible]

7:30 [illegible]

Jess Messinger [illegible] Floyd Snider

800 Setting up boat / H+S briefing

900 at S-15 collecting 1st sediment grab

Floyd Snider location

920 Free Landing 253-627-4344

Crew 253-250 1906

We tied up to boat to collect S-15

945 Collected S-19 outside of boat

connected to dock.

Collecting lead lines each station

1014 at RC/WC-11 Tied to dock

1020 Emile Pitre from ACOE arrived on site

to do oversight of sampling

1040 completed sampling at RC/WC-11

moving for intertidal sampling

1107 at RC/WC-01

Ray collecting 0-2, Jess: collecting 0-10

Found w/ hand held GPS

1125 Rebar present at RC-13

Note - location N701 89[illegible]

E 1165416

1140 Rebar [illegible] at RC-14

5/16/07 Photos

1	~~S-19~~ S-15	
2	S-19	
3	WC-11	(+ RC-11) Attempt A
4	RC-11	Attempt B
5	RC/WC-01	
6	RC-13	Rebar
7	RC-14	Rebar
8	S-17	
9	S-24	(ghost shrimp)
10	RC/WC-10	Attempt A
11	RC-10	Attempt B
12	RC/WC-05	Attempt A
13	RC-05	Attempt B
14	RC/WC-07	Attempt A
15	RC/WC-08	Attempt A
16	RC/WC-08	Attempt B
17	RC-08	Attempt C
18	WC-13	
19	WC-14	
20	RC/WC-09	Attempt A
21	RC/WC-09	Attempt B
22	RC/WC-02	Attempt A
23	RC-02	Attempt B
24	WC-03	Attempt A
25	RC-03	Attempt B

Samples 5/16

Y3-RC11-S	1010	
Y3-RC01-S	1107	
Y3-RC13-S	1125	
Y3-RC14-S	1140	
Y3-RC10-S	1332	
Y3-RC05-S	1422	
Y3-RC07-S	1510	
Y3-RC08-S	1600	included MS/MSD
Y3-RC15-S	1650	Duplicate of RC08
Y3-RC09-S	1734	
Y3-RC02-S	1802	
Y3-RC03-S	1830	

Samples 5/17

Y3-RC12-S	800
Y3-RC06-S	825
Y3-RC04-S	849
Y3-RB-01	950

5-16-07

Note - in low tide location - there is no distinct layer of silt - mixed throughout.

1030 Pam Sargent on site doing survey of cap.

1210 Jen on boat processing RC13, 14, #01 samples

1215 at S-17 - tried to dock at edge of dock just at edge of bridge

1215 Ray + Pam setting control for total station

1248 on S-24 FS collected 0-10 ghost shrimp

1317 Ray done with control. Put prism on boat

1320 Aiming for RC/WC-08 Ray on total Station He needs to reset.

1330 moved to RC/WC-10

FS - 0-10 attempt A

TT - 0-2 Attempt A - other side of Van Ness

1420 Ray needs to Recalibrate to prism

1422 at RC/WC 05 A -0-10 + 0-2

B 0-2

1509 at RC/WC 07

A 0-10, 0-2 B 0-2

5-16-07

15:55 Headed to RC-08 with tube station usage.
Attempt A 0-10 + 0-2
1615 Attempt B 0-2
1630 Attempt C 0-2
collecting Lab QC at RC-08
1650 Collected Field duplicate
Y3-RC15-S @ 1650
of RC08
1645 collected WC-13 for Floyd Smith
1710 Collected WC-14
Proposed location under cement dock.
took grab adjacent to dock
1725 at RC/W-09
A 0-10, 0-2
B 0-2
1800 at RC/WC-02
A 0-10, 0-2
B 0-2
1830 at RC/WC-03
A 0-10, 0-2
a second grab was not needed
1851 Done work for the day.
1858 Jessi left site
1908 Ray + Jen left site

5-17-07

700 Jen + Lou at boat. Jen to Foss
720 Dock at Foss to pick up
Jessi, Jen + Gary
745 H + S briefing
800 Go to RC/WC-12
Attempt A 0-10, 0-2
Attempt B 0-2
810 Jackie Wetzon called - game update
she may come by on site.
824 at RC/WC-06
Attempt A 0-10, 0-2
Attempt B 0-2
849 at RC/WC-04
Attempt A - 0-10, 0-2
Sufficient volume for both sample
900 Cleaning up from surface sampling
930 Jessi left site
945 Called Jackie - game update
She will not be driving up to site.
950 Jen collecting Rinsate Blank
Y3-RB-01
1000 Gary + Lou trying harpoon core
Attempt 1 - 15' Sand
bottom fell out
1008 Attempt 2

5-17-07 photos

26 ~~24~~ RC/WC-12 Attempt A
27 ~~25~~ RC/WC-06 attempt A
28 ~~26~~ RC-06 Attempt B (2 crabs)
29 ~~27~~ RC/WC-04 Attempt A
30 ~~28~~ RC/WC-04 Attempt A outside of Van veen - note colors of cap sand
31 ~~29~~ 1st core in middle - 1.5' of sand with silt on top
32 ~~30~~ 2nd core in middle - ~3' of material slipped out of core tube
33 ~~31~~ 3rd core in middle silt on top of sand cap on top of silt
34 hammer core 1.8 ft sand
35 hamer core } same core
36 hammer core
37 Piston corer near shore pushed 3 ft
38 Deployment of piston corer near shore
39 Rebar right next to it. in 5.5 ft
40 Piston core retrieved 2.9 ft
41 close up of bottom of core
42 Piston Core measured 2.9 ft

5-17-07

1015 3rd attempt with slide hammer corer. showed sand cap and silt above & below

1045 Tried piston corer and rebar at same time. Still anchored in center.
Tried Rebar in several places.
- Going through 3.5 - 4 ft of sand and hitting resistance & could not go any further.
6 - 8 places Rebar was tried.
at 2 of these locations, when rebar was pulled out, there was off gas bubbles, so it was obvious that the rebar penetrated the cap.

1130 Tried slide hammer again
Lost Sample

1135 Try rebar again (N 702311.2 / 702301.6 E 1160532.9 / 1160564.1)
3 ft until met resistance
Can feel & hear sand for 3 ft & hit hard bottom after 3 ft

1137 Tried Rebar (N 702301.6 E 1160564.1)
hit resistance at 4 ft. hear sand when pull up rebar.
No bubbles off gassed at this time.

1139 Rebar 4.5 ft sand till resistance.
bubbles off gassed at this location.

5-17-07

1148 Slide hammer - pounded on it for 10 minutes
came up with 1.8 ft of sand
with lost sand below. hammer core 1.8

1204 Rebar in same place.
2.5 ft pushed
hammered down to 5 ft (total)
still sandy
push / hammer another 1.5 ft
till resistance at total of 8 ft
Note - .5 - .1 ft silt on top.

1206 Rebar pushed in ~~same~~ similar place
went below sand at 6 ft - 1 foot
of easy (silt) pushing.
Sand felt 6 ft thick with
silt below.

1230 Going to core location as shown
aim for N 702365.8 E 1160411.0

1255 Piston corer pushed 3 ft
photo. Piston corer does not penetrate more than 3 ft.

1306 Pushed rebar in next to piston corer
pushed 5.5 ft. felt like sand GPS

1320 Piston core collected - 3 ft core
Sand for 2.6 feet
GPS location N 702359.6
E 1160403.6

5-17-07

1400 Back at Maryhelen, unloading
sampling equipment at Foss landing

1430 They left to bring supplies to office
Jen left to bring samples to ARI
Lou left to bring boat North.

1520 Jen at ARI with samples

1540 Picked up empty coolers & CAS
bottles

Jlf

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Sample No. RC01- WC01
Project Name:
Project No.:

Date: 1/07 Time: 1/07 Sampled by: RB Checked by: JH

Equipment: Bowl + Spoon

Location Description: ~~Bowl + Spoon~~ at edge of scour apron - no flowing water at locale

Deployment : A Time: 1/07 Northing: (proposed) 702002.6 Easting: 1160586.1

Accepted / Rejected Bio / Chem Water Depth 0 Penetration 2 RPD 1mm

Sediment (density, color, type): dark gray to black silt, sand + organics

Sediment Odor (type and magnitude): —

Biological (flora and fauna): crab shell

Sheen some organic sheen Debris twigs + leaves organic bottle

Comments: barnacles on Rocks

TT 02

Deployment : Time: Northing: Easting:

Accepted / Rejected Bio / Chem Water Depth Penetration RPD

Sediment (density, color, type):

Sediment Odor (type and magnitude):

Biological (flora and fauna):

Sheen Debris

Comments:

Deployment : Time: Northing: Easting:

Accepted / Rejected Bio / Chem Water Depth Penetration RPD

Sediment (density, color, type):

Sediment Odor (type and magnitude):

Biological (flora and fauna):

Sheen Debris

Comments:

Deployment : Time: Northing: Easting:

Accepted / Rejected Bio / Chem Water Depth Penetration RPD

Sediment (density, color, type):

Sediment Odor (type and magnitude):

Biological (flora and fauna):

Sheen Debris

Comments:

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Sample No. Rc/wc-02
Project Name: Thea Foss
Project No.:

Date: 5-16-07 Time: 1800 Sampled by: RB / JM Checked by: JH
Equipment: Van Veen
Location Description:

A
FS 0-10
TT 0-2

Deployment: A Time: 1802 Northing: 702135.7 Easting: 1160702.6
Accepted / Rejected Bio / Chem Water Depth 19.5 Penetration 10cm RPD —
Sediment (density, color, type): 10 cm dark gray to black soft silt with lots of organic debris
Sediment Odor (type and magnitude): —
Biological (flora and fauna): —
Sheen — Debris leaves + twigs
Comments: all silt

TT
0-2

Deployment: B Time: 1813 Northing: 702148.6 Easting: 1160718.2
Accepted / Rejected Bio / Chem Water Depth Penetration 13 cm RPD —
Sediment (density, color, type): dark gray to black silt with lots of organic debris
Sediment Odor (type and magnitude): —
Biological (flora and fauna): —
Sheen — Debris twigs + leaves
Comments: all silt

Deployment: Time: Northing: Easting:
Accepted / Rejected Bio / Chem Water Depth Penetration RPD
Sediment (density, color, type):
Sediment Odor (type and magnitude):
Biological (flora and fauna):
Sheen Debris
Comments:

Deployment: Time: Northing: Easting:
Accepted / Rejected Bio / Chem Water Depth Penetration RPD
Sediment (density, color, type):
Sediment Odor (type and magnitude):
Biological (flora and fauna):
Sheen Debris
Comments:

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Sample No. RC/WC-03
Project Name: Thea Foss
Project No.:

Date: 5-16-07 Time: 1825 Sampled by: RB/JM Checked by: GH

Equipment: Van Veen

Location Description:

FS 0-10
TT 0-2

Deployment : A Time: 1831 Northing: 702106.5 Easting: 1160505.2

Accepted / Rejected Bio / Chem Water Depth 19.2 Penetration 15 cm RPD 1mm

Sediment (density, color, type): 13cm dark gray silt over sandy silt

Sediment Odor (type and magnitude): —

Biological (flora and fauna): + shell fragments

Sheen — Debris shell fragments

Comments: sufficient material

Deployment : B Time: Northing: Easting:

Accepted / Rejected Bio / Chem Water Depth Penetration RPD

Sediment (density, color, type):

Sediment Odor (type and magnitude):

Biological (flora and fauna):

Sheen Debris

Comments:

Deployment : Time: Northing: Easting:

Accepted / Rejected Bio / Chem Water Depth Penetration RPD

Sediment (density, color, type):

Sediment Odor (type and magnitude):

Biological (flora and fauna):

Sheen Debris

Comments:

Deployment : Time: Northing: Easting:

Accepted / Rejected Bio / Chem Water Depth Penetration RPD

Sediment (density, color, type): GH

Sediment Odor (type and magnitude):

Biological (flora and fauna):

Sheen Debris

Comments:

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Sample No. RC/WC - 04
Project Name: Thea Foss
Project No.:

Date: 5-17-07 Time: 849 Sampled by: JM / GB Checked by: JH
Equipment: Van Veen
Location Description:

FS 0-10
TT 0-2

Deployment : A Time: 849 Northing: 702205.6 Easting: 1160560.3
(Accepted) Rejected Bio (Chem) Water Depth 13.9 Penetration 17 cm RPD 1mm
Sediment (density, color, type): 13 cm dark gray soft silt over sandy silt - fine grained sand cap material
Sediment Odor (type and magnitude): H_2S odor upon disturbance & homogenizing
Biological (flora and fauna): worms, shell
Sheen — Debris shell
Comments: 13 cm silt. sufficient volume for both samples

Deployment : Time: Northing: Easting:
Accepted / Rejected Bio / Chem Water Depth Penetration RPD
Sediment (density, color, type):
Sediment Odor (type and magnitude):
Biological (flora and fauna):
Sheen Debris
Comments:

Deployment : Time: Northing: Easting:
Accepted / Rejected Bio / Chem Water Depth Penetration RPD
Sediment (density, color, type):
Sediment Odor (type and magnitude):
Biological (flora and fauna):
Sheen Debris
Comments:

Deployment : Time: Northing: Easting:
Accepted / Rejected Bio / Chem Water Depth Penetration RPD
Sediment (density, color, type):
Sediment Odor (type and magnitude):
Biological (flora and fauna):
Sheen Debris
Comments:

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Sample No. RC/WC-05
Project Name: The Foss
Project No.:

Date: 5-16-05 Time: 1422 Sampled by: JM Checked by: JK

Equipment: Van Veen

Location Description: adjacent to old concrete dock

Deployment : A Time: 1422 Northing: 702 363.5 Easting: 116 064 45.35

Accepted / Rejected Bio / Chem Water Depth Penetration 16 cm RPD 1m

FS 0-10

Sediment (density, color, type): 14 cm dark gray silt over some sand

Sediment Odor (type and magnitude): slight H_2S odor

TT 0-2

Biological (flora and fauna): mussel shell, worm tubes

Sheen — Debris plant roots

Comments: 14 cm silt

Deployment : B Time: 1443 Northing: 702355.98 Easting: 116 064 8.1

Accepted / Rejected Bio / Chem Water Depth Penetration 17 cm RPD 1 mm

TT 0-2

Sediment (density, color, type): dark gray silt, some sand at bottom

Sediment Odor (type and magnitude): —

Biological (flora and fauna): worms

Sheen — Debris shells

Comments: 16 cm of silt

Deployment : Time: Northing: Easting:

Accepted / Rejected Bio / Chem Water Depth Penetration RPD

Sediment (density, color, type):

Sediment Odor (type and magnitude):

Biological (flora and fauna):

Sheen Debris

Comments:

Deployment : Time: Northing: Easting:

Accepted / Rejected Bio / Chem Water Depth Penetration RPD

Sediment (density, color, type):

Sediment Odor (type and magnitude):

Biological (flora and fauna):

Sheen Debris

Comments:

JK

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Sample No. RC/WS -06
Project Name: Thea Foss
Project No.:

Date: 5/17/07 Time: 824 Sampled by: JM/CB Checked by: JH
Equipment: Van Veen
Location Description:

FS 0-10
TT 0-2

Deployment: A Time: 825 Northing: 702238.7 Easting: 1160432.5
Accepted / Rejected Bio / Chem Water Depth 13.8 Penetration 13 cm RPD 1 mm
Sediment (density, color, type): 12 cm dark gray silt over sandy silt. 4 cm sand cap on one side in one side
Sediment Odor (type and magnitude): slight H_2S odor
Biological (flora and fauna): worms
Sheen — Debris —
Comments: 12 cm silt

TT 0-2.

Deployment: B Time: 856 Northing: 702240.4 Easting: 1160435.4
Accepted / Rejected Bio / Chem Water Depth Penetration 12 cm RPD 1 mm
Sediment (density, color, type): 12 cm dark gray silt
Sediment Odor (type and magnitude):
Biological (flora and fauna): Crabs (2)
Sheen Debris —
Comments: 12 cm silt

Deployment: Time: Northing: Easting:
Accepted / Rejected Bio / Chem Water Depth Penetration RPD
Sediment (density, color, type):
Sediment Odor (type and magnitude):
Biological (flora and fauna):
Sheen Debris
Comments:

Deployment: Time: Northing: Easting:
Accepted / Rejected Bio / Chem Water Depth Penetration RPD
Sediment (density, color, type):
Sediment Odor (type and magnitude):
Biological (flora and fauna):
Sheen Debris
Comments:

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Sample No. Rc/WC-07
Project Name: Thea Foss
Project No.:

Date: 5/16/07 Time: 1509 Sampled by: JM / JH Checked by: JH
Equipment: Van Veen
Location Description:

FS 0-10
TT 0-2

Deployment: A Time: 1510 Northing: 702376.9 Easting: 1160462.8
Accepted / Rejected Bio / Chem Water Depth 15 Penetration 11 RPD 1 mm
Sediment (density, color, type): dark gray silt
Sediment Odor (type and magnitude): H_2S odor upon mixing
Biological (flora and fauna): Crab, cockle
Sheen — Debris plastic - 1 piece
Comments: 11 cm silt

TT 0-2

Deployment: B Time: 1530 Northing: 702377.7 Easting: 1160467.05
Accepted / Rejected Bio / Chem Water Depth Penetration 12 RPD 1 mm
Sediment (density, color, type): dark gray silt with pockets of gray medium sand.
Sediment Odor (type and magnitude): —
Biological (flora and fauna): ele
Sheen — Debris clam shells
Comments: s. 12 cm silt

Deployment: Time: Northing: Easting:
Accepted / Rejected Bio / Chem Water Depth Penetration RPD
Sediment (density, color, type):
Sediment Odor (type and magnitude):
Biological (flora and fauna):
Sheen Debris
Comments:

Deployment: Time: Northing: Easting:
Accepted / Rejected Bio / Chem Water Depth Penetration RPD
Sediment (density, color, type):
Sediment Odor (type and magnitude): JH
Biological (flora and fauna):
Sheen Debris
Comments:

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Sample No. RC/WC -08
Project Name: Thea Foss
Project No.:

Date: 5-16-07 Time: 1325 Sampled by: JM / JH Checked by: JH
Equipment: Van Veen Field Dup - RC15-5
Location Description: Used Total Station to get to sample location under 509 Bridge

A
FS 0-10
TT 0-2

Deployment: A Time: 1600 Northing: (proposed) 1024345 Easting: 1160568.0
Accepted / Rejected Bio / Chem Water Depth Penetration 14 cm RPD
Sediment (density, color, type): 7 cm dark gray silt over sand - medium to fine gray sand
Sediment Odor (type and magnitude): —
Biological (flora and fauna): worm
Sheen — Debris —
Comments: After Re calibrating total station, went back to RC/WC-08
7cm silt

TT
0-2

Deployment: B Time: 1615 Northing: " Easting: "
Accepted / Rejected Bio / Chem Water Depth Penetration 13 RPD 1 mm
Sediment (density, color, type): 7 cm silt w dark gray over medium to fine gray sand
Sediment Odor (type and magnitude):
Biological (flora and fauna):
Sheen Debris
Comments: ~7 cm silt

TT
0-2
Dup

Deployment: C Time: 1630 Northing: " Easting: "
Accepted / Rejected Bio / Chem Water Depth Penetration 13 RPD 1 mm
Sediment (density, color, type): 7 cm dark gray silt over medium to fine gray sand
Sediment Odor (type and magnitude): —
Biological (flora and fauna): worm tubes
Sheen ~~mtg~~ slight sheen spot Debris
Comments: This composite includes lab MS/MSD and Field Dup
Field Dup = V3-RC15-5

Deployment: Time: Northing: Easting:
Accepted / Rejected Bio / Chem Water Depth Penetration RPD
Sediment (density, color, type):
Sediment Odor (type and magnitude):
Biological (flora and fauna):
Sheen Debris JH
Comments:

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Sample No. RL/WC-09
Project Name: Thea Foss
Project No.:

Date: 5-16-01 Time: 1735 Sampled by: JM/JH Checked by: JH

Equipment: Van Veen

Location Description: Under 509 Bridge - using Total station

Deployment : A Time: 1734 Northing: (proposed) 702452.3 Easting: 1160653.5

FS 0-10 Accepted / Rejected Bio / Chem Water Depth Penetration 13 cm RPD

Sediment (density, color, type): 9 cm silt - dark gray over fine gray sand

TT 0-2 Sediment Odor (type and magnitude): —

Biological (flora and fauna): worms

Sheen — Debris —

Comments: Drifted 10 ft east of station by the time of deployment
9 cm silt

Deployment : B Time: 1735 Northing: Easting:

Accepted / Rejected Bio / Chem Water Depth Penetration 14 RPD

TT 0-2 Sediment (density, color, type): 9 cm dark gray silt over gray fine sand

Sediment Odor (type and magnitude): —

Biological (flora and fauna): worms

Sheen — Debris —

Comments: 9 cm silt

Deployment : Time: Northing: Easting:

Accepted / Rejected Bio / Chem Water Depth Penetration RPD

Sediment (density, color, type):

Sediment Odor (type and magnitude):

Biological (flora and fauna):

Sheen Debris

Comments:

Deployment : Time: Northing: Easting:

Accepted / Rejected Bio / Chem Water Depth Penetration RPD

Sediment (density, color, type):

Sediment Odor (type and magnitude): JH

Biological (flora and fauna):

Sheen Debris

Comments:

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Sample No. RC/WC-10
Project Name: The Ford
Project No.:

Date: 5-16-07 Time: 1332 Sampled by: JM/SLK Checked by: SLK

Equipment: Van Veen

Location Description:

FS 0-10

Deployment : A Time: 1332 Northing: 702580 Easting: 1160568

Accepted / Rejected Bio / Chem Water Depth 9.8 ft Penetration 10 cm RPD

Sediment (density, color, type): 1 cm dark gray silt over coarse sand cap material

Sediment Odor (type and magnitude): —

TT 0-2

Biological (flora and fauna): worm

Sheen — Debris —

Comments: 1 cm

B TT 0-2

Deployment : B Time: 1401 Northing: Drifted [illegible] Easting: [illegible]

Accepted / Rejected Bio / Chem Water Depth Penetration 13 RPD 1 cm

Sediment (density, color, type): 1 cm dark gray silt over coarse sand cap material

Sediment Odor (type and magnitude): —

Biological (flora and fauna): worm tubes, worm

Sheen — Debris —

Comments: 1 cm silt

Deployment : Time: Northing: Easting:

Accepted / Rejected Bio / Chem Water Depth Penetration RPD

Sediment (density, color, type):

Sediment Odor (type and magnitude):

Biological (flora and fauna):

Sheen Debris

Comments:

Deployment : Time: Northing: Easting:

Accepted / Rejected Bio / Chem Water Depth Penetration RPD

Sediment (density, color, type):

Sediment Odor (type and magnitude):

Biological (flora and fauna):

Sheen Debris

Comments:

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Sample No. RC/WC-11
Project Name: Thea Foss
Project No.:

Date: 5/16/07 Time: 10:10 Sampled by: RB/JM Checked by: JH

Equipment: Van Veen

Location Description: road to dock

Deployment: A Time: 10:10 Northing: 702712.6 Easting: 1160665.6

Accepted / Rejected Bio / Chem Water Depth 8 ft Penetration ~~8 ft~~ 15 cm RPD 1mm

FS 0-10 TT 0-2

Sediment (density, color, type): 2.5-3 cm dark gray silt over coarse sand cap material

Sediment Odor (type and magnitude): —

Biological (flora and fauna): —

Sheen — Debris —

Comments: 3 cm silt

Deployment: B Time: 10:15 Northing: same Easting: "

Accepted / Rejected Bio / Chem Water Depth Penetration 15 cm RPD 1 mm

TT 0-2

Sediment (density, color, type): 2 cm dark gray silt over coarse sand cap material

Sediment Odor (type and magnitude): —

Biological (flora and fauna): —

Sheen small sheen spots Debris —

Comments: 2 cm silt

Deployment: Time: Northing: Easting:

Accepted / Rejected Bio / Chem Water Depth Penetration RPD

Sediment (density, color, type):

Sediment Odor (type and magnitude):

Biological (flora and fauna):

Sheen Debris

Comments:

Deployment: Time: Northing: Easting:

Accepted / Rejected Bio / Chem Water Depth Penetration RPD

Sediment (density, color, type):

Sediment Odor (type and magnitude):

Biological (flora and fauna): JH

Sheen Debris

Comments:

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Sample No. RC/WC -12
Project Name: The Fms
Project No.:

Date: 5-17-07 Time: 800 Sampled by: GB JM Checked by: JH
Equipment: Van Veen
Location Description:

Deployment : A Time: 800 Northing: 702714.7 Easting: 1160496.5
Accepted / Rejected Bio / Chem Water Depth 14.5 ft Penetration 11 cm RPD 1 mm
Sediment (density, color, type): 2 cm dark gray silt overlying coarse sand cap material
Sediment Odor (type and magnitude): —
Biological (flora and fauna): —
Sheen — Debris —
Comments: 1.5 - 2 cm silt

FS 0-10
TS 0-2

Deployment : B Time: 812 Northing: 702720.2 Easting: 1160504.9
Accepted / Rejected Bio / Chem Water Depth Penetration 12 cm RPD 1 mm
Sediment (density, color, type): 3 cm dark dry silt overlying sand cap material
Sediment Odor (type and magnitude):
Biological (flora and fauna): 3 m crab, worm tubes, Kelp, clam
Sheen Debris
Comments: 3 - 3.5 cm silt

TT 0-2

Deployment : Time: Northing: Easting:
Accepted / Rejected Bio / Chem Water Depth Penetration RPD
Sediment (density, color, type):
Sediment Odor (type and magnitude):
Biological (flora and fauna):
Sheen Debris
Comments:

Deployment : Time. Northing: Easting:
Accepted / Rejected Bio / Chem Water Depth Penetration RPD
Sediment (density, color, type):
Sediment Odor (type and magnitude):
Biological (flora and fauna):
Sheen Debris
Comments:

JM

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Sample No. Y3 RC13-S
Project Name: The Fons
Project No.:

Date: 5/16/07 Time: 1125 Sampled by: RB Checked by: SH
Equipment: Bowl + Spoon
Location Description: Rebar Present at RC13 N701894.6 E1160541.6

Deployment: A Time: 1125 Northing: Rebar 701876.1 Easting: 1160501.9
(Accepted) / Rejected Bio / (Chem) Water Depth 0 Penetration 2 RPD 1 mm
Sediment (density, color, type): silt - dark gray to black and organic debris
Sediment Odor (type and magnitude): —
Biological (flora and fauna): —
Sheen — no sheen in sample Debris
Comments: some organic sheen in areas distributed (roots, twigs) leaves + twigs
— mussels on rebar + surrounding rocks

TT 0-2

Deployment: Time: Northing: Easting:
Accepted / Rejected Bio / Chem Water Depth Penetration RPD
Sediment (density, color, type):
Sediment Odor (type and magnitude):
Biological (flora and fauna):
Sheen Debris
Comments:

Deployment: Time: Northing: Easting:
Accepted / Rejected Bio / Chem Water Depth Penetration RPD
Sediment (density, color, type):
Sediment Odor (type and magnitude):
Biological (flora and fauna):
Sheen Debris
Comments:

Deployment: Time: Northing: Easting:
Accepted / Rejected Bio / Chem Water Depth Penetration RPD
Sediment (density, color, type):
Sediment Odor (type and magnitude):
Biological (flora and fauna):
Sheen Debris
Comments:

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Sample No. Y3 - RC14-S
Project Name: Thea Foss
Project No.:

Date: 5-16-07 Time: 1140 Sampled by: RB Checked by: JK
Equipment: Bowl + Spoon
Location Description: below ground

Deployment : A Time: 1140 Northing (proposed) 701872 Easting: 1160718
Accepted / Rejected Bio / Chem Water Depth 0 Penetration 2 RPD 1mm
Sediment (density, color, type): silt, sand + gravel mixed, (less lignin than RC-13)
Sediment Odor (type and magnitude): —
Biological (flora and fauna): mussels
Sheen Debris nearby garbage, leaves + twigs
Comments: mussels present on Rocks

RT 0-2

Deployment : Time: Northing: Easting:
Accepted / Rejected Bio / Chem Water Depth Penetration RPD
Sediment (density, color, type):
Sediment Odor (type and magnitude):
Biological (flora and fauna):
Sheen Debris
Comments:

Deployment : Time: Northing: Easting:
Accepted / Rejected Bio / Chem Water Depth Penetration RPD
Sediment (density, color, type):
Sediment Odor (type and magnitude):
Biological (flora and fauna):
Sheen Debris
Comments:

Deployment : Time: Northing: Easting:
Accepted / Rejected Bio / Chem Water Depth Penetration RPD
Sediment (density, color, type):
Sediment Odor (type and magnitude):
Biological (flora and fauna):
Sheen Debris
Comments:

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Sample No. [illegible]
Project Name: [illegible]
Project No.:

Date: [illegible] Time: [illegible] Sampled by: [illegible] Checked by: [illegible]

Equipment: [illegible]

Location Description: Tried to boat that is tied to dock

Deployment : 1 Time: 917 Northing: 705 759.3 Easting: 1166876

Accepted / Rejected Bio / Chem Water Depth 9.9 10.8 ft Penetration 14 RPD 1mm

Sediment (density, color, type): 3 cm silt over coarse sand cap material

Sediment Odor (type and magnitude): —

Biological (flora and fauna): —

Sheen — Debris shell fragments

Comments: duplicate 1/1

Deployment : Time: Northing: Easting:

Accepted / Rejected Bio / Chem Water Depth Penetration RPD

Sediment (density, color, type):

Sediment Odor (type and magnitude):

Biological (flora and fauna):

Sheen Debris

Comments:

Deployment : Time: Northing: Easting:

Accepted / Rejected Bio / Chem Water Depth Penetration RPD

Sediment (density, color, type):

Sediment Odor (type and magnitude):

Biological (flora and fauna):

Sheen Debris

Comments:

Deployment : Time: Northing: Easting:

Accepted / Rejected Bio / Chem Water Depth Penetration RPD

Sediment (density, color, type): Jig

Sediment Odor (type and magnitude):

Biological (flora and fauna):

Sheen Debris

Comments:

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Sample No. 5-17
Project Name: Thea Foss
Project No.:

Date: 5-16-09 Time: 1215 Sampled by: SM Checked by: SW

Equipment: Van Veen

Location Description: At end of dock - Edge of bridge - losing DPS - need/proposed

FS 0-10

Deployment : A Time: 1217 Northing: (proposed) 702546.9 Easting: 1162673.6

Accepted / Rejected Bio / Chem Water Depth 6.9 ft Penetration 11 cm RPD 1 mm

Sediment (density, color, type): ~2 cm dark gray silt over coarse sand cap

Sediment Odor (type and magnitude): –

Biological (flora and fauna): —

Sheen — Debris —

Comments: 1-2 cm silt

Deployment : Time: Northing: Easting:

Accepted / Rejected Bio / Chem Water Depth Penetration RPD

Sediment (density, color, type):

Sediment Odor (type and magnitude):

Biological (flora and fauna):

Sheen Debris

Comments:

Deployment : Time: Northing: Easting:

Accepted / Rejected Bio / Chem Water Depth Penetration RPD

Sediment (density, color, type):

Sediment Odor (type and magnitude):

Biological (flora and fauna):

Sheen Debris

Comments:

Deployment : Time: Northing: Easting:

Accepted / Rejected Bio / Chem Water Depth Penetration RPD

Sediment (density, color, type):

Sediment Odor (type and magnitude):

Biological (flora and fauna):

Sheen Debris

Comments:

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Sample No. S-19
Project Name: Thea Foss
Project No.:

Date: 5/16/07 Time: 945 Sampled by: RB / JM Checked by: JH
Equipment: Van Veen
Location Description: next to boat that is tied to dock

Deployment: A Time: 945 Northing: 702659.5 Easting: 1160587.0
Accepted / Rejected Bio / Chem Water Depth 9.9 ft Penetration 15 RPD
Sediment (density, color, type): 4 cm dark gray silt over coarse sand cap material
Sediment Odor (type and magnitude): —
Biological (flora and fauna): Live crab
Sheen — Debris —
Comments: 4 cm silt

Deployment: Time: Northing: Easting:
Accepted / Rejected Bio / Chem Water Depth Penetration RPD
Sediment (density, color, type):
Sediment Odor (type and magnitude):
Biological (flora and fauna):
Sheen Debris
Comments:

Deployment: Time: Northing: Easting:
Accepted / Rejected Bio / Chem Water Depth Penetration RPD
Sediment (density, color, type):
Sediment Odor (type and magnitude):
Biological (flora and fauna):
Sheen Debris
Comments:

Deployment: Time: Northing: Easting:
Accepted / Rejected Bio / Chem Water Depth Penetration RPD
Sediment (density, color, type):
Sediment Odor (type and magnitude):
Biological (flora and fauna):
Sheen Debris
Comments:

JH

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Sample No. 5-24
Project Name: The Fort
Project No.:

Date: 5-16-07 Time: 1750 Sampled by: JM Checked by: JH

Equipment: Van Veen

Location Description:

FS 0-10

Deployment: A Time: 1750 Northing: 702549.2 Easting: 1160507.8

Accepted / Rejected Bio / Chem Water Depth Penetration 11cm RPD 1cm

Sediment (density, color, type): 1cm dark gray silt over coarse sand cap material

Sediment Odor (type and magnitude): —

Biological (flora and fauna): ghost shrimp, worm tubes

Sheen — Debris —

Comments: 1 cm silt

Deployment: Time: Northing: Easting:

Accepted / Rejected Bio / Chem Water Depth Penetration RPD

Sediment (density, color, type):

Sediment Odor (type and magnitude):

Biological (flora and fauna):

Sheen Debris

Comments:

Deployment: Time: Northing: Easting:

Accepted / Rejected Bio / Chem Water Depth Penetration RPD

Sediment (density, color, type):

Sediment Odor (type and magnitude):

Biological (flora and fauna):

Sheen Debris

Comments:

Deployment: Time: Northing: Easting:

Accepted / Rejected Bio / Chem Water Depth Penetration RPD

Sediment (density, color, type):

Sediment Odor (type and magnitude):

Biological (flora and fauna):

Sheen Debris

Comments:

TtEC
CORE LOGGING FORM

Project Thea Foss

SAMPLING STATION: ~~Middle Core~~ Core1 Date 5/17/07 Deployment Time: 1148

Core Attempt 4 Station Description: Middle of the waterway, south of bridge

DEPTH TO MUDLINE: N/A Feet LOCATION: N 702361.1 E 1160606.6

Predicted Tide : 3.6 ft MLLW Water Surface Elevation: N/A Mudline Elevation: N/A

TYPE OF CORE ~~VIBRACORE~~ slide hammer core

MODEL N/A Samplers GB, JH

TUBE LENGTH: 5 Feet Tube Type: ~~Lexan~~ Liner Type: Lexan

Core Penetration: 3 (ft below mudline) Recovered Core length: 1.8 + Percent Recovery: _____

Compacted Core sections: _____ to _____ _____ to _____

Expanded Core sections: _____ to _____ _____ to _____

NOTES: Photo OMMP Yr 3 036.jpg

Length	Sample Depth	Description(soil type, color, MC, odor etc)	Other notes, Insitu tests
0		dark gray silt from mud line to approximately 1.8 ft	
1		Coarse sand cap material	
2		sand last - total depth unknown	
3			
4			
5			
6			
7			
8			
9			
10			

TtEC
CORE LOGGING FORM

Project Thea Foss

SAMPLING STATION: Core 1 Date 5/17/07 Deployment Time: 204

Core Attempt 12 Station Description: Middle of waterway, South of SR 509 bridge

DEPTH TO MUDLINE: NA Feet LOCATION: N 702 301.6 E 1160514.1

Predicted Tide : -3.6 ft MLLW Water Surface Elevation: NA Mudline Elevation: NA

TYPE OF CORE ~~VIBRACORE~~ Reber
MODEL N/A Samplers GB
TUBE LENGTH: 20 Feet Tube Type: Reber Liner Type: —

Core Penetration: _____ (ft below mudline) Recovered Core length: _____ Percent Recovery: _____

Compacted Core sections: _____ to _____ _____ to _____

Expanded Core sections: _____ to _____ _____ to _____

NOTES:

Length	Sample Depth	Description(soil type, color, MC, odor etc)	Other notes, Insitu tests
0		silt 0 - ~.8 ft	
1		Sand : pushed and hammered ~0.8-5ft Reber	
2		Resistant Layer Sounds and feels like sand down to 5 feet	
3			
4			
5		hammered harder through material	
6		resistance - Could go no further	
7			
8			
9			
10			

TtEC
CORE LOGGING FORM

Project Thea Foss

SAMPLING STATION: Core 2 Date 5/17/07 Deployment Time: 1306

Core Attempt 2 Station Description: west shoreline south of SR 509 bridge

DEPTH TO MUDLINE: 0 Feet LOCATION: N 702373.9 E 1160402.2 JH

Predicted Tide: -2.7 ft MLLW Water Surface Elevation: -2.8 ft Mudline Elevation: -2.6 ft MLLW

TYPE OF CORE ~~VIBRACORE~~ Rebar
MODEL
Samplers GB
TUBE LENGTH: 10 Feet Tube Type: — Liner Type: —

Core Penetration: 5.5 (ft below mudline) Recovered Core length: — Percent Recovery:

Compacted Core sections: to to

Expanded Core sections: to to

NOTES: Photo 0MMC Yr 3 039.jpg

Length	Sample	Depth	Description(soil type, color, MC, odor etc)	Other notes, Insitu tests
0			Sand · Rebar pushed through sand for 5.5 feet	
1			Resistance layer	
2				
3				
4				
5			hit Resistance at 5.5 ft	
6				
7				
8				
9				
10				

TtEC
CORE LOGGING FORM

Project Thea Foss

SAMPLING STATION: Core 2 Date 5-17-07 Deployment Time: 1320

Core Attempt 3 Station Description: West shore south of SR 509 bridge

DEPTH TO MUDLINE: 0 Feet LOCATION: N 702359.6 E 1160403.6

Predicted Tide: -2.3 ft mllw Water Surface Elevation: N/A Mudline Elevation: N/A

TYPE OF CORE ~~VIBRACORE~~ Piston Core
MODEL N/A Samplers GB
TUBE LENGTH: 3.2 Feet Tube Type: — Liner Type: Lexan

Core Penetration: 3 (ft below mudline) Recovered Core length: 2.8 Percent Recovery: 97%

Compacted Core sections: _____ to _____ _____ to _____

Expanded Core sections: _____ to _____ _____ to _____

NOTES: Photo OMMP Yr 3 042.jpg

Length	Sample Depth	Description(soil type, color, MC, odor etc)	Other notes, Insitu tests
0		Silt mixed into sand top .5 ft	
1		sand - coarse sand cup material for additional 2.0 feet	
2			
3		Silt in bottom of core for 0.3 ft	
4			
5			
6			
7			
8			
9			
10			

APPENDIX C.2

SAMPLE PHOTOS

(Located on Enclosed CD)

Appendix C.2 Field Photos

File Name	Subject	Date
OMMP Yr 3 001	S-15	5/16/2007
OMMP Yr 3 002	S-19	5/16/2007
OMMP Yr 3 003	WC-11 (+ RC-11) Attempt A	5/16/2007
OMMP Yr 3 004	WRC-11 Attempt B	5/16/2007
OMMP Yr 3 005	RC/WC-01	5/16/2007
OMMP Yr 3 006	RC-13 Rebar	5/16/2007
OMMP Yr 3 007	RC-14 Rebar	5/16/2007
OMMP Yr 3 008	S-17	5/16/2007
OMMP Yr 3 009	S-24 (ghost shrimp)	5/16/2007
OMMP Yr 3 010	RC/WC-10 Attempt A	5/16/2007
OMMP Yr 3 011	RC-10 Attempt B	5/16/2007
OMMP Yr 3 012	RC/WC-05 Attempt A	5/16/2007
OMMP Yr 3 013	RC-05 Attempt B	5/16/2007
OMMP Yr 3 014	RC/WC-07 Attempt A	5/16/2007
OMMP Yr 3 015	RC/WC-08 Attempt A	5/16/2007
OMMP Yr 3 016	RC/WC-08 Attempt B	5/16/2007
OMMP Yr 3 017	RC-08 Attempt C	5/16/2007
OMMP Yr 3 018	WC-13	5/16/2007
OMMP Yr 3 019	WC-14	5/16/2007
OMMP Yr 3 020	RC/WC-09 Attempt A	5/16/2007
OMMP Yr 3 021	RC/WC-09 Attempt B	5/16/2007
OMMP Yr 3 022	RC/WC-02 Attempt A	5/16/2007
OMMP Yr 3 023	RC-02 Attempt B	5/16/2007
OMMP Yr 3 024	WC-03 Attempt A	5/16/2007
OMMP Yr 3 025	RC-03 Attempt B	5/16/2007
OMMP Yr 3 026	RC/WC-12 Attempt A	5/17/2007
OMMP Yr 3 027	RC/WC-06 Attempt A	5/17/2007
OMMP Yr 3 028	RC-06 Attempt B (2 crabs)	5/17/2007
OMMP Yr 3 029	RC/WC-04 Attempt A	5/17/2007
OMMP Yr 3 030	RC/WC-04 Attempt A outside of Van veen - note colors of cap sand	5/17/2007
OMMP Yr 3 031	1st core in middle - 1.5 feet of sand with silt on top	5/17/2007
OMMP Yr 3 032	2nd core in middle - ~3 feet of material slipped out of core tube	5/17/2007
OMMP Yr 3 033	3rd core in middle - silt on top of sand cap on top of silt	5/17/2007
OMMP Yr 3 034	Hammer core - 1.8 feet of sand	5/17/2007
OMMP Yr 3 035	Hammer core	5/17/2007
OMMP Yr 3 036	Hammer core (same core)	5/17/2007
OMMP Yr 3 037	Piston corer near shore pushed 3 feet	5/17/2007
OMMP Yr 3 038	Deployment of piston corer near shore	5/17/2007
OMMP Yr 3 039	Rebar right next to it in 5.5 feet	5/17/2007
OMMP Yr 3 040	Piston core retrieved 2.9 feet	5/17/2007
OMMP Yr 3 041	Close up of bottom of core	5/17/2007
OMMP Yr 3 042	Piston core measured 2.9 feet	5/17/2007

APPENDIX D

SAMPLE LOCATIONS AND DESCRIPTIONS

Appendix D Sediment Sampling Locations and Descriptions

Location	Easting	Northing	Sample Time	Sample Date	Sample ID	Sample depth	Depth of Fines (cm)	Description
RC/WC-01	1160586.1	702002.6	11:07	5/16/2007	Y3-RC01-S WC-01-070516-G	0-2 cm 0-10 cm	NA	1 mm RPD layer over dark gray to black SILT, SAND, and organics. Some organic sheen. Crab shell, twigs, leaves, cigarette butts. Barnicles on rocks.
RC/WC-02	1160702.6	702133.69	18:02	5/16/2007	Y3-RC02-S WC-02-070516-G	0-2 cm 0-10 cm	13+	Dark gray to black soft SILT with lots of organic debris. Twigs and leaves. Penetration of 13 cm did not encounter sand cap.
RC/WC-03	1160505.2	702106.53	18:31	5/16/2007	Y3-RC03-S WC-03-070516-G	0-2 cm 0-10 cm	13	1 mm RPD layer over 13 cm dark gray SILT over sandy SILT. Shell fragments.
RC/WC-04	1160560.3	702205.63	8:49	5/17/2007	Y3-RC04-S WC-04-070517-G	0-2 cm 0-10 cm	13	1 mm RPD layer over 13 cm dark gray soft SILT over sandy SILT-fine grained sand cap material. H_2S odor upon homogenizing. Worms, shell.
RC/WC-05	1160645.4	702363.49	14:22	5/16/2007	Y3-RC05-S WC-05-070516-G	0-2 cm 0-10 cm	14	1mm RPD layer over 14 cm dark gray SILT over bottom layer of SAND. Slight H_2S odor. Mussel shell, worms, worm tubes. Plant roots.
RC/WC-06	1160432.5	702238.74	8:25	5/17/2007	Y3-RC06-S WC-06-070517-G	0-2 cm 0-10 cm	12	1 mm RPD layer over 12 cm dark gray SILT over sandy SILT. 4 cm sand cap on side. Slight H_2S odor. Worms, crabs (2).
RC/WC-07	1160462.8	702376.9	15:10	5/16/2007	Y3-RC07-S WC-07-070516-G	0-2 cm 0-10 cm	12+	1 mm RPD layer over 11-12 cm dark gray SILT with pockets of gray medium SAND. H_2S odor upon homogenizing. Crab, cockle. Clam shells, piece of plastic. Penetration of 12 cm did not encounter stratified sand layer.
RC/WC-08	1160568.17	702432.99	16:00	5/16/2007	Y3-RC08-S (Y3-RC15-S) WC-08-070516-G	0-2 cm 0-2 cm 0-10 cm	7	1 mm RPD layer over 7 cm dark gray SILT over medium to fine gray SAND. Slight sheen spot. Worm, worm tubes.
RC/WC-09	1160653.49	702452.43	17:34	5/16/2007	Y3-RC09-S WC-09-070516-G	0-2 cm 0-10 cm	9	9 cm dark gray SILT over gray fine SAND. Worms.
RC/WC-10	1160568.5	702580.18	13:32	5/16/2007	Y3-RC10-S WC-10-070516-G	0-2 cm 0-10 cm	1	1 mm RPD layer over 1 cm dark gray SILT over coarse SAND cap material. Worms, worm tubes.
RC/WC-11	1160665.6	702712.6	10:10	5/16/2007	Y3-RC11-S WC-11-070516-G	0-2 cm 0-10 cm	3	1 mm RPD layer over 2-3 cm dark gray SILT over coarse SAND cap material. Small sheen spots.
RC/WC-12	1160496.5	702714.72	8:00	5/17/2007	Y3-RC12-S WC-12-070517-G	0-2 cm 0-10 cm	3	1 mm RPD layer over 2-3 cm dark gray SILT over coarse SAND cap material. 3 inch crab, worm tubes, kelp, clam.
RC-13	1160565.9	701876.1	11:25	5/16/2007	Y3-RC13-S	0-2 cm	NA	1 mm RPD layer over dark gray to black SILT and organic debris. Some organic sheen in areas of disturbance (footprints). No sheen in sample. Leaves, twigs. Mussels on rebar and surrounding rocks.
RC-14	1160718.7	701872.7	11:40	5/16/2007	Y3-RC14-S	0-2 cm	NA	1 mm RPD layer over SILT, SAND, and GRAVEL mix. Mussels. Nearby garbage, leaves, twigs. Mussels present on rocks.
WC-13	1160602.7	702476.7	16:42	5/16/2007	WC-13-070516-G	0-10 cm	8	8 cm dark gray/black silt over dark gray/black gravelly well graded SAND. Worms. Garbage on surface.
WC-14	1160617.9	702398.4	17:12	5/16/2007	WC-14-070516-G	0-10 cm	13+	1 mm RPD layer over 13 cm dark gray to black soft silt. Slight H2S odor upon disturbance. Worms and plant fibers. Penetration of 13 cm did not encounter sand cap.
S-15	1160587.6	702759.3	9:17	5/16/2007	S-15-070516-G (S-15-070516-G-D)	0-10 cm	3	1 mm RPD layer over 3 cm dark gray SILT over coarse SAND cap material. Shell fragments.
S-17	1160673.6	702546.9	12:17	5/16/2007	S-17-070516-G	0-10 cm	2	1 mm RPD layer over 2 cm dark gray SILT over coarse SAND cap material.
S-19	1160587.0	702659.5	9:45	5/16/2007	S-19-070516-G	0-10 cm	4	4 cm dark gray SILT over coarse SAND cap material. Live crab.
S-24	1160507.8	702549.2	12:50	5/16/2007	S-24-070516-G	0-10 cm	1	1 mm RPD layer over 1 cm dark gray SILT over coarse SAND cap material. Ghost shrimp, worm tubes.
NA			9:50	5/17/2007	Y3-RB-01	NA	NA	NA

APPENDIX E

DATA EVALUATION REPORTS

D.M.D., Inc.
Environmental & Toxicological Services
13706 SW Caster Road, Vashon, WA 98070-7428 (206) 463-6223 fax: (206) 463-4013

MEMORANDUM

TO: Matt Dalton (DOF)

FROM: Raleigh Farlow

DATE: June 19, 2007

SUBJECT: Review of Results of Analyses for Fifteen Sediments and One Field Rinsate Blank Collected during May 2007 from the Head of Thea Foss Waterway (Year-Three Post-Construction Monitoring)

Fifteen sediment samples and one field equipment rinsate sample were collected and submitted in one sample delivery group to Analytical Resources Inc. (ARI) of Tukwila, Washington, for analyses of TOC (Plumb, 1981), TPH-Dx (NWTPHDx), metals (6010B & 7471A), SVOCs (including PAH and phthalates)(8270D), PCBs (8082) and sediment grain size (PSEP). Results of analyses (all dry weight normalized for sediments, as required) are attached to this summary. Samples were relinquished by Tetra Tech EC under chain-of-custody (C-O-C) procedure and "hand" delivered to ARI within two days of collection. Samples were received intact at 2.8 - 6 °C, with ice present in all coolers. Sample Y3-RC03-S was not listed on the C-O-C and analytical request form; however, instructions were communicated between SD (ARI) and JH (TT) via telecon. All analyses were completed within the technical holding time requirements identified in the project QAPP (*Quality Assurance Project Plan (QAPP), Utilities Work Area Remediation*, prepared by DOF, DMD & Tetra Tech-FW, July 24, 2003) and/or within the recommended maximum holding times recommended by the U.S. EPA. Sample holding times/conditions are within specifications.

All **reporting limits** are sufficiently low for comparison to the project/task SQO's. Dilutions and reruns were frequently required for SVOC extracts to bring QC measures within performance specifications. Most SVOC parameters show a lower reporting limit of 60 - 150 µg/kg. All lower reporting limits for organics are based on the lowest calibration point used to establish instrument linearities. Detections of organic analytes at less than the lower verifiable calibration point are qualified as estimates with the "J" qualifier code.

Method blanks were analyzed with each parameter group, and all blanks showed nondetected analytes.

The field equipment **rinsate blank** showed no contamination for target analytes.

All laboratory control sample (**LCS**) and matrix spike (**MS/MSD**) recoveries were within the QAPP-specified ranges for all designated analytes (Aroclors 1016 and 1260 were substituted for

the QAPP-specified Aroclor 1242 with the same specified acceptance range). All recovereies were within acceptable limits, and no qualification of results were required.

All **surrogate compound recoveries** (for organic analytes) are within the project-specified acceptance ranges for results for those extracts reported. PCB results were evaluated by comparison to the recoveries for decachlorobiphenyl (DCBP). All measures of recovery performance in sediments are within specification; no data qualification is necessary.

Internal standards (**IS**) performance was determined to be within method specifications for reported results of organic analytes.

Initial and **continuing calibration** performances were determined to be within method specifications for all analyses; with the exception of continuing calibration end-of-run checks for Aroclor 1254 in initial analyses. Reanalyses were performed on dilutions, and continuing calibration performance was determined to be within acceptance limits on the reruns. Affected PCB results reported from the initial analyses are assigned the "J_C" qualifier code as estimates.

Examination of **TPH-Dx** profiles revealed the presence of principally lubricant-range hydrocarbons, and <u>not</u> diesel-range hydrocarbons. The values reported by the analyst/laboratory for diesel-range hydrocarbons are due to the chromatographic overlap associated with lubricant hydrocarbons. The lube-range profile exhibits an unresolved complex mixture (UCM) typical of contamination from urban runoff. Total hydrocarbons are most represented by the lube-range values, and are thus highlighted in bold in the attached results table.

All chromatograms were inspected to evaluate general chromatographic integrity. Peak shapes are reasonable and acceptable, and no abrupt baseline shifts are noted. Extracts analyzed by M.8270 (GC/MS) showed relatively high levels of elemental sulfur, most likely associated with natural reduction of sulfate from high organic loadings.

Sample results reported here are determined to be in general compliance with method and QAPP requirements. Some deviations from specified performance goals are associated with matrix effects from contaminated samples. Sample extracts/digestates were rerun/reanalyzed when QC performance goals were not initially met. Continuing deviations in subsequent analyses were identified and flagged; generally resulting in identifying associated values as estimates with the "J_x" qualifier code. All reported data (see attached) are considered usable for the intended purposes of the project.

Head of Thea Foss Waterway
Post-Construction Monitoring
May 2007

metals - mg/kg, dry
organics - µg/kg, dry

Field Sample I.D.	Location	Comments	Sample Date	Lab I.D.	% solids	% TOC	TPH-Dx (mg/kg) Diesel-range	TPH-Dx (mg/kg) Lube-range	Pb 7439-92-1	Hg 7439-97-6	Zn 7440-66-6
Y3-RC11-S	RC/WC-11/R-04	0-2 cm	5/16/2007	079547-KZ56A	53	6.1	490	**3000**	**73**	**0.19**	**195**
Y3-RC01-S	RC/WC-01	0-2 cm	5/16/2007	079548-KZ56B	28	11.8	540	**3400**	**111**	**0.3**	**380**
Y3-RC13-S	RC-13	0-2 cm	5/16/2007	079549-KZ56C	41	5.5	560	**3800**	**113**	**0.2**	**256**
Y3-RC14-S	RC-14	0-2 cm	5/16/2007	079550-KZ56D	53	7.3	300	**2200**	**70**	**0.1**	**209**
Y3-RC10-S	RC/WC-10	0-2 cm	5/16/2007	079551-KZ56E	75	5.3	140	**1000**	**33**	**0.08**	**102**
Y3-RC05-S	RC/WC-05	0-2 cm	5/16/2007	079552-KZ56F	47	5.9	540	**3300**	**78**	**0.2**	**220**
Y3-RC07-S	RC/WC-07	0-2 cm	5/16/2007	079553-KZ56G	57	5.4	310	**2200**	**64**	**0.15**	**173**
Y3-RC08-S	RC/WC-08/R-03	0-2 cm; QC	5/16/2007	079554-KZ56H	52	3.4	490	**3100**	**70**	**0.18**	**184**
Y3-RC15-S	RC/WC-08/R-03	0-2 cm	5/16/2007	079555-KZ56I	53	5.5	520	**3100**	**76**	**0.2**	**194**
Y3-RC09-S	RC/WC-09	0-2 cm	5/16/2007	079556-KZ56J	48	3.1	560	**3600**	**86**	**0.2**	**221**
Y3-RC02-S	RC/WC-02	0-2 cm	5/16/2007	079557-KZ56K	40	7.0	790	**5600**	**114**	**0.2**	**539**
Y3-RC12-S	RC/WC-12	0-2 cm	5/17/2007	079558-KZ56L	65	4.9	220	**1300**	**39**	**0.14**	**109**
Y3-RC06-S	RC/WC-06	0-2 cm	5/17/2007	079559-KZ56M	52	3.7	420	**2900**	**86**	**0.18**	**227**
Y3-RC04-S	RC/WC-04/R-02	0-2 cm	5/17/2007	079560-KZ56N	47	7.2	500	**3300**	**77**	**0.32**	**227**
Y3-RB-01	field QC	Rinsate Blank	5/17/2007	079561-KZ56O	0.0		0.25 U	0.5 U	0.02 U	0.0001 U	0.01 U
Y3-RC03-S	RC/WC-03	0-2 cm	5/17/2007	079562-KZ56P	60	5.1	230	**1500**	**36**	**0.1**	**113**

U = nondetected at the associated value

Head of Thea Foss Waterway
Post-Construction Monitoring
May 2007

metals - mg/kg, dry
organics - µg/kg, dry

Field Sample I.D.	% gravel > 2000 µm	% v. coarse sand 1000-2000 µm	% coarse sand 500-1000 µm	% med. sand 250-500 µm	% fine sand 125-250 µm	% v. fine sand 62-125 µm	% silt 3.9-62.5 µm	% clay < 3.9 µm	% fines < 62.5 µm
Y3-RC11-S	9.7	6.5	13	12	5.2	4.2	36	14	50
Y3-RC01-S	32	16	10	7.3	5.5	5.1	14	10	24
Y3-RC13-S	4.6	6.3	7.7	10	17	14	27	13	40
Y3-RC14-S	14	7.0	11	14	16	15	16	7.8	24
Y3-RC10-S	20	11	16	21	9.4	3.7	13	5.9	19
Y3-RC05-S	0.7	3.1	5.3	12	16	12	34	17	51
Y3-RC07-S	3.7	2.6	9.6	26	18	6.8	23	11	34
Y3-RC08-S	1.5	1.9	7.7	21	18	8.8	30	12	42
Y3-RC15-S	0.8	1.5	8.0	21	18	8.9	30	12	42
Y3-RC09-S	0.6	1.3	6.6	18	16	8.3	35	15	49
Y3-RC02-S	2.4	5.4	9.3	15	20	13	26	11	36
Y3-RC12-S	30	11	13	13	5.0	3.0	17	7.5	25
Y3-RC06-S	4.6	2.5	5.5	18	16	8.8	36	9.3	45
Y3-RC04-S	0.7	0.8	5.3	14	16	11	36	17	53
Y3-RB-01									
Y3-RC03-S	0.1	3.2	8.4	21	23	13	22	9.7	32

Head of Thea Foss Waterway
Post-Construction Monitoring
May 2007

metals - mg/kg, dry
organics - µg/kg, dry

Field Sample I.D.	Naphthalene 91-20-3	2-Methyl-naphthalene 91-57-6	Acenaph-thylene 208-96-8	Acenaphthene 83-32-9	Dibenzo-furan 132-64-9	Fluorene 86-73-7	Phenanthrene 85-01-8	Anthracene 120-12-7	Fluoranthene 206-44-0	Pyrene 129-00-0
Y3-RC11-S	**120**	**48 J**	60 U	**60**	60 U	**52 J**	**630**	**150**	**1500**	**1400**
Y3-RC01-S	**110 J**	150 U	150 U	150 U	150 U	**100 J**	**1500**	**300**	**2800**	**2000**
Y3-RC13-S	**130**	**64 J**	120 U	**130**	**120 J**	**180**	**2800**	**460**	**6200**	**5300**
Y3-RC14-S	**74 J**	120 U	120 U	**86 J**	**72 J**	**110 J**	**1600**	**270**	**3400**	**2600**
Y3-RC10-S	**44 J**	67 U	67 U	67 U	67 U	67 U	**310**	**60 J**	**720**	**660**
Y3-RC05-S	**110 J**	150 U	150 U	150 U	150 U	150 U	**680**	**140 J**	**1800**	**1500**
Y3-RC07-S	**130**	**52 J**	96 U	**61 J**	96 U	**52 J**	**690**	**150**	**1600**	**1500**
Y3-RC08-S	**200**	**76 J**	120 U	**87 J**	120 U	**74 J**	**890**	**200**	**1900**	**1900**
Y3-RC15-S	**220**	**93 J**	110 U	**100 J**	110 U	**90 J**	**1000**	**240**	**2400**	**2300**
Y3-RC09-S	**150**	130 U	130 U	130 U	130 U	130 U	**860**	**190**	**2300**	**1900**
Y3-RC02-S	**150 J**	170 U	170 U	**110 J**	**110 J**	**160 J**	**2500**	**430**	**5000**	**4700**
Y3-RC12-S	**130**	**54 J**	72 U	**76**	72 U	**48 J**	**500**	**150**	**1100**	**980**
Y3-RC06-S	**160**	**60 J**	120 U	**59 J**	120 U	**62 J**	**910**	**180**	**2400**	**2100**
Y3-RC04-S	**130**	110 U	110 U	**61 J**	110 U	**63 J**	**930**	**190**	**2300**	**2000**
Y3-RB-01	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Y3-RC03-S	**100**	**39 J**	76 U	**40 J**	76 U	76 U	**570**	**120**	**1400**	**1300**

U = nondetected at the associated value
J = associated value is considered an estimate; less than verifiable lower calibration point

Head of Thea Foss Waterway
Post-Construction Monitoring
May 2007

metals - mg/kg, dry
organics - µg/kg, dry

Field Sample I.D.	Benzo(a)-anthracene 56-55-3	*bis* (2-Ethylhexyl)-phthalate 117-81-7	Chrysene 218-01-9	Benzo(b)-fluoranthene 205-99-2	Benzo(k)-fluoranthene 207-08-9	Benzo(a)-pyrene 50-32-8	Indeno(1,2,3-cd)pyrene 193-39-5	Dibenz(a,h)-anthracene 53-70-3	Benzo(ghi)-perylene 191-24-2
Y3-RC11-S	**610**	**6100**	**1000**	**1300**	**980**	**750**	**350**	**79**	**380**
Y3-RC01-S	**900**	**14,000**	**1600**	**1500**	**1500**	**960**	**380**	**93 J**	**410**
Y3-RC13-S	**2400**	**7300**	**3500**	**3400**	**4400**	**2700**	**1200**	**240**	**1100**
Y3-RC14-S	**1200**	**4200**	**1800**	**2000**	**2100**	**1400**	**560**	**130**	**540**
Y3-RC10-S	**280**	**1600**	**450**	**550**	**460**	**340**	**160**	**35 J**	**170**
Y3-RC05-S	**640**	**4000**	**960**	**1100**	**870**	**740**	**400**	**83 J**	**390**
Y3-RC07-S	**640**	**3700**	**960**	**980**	**990**	**770**	**380**	**77 J**	**400**
Y3-RC08-S	**800**	**4300**	**1200**	**1400**	**1100**	**1000**	**600**	**270**	**650**
Y3-RC15-S	**920**	**5100**	**1400**	**1700**	**1400**	**1100**	**420**	**93 J**	**440**
Y3-RC09-S	**800**	**6200**	**1300**	**1200**	**1600**	**950**	**410**	**100 J**	**410**
Y3-RC02-S	**2000**	**9500**	**3100**	**3300**	**3600**	**2300**	**870**	**390**	**900**
Y3-RC12-S	**420**	**2200**	**620**	**820**	**560**	**510**	**190**	**48 J**	**190**
Y3-RC06-S	**860**	**5600**	**1300**	**1400**	**1700**	**990**	**440**	**84 J**	**460**
Y3-RC04-S	**840**	**5100**	**1300**	**1300**	**1500**	**1000**	**410**	**82 J**	**420**
Y3-RB-01	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Y3-RC03-S	**540**	**2600**	**790**	**920**	**960**	**620**	**260**	**61 J**	**270**

U = nondetected at the associated value
J = associated value is considered an estimate; less than verifiable lower calibration point

Head of Thea Foss Waterway
Post-Construction Monitoring
May 2007

metals - mg/kg, dry
organics - µg/kg, dry

Field Sample I.D.	Aroclor 1016 12674-11-2	Aroclor 1242 53469-21-9	Aroclor 1248 12672-29-6	Aroclor 1254 11097-69-1	Aroclor 1260 11096-82-5	Aroclor 1221 11104-28-2	Aroclor 1232 11141-16-5
Y3-RC11-S	9.9 U	9.9 U	25 U	**60**	**78**	9.9 U	9.9 U
Y3-RC01-S	9.9 U	9.9 U	30 U	**100**	**72**	9.9 U	9.9 U
Y3-RC13-S	9.8 U	9.8 U	30 U	**82**	**110**	9.8 U	9.8 U
Y3-RC14-S	10 U	10 U	20 U	**60**	**62**	10 U	10 U
Y3-RC10-S	9.8 U	9.8 U	9.8 U	**20 J_C**	**20**	9.8 U	9.8 U
Y3-RC05-S	9.7 U	9.7 U	29 U	**61**	**82**	9.7 U	9.7 U
Y3-RC07-S	9.9 U	9.9 U	25 U	**52**	**53**	9.9 U	9.9 U
Y3-RC08-S	9.9 U	9.9 U	35 U	**56**	**80**	9.9 U	9.9 U
Y3-RC15-S	9.8 U	9.8 U	**19 J_C**	**49**	**66**	9.8 U	9.8 U
Y3-RC09-S	9.8 U	9.8 U	29 U	**60**	**62**	9.8 U	9.8 U
Y3-RC02-S	9.8 U	9.8 U	39 U	**78**	**55**	9.8 U	9.8 U
Y3-RC12-S	9.8 U	9.8 U	24 U	**32**	**40**	9.8 U	9.8 U
Y3-RC06-S	9.8 U	9.8 U	29 U	**54**	**72**	9.8 U	9.8 U
Y3-RC04-S	9.9 U	9.9 U	25 U	**67**	**73**	9.9 U	9.9 U
Y3-RB-01	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Y3-RC03-S	9.7 U	9.7 U	15 U	**26 J_C**	**38**	9.7 U	9.7 U

U = nondetected at the associated value
J_C = estimate; noncompliant continuing calibration response

APPENDIX F

HEAD OF THE THEA FOSS CHEMISTRY DATA 2004-2007

Table F. Head of the Thea Foss Results 2004 - 2007

Location	Sample ID	Monitoring Type	Sample Date	Depth Below Mudline	Easting	Northing	Total Solids	TOC	TPH Diesel	TPH Motor Oil	Sb	As	Cd	Cr	Cu	Pb	Hg	Ni	Ag
		SQO									150	57	5.1		390	450	0.59	140	6.1
		Units					Percent	Percent	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG
RC/WC-01	RC-01	Year 0 OMMP	4/8/2004	0-2 cm	1160586.1	702002.6	79.8	2.44			6 U	6	0.2 U	33.2	44.1	25	0.06 U	28	0.3 U
RC/WC-01	RC-01	City Sampling	12/9/2004	0-2 cm	1160586.1	702002.6	77.7		96	430		7			39.7	27	0.06	24	
RC/WC-01	RC-01	Year 1 OMMP	5/12/2005	0-2 cm	1160586.1	702002.6	6.93	45.2	1200	4800		10			81.7	104	0.2	37	
RC/WC-01	Y2-RC01-S	Year 2 OMMP	5/16/2006	0-2 cm	1160586.1	702002.6	40.4	9.92	900	4700	10 U (UJ)	10 U	0.6		76.5	90	0.1	59	0.8 U
RC/WC-01	Y3-RC01-S	Year 3 OMMP	5/16/2007	0-2 cm	1160586.1	702003	26.5	11.8	540	3400						111	0.3		
RC/WC-01	WC-01	Year 0 OMMP	4/8/2004	0-10 cm	1160586.1	702002.6	86.9	1.47			5 U	5 U	0.2 U	19.1	28.9	6	0.04 U	23	0.3 U
RC/WC-01	WC-01	City Sampling	12/9/2004	0-10 cm	1160586.1	702002.6	78.9		91	440		6 U			37.4	22	0.07	25	
RC/WC-01	Y2-WC01-S	Year 2 OMMP	5/16/2006	0-10 cm	1160586.1	702002.6	36.4	7.11	1100	5100	10 U (UJ)	10 U	0.6		69.4	86	0.1	34	0.8 U
RC/WC-01	WC-01-070516-G	Year 3 OMMP/City Sampling	5/16/2007	0-10 cm	1160586.1	702003	60.8	4.55											
WC-01B/R-01B	Y2-WC01B-C3	Year 2 OMMP	5/17/2006	2-3 ft	1160608.62	702092.89	85.6	0.548			6 U (UJ)	6 U	0.2 U		31.1	3	0.05 U	15	0.3 U
RC/WC-02	RC-02	Year 0 OMMP	4/8/2004	0-2 cm	1160699.7	702124.5	50.7	5.32			9 U	9 U	0.4 U	27.5	71.3	20	0.1 U	27	0.6 U
RC/WC-02	RC-02	Year 1 OMMP	5/12/2005	0-2 cm	1160699.7	702124.5	7.11	41.7	1300	5900		10			107	122	0.3	34	
RC/WC-02	RC-2A (Dup of RC-2)	Year 1 OMMP	5/12/2005	0-2 cm	1160699.7	702124.5	6.54	40.8	880	3700		10			106	123	0.3	34	
RC/WC-02	Y2-RC02-S	Year 2 OMMP	5/12/2006	0-2 cm	1160699.7	702124.5	41.6	5.17	1000	5300	10 U (UJ)	10 U	1		88.4	97	0.2	31	0.7 U
RC/WC-02	Y3-RC02-S	Year 3 OMMP	5/16/2007	0-2 cm	1160702.63	702134	33.4	7.02	790	5600						114	0.2		
RC/WC-02	RC-02	City Sampling	12/2/2004	0-8 cm	1160699.7	702124.5	48.9		340	1700		10 U			91.3	70	0.1	30	
RC/WC-02	WC-02	Year 0 OMMP	4/8/2004	0-10 cm	1160699.7	702124.5	61.6	3.45			8 U	8 U	0.3 U	23.6	60.9	15	0.08 U	23	0.5 U
RC/WC-02	WC-02 (City)	City Sampling	12/2/2004	0-10 cm	1160699.7	702124.5	52	4.2								49.4	0.075		
RC/WC-02	WC-02	Year 1 OMMP	5/12/2005	0-10 cm	1160699.7	702124.5	4.9	65.3	440	2100		10			72.5	54	0.12	26	
RC/WC-02	Y2-WC02-S	Year 2 OMMP	5/12/2006	0-10 cm	1160699.7	702124.5	47	6.37	840	4000	10 U (UJ)	10 U	1.2		90.8	92	0.22	32	0.7 U
RC/WC-02	WC-02-070516-G	Year 3 OMMP/City Sampling	5/16/2007	0-10 cm	1160702.63	702134	35.6	6.86											
RC/WC-03	RC-03	Year 0 OMMP	4/8/2004	0-2 cm	1160508.2	702105.1	37.8	6.68			10 U	10 U	0.5 U	40	112	44	0.1	36	0.8 U
RC/WC-03	RC-03	Year 1 OMMP	5/12/2005	0-2 cm	1160508.2	702105.1	5.44	50.4	400	1600		10 U			69.3	55	0.21	25	
RC/WC-03	Y2-RC03-S	Year 2 OMMP	5/15/2006	0-2 cm	1160508.2	702105.1	47.9	4.98	530	2300	10 U (UJ)	10 U	0.6		73.6	62	0.16	28	0.7 U
RC/WC-03	Y3-RC03-S	Year 3 OMMP	5/16/2007	0-2 cm	1160505.21	702107	55.1	5.13	230	1500						36	0.1		
RC/WC-03	WC-03	Year 0 OMMP	4/8/2004	0-10 cm	1160508.2	702105.1	50.8	7.12			10 U	10 U	0.4 U	26	65.6	20	0.07	24	0.6 U
RC/WC-03	WC-03 (City)	City Sampling	12/2/2004	0-10 cm	1160508.2	702105.1	42	6.5								42	0.081		
RC/WC-03	Y2-WC03-S	Year 2 OMMP	5/15/2006	0-10 cm	1160508.2	702105.1	54.4	5.32	340	1400	10 U (UJ)	10 U	0.4 U		55.7	37	0.13	21	0.6 U
RC/WC-03	WC-03-070516-G	Year 3 OMMP/City Sampling	5/16/2007	0-10 cm	1160505.21	702107	60.4	2.54											
RC/WC-03	RC-03	City Sampling	12/2/2004	0-12 cm	1160508.2	702105.1	48.1		93	420		10 U			84.4	34	0.1	29	
RC/WC-04/R-02	RC-04	Year 0 OMMP	4/8/2004	0-2 cm	1160565.7	702219.9	55.2	6.34			9 U	9 U	0.4 U	27.1	71.8	19	0.08	25	0.5 U
RC/WC-04/R-02	RC-04	Year 1 OMMP	5/12/2005	0-2 cm	1160565.7	702219.9	6.26	35.4	1000	3500		20			119	140	0.5	37	
RC/WC-04/R-02	Y2-RC04-S	Year 2 OMMP	5/12/2006	0-2 cm	1160565.7	702219.9	46.4	7.41	680	3000	10 U (UJ)	10 U	0.5 U		46.7	44	0.2	19	0.7 U
RC/WC-04/R-02	Y3-RC04-S	Year 3 OMMP	5/17/2007	0-2 cm	1160560.3	702206	45.5	7.21	500	3300						77	0.32		
RC/WC-04/R-02	RC-04	City Sampling	12/1/2004	0-9 cm	1160565.7	702219.9	49.1		40	210		10			76.8	49	0.16	27	
RC/WC-04/R-02	WC-04	Year 0 OMMP	4/8/2004	0-10 cm	1160565.7	702219.9	70	4.6			7 U	7 U	0.3 U	24	55.2	13	0.06 U	22	0.4 U
RC/WC-04/R-02	WC-04-Duplicate	Year 0 OMMP	4/8/2004	0-10 cm	1160565.7	702219.9	67.7	6.23			7 U	7 U	0.3 U	23.2	62	13	0.05	21	0.4 U
RC/WC-04/R-02	S-34 (Dup of WC-04)	City Sampling	12/1/2004	0-10 cm	1160565.7	702219.9	55.1		31	100		9 U			67.7	33	0.11	26	
RC/WC-04/R-02	WC-04	City Sampling	12/1/2004	0-10 cm	1160565.7	702219.9	54.3		71	380		9 U			67.2	35	0.12	25	
RC/WC-04/R-02	WC-04	Year 1 OMMP	5/12/2005	0-10 cm	1160565.7	702219.9	6.28	52.5	350	1400		10			80.9	50	0.25	26	
RC/WC-04/R-02	Y2-WC04-S	Year 2 OMMP	5/12/2006	0-10 cm	1160565.7	702219.9	55.3	3.2	470	2100	9 U (UJ)	9 U	0.6		61.2	54	0.18	23	0.6 U
RC/WC-04/R-02	WC-04-070517-G	Year 3 OMMP/City Sampling	5/17/2007	0-10 cm	1160560.3	702206	56.1	3.3											
RC/WC-04/R-02	WCBU-4A	Year 0 OMMP	4/7/2004	0-1 ft	1160565.7	702219.9	84.1	0.886			6 U	6 U	0.2 U	19.7	36	3	0.04 U	20	0.3 U
RC/WC-04/R-02	WCBU-4B	Year 0 OMMP	4/7/2004	1-2 ft	1160565.7	702219.9	91.7	0.14			10 U	10 U	0.5 U	26	37	5 U	0.05 U	22	0.8 U
RC/WC-04/R-02	WCBU-4C	Year 0 OMMP	4/7/2004	2-3 ft	1160565.7	702219.9	90.8	0.0364			5 U	5 U	0.2 U	18.3	40.8	2 U	0.05 U	18	0.3 U
RC/WC-04/R-02	Y2-WC04-C3	Year 2 OMMP	5/17/2006	1.5-3 ft	1160565.7	702219.9	87.5	0.866			6 U (UJ)	6 U	0.2 U		43.8	5	0.06 U	21	0.3 U
RC/WC-05	RC-05	Year 0 OMMP	4/8/2004	0-2 cm	1160639.3	702358.6	46.2	5.34			10 U	10 U	0.4 U	33	87.3	19	0.09	29	0.6 U
RC/WC-05	RC-05-Duplicate	Year 0 OMMP	4/8/2004	0-2 cm	1160639.3	702358.6	45.4	5.2			10 U	10 U	0.4 U	31	85.1	19	0.09 U	28	0.6 U
RC/WC-05	RC-05	Year 1 OMMP	5/12/2005	0-2 cm	1160639.3	702358.6	5.2	41.6	880	3000		10			100	108	0.3	31	
RC/WC-05	Y2-RC05-S	Year 2 OMMP	5/15/2006	0-2 cm	1160639.3	702358.6	44.6	6.58	720	3200	10 U (UJ)	10 U	0.7		83.5	76	0.19	32	0.7 U
RC/WC-05	Y3-RC05-S	Year 3 OMMP	5/16/2007	0-2 cm	1160645.35	702363	44	5.89	540	3300						78	0.2		
RC/WC-05	WC-05	Year 0 OMMP	4/8/2004	0-10 cm	1160639.3	702358.6	58.7	4.48			8 U	8 U	0.3 U	24.2	60.4	10	0.11	23	0.5 U
RC/WC-05	WC-05	City Sampling	12/2/2004	0-10 cm	1160639.3	702358.6	44.9		190	790		10 U			100	70	0.3	31	
RC/WC-05	WC-05	Year 1 OMMP	5/12/2005	0-10 cm	1160639.3	702358.6	4.89	49.4	390	1400		10			80.3	54	0.2	27	
RC/WC-05	Y2-WC05-S	Year 2 OMMP	5/15/2006	0-10 cm	1160639.3	702358.6	49	5.16	580	2300	10 U (UJ)	10 U	0.4 U		31.6	29	0.2	11	0.6 U
RC/WC-05	WC-05-070516-G	Year 3 OMMP/City Sampling	5/16/2007	0-10 cm	1160645.35	702363	52.4	5.03											
RC/WC-05	RC-05	City Sampling	12/2/2004	0-11 cm	1160639.3	702358.6	46.9		140	710		10 U			92.6	54	0.2	30	
RC/WC-05	WCBU-5A	Year 0 OMMP	4/7/2004	0-1.3 ft	1160639.3	702358.6	89	0.251			6 U	6 U	0.2 U	16.5	30.4	2 U	0.05 U	16	0.3 U
RC/WC-05	Y2-WC05-C3	Year 2 OMMP	5/17/2006	1-2.5 ft	1160639.3	702358.6	87.9	0.527			6 U (UJ)	6 U	0.2 U		35.3	3	0.05 U	19	0.3 U
RC/WC-06	RC-06	Year 0 OMMP	4/8/2004	0-2 cm	1160432.2	702254.1	57.4	4.65			9 U	9 U	0.4 U	22.9	54.5	18	0.08 U	21	0.5 U
RC/WC-06	RC-06	Year 1 OMMP	5/12/2005	0-2 cm	1160432.2	702254.1	5.63	42.2	580	1800		10 U			100	114	0.3	32	

Table F. Head of the Thea Foss Results 2004 - 2007

Location	Sample ID	Monitoring Type	Sample Date	Depth Below Mudline	Easting	Northing	Total Solids	TOC	TPH Diesel	TPH Motor Oil	Sb	As	Cd	Cr	Cu	Pb	Hg	Ni	Ag
		SQO									150	57	5.1		390	450	0.59	140	6.1
		Units					Percent	Percent	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG
RC/WC-06	Y2-RC06-S	Year 2 OMMP	5/15/2006	0-2 cm	1160432.2	702254.1	58.7	5.47	380	1700	8 U (UJ)	8 U	0.3		56.8	47	0.11	24	0.5 U
RC/WC-06	Y2-RC15-S	Year 2 OMMP	5/15/2006	0-2 cm	1160432.2	702254.1	59.8	6.67	400	1700	9 U (UJ)	9 U	0.3 U		57.7	47	0.12	24	0.5 U
RC/WC-06	Y3-RC06-S	Year 3 OMMP	5/17/2007	0-2 cm	1160432.54	702239	48.2	3.73	420	2900						86	0.18		
RC/WC-06	RC-06	City Sampling	12/2/2004	0-5 cm	1160432.2	702254.1	49		220	870		10			94.4	83	0.24	28	
RC/WC-06	WC-06	Year 0 OMMP	4/8/2004	0-10 cm	1160432.2	702254.1	73	3.45			7 U	7 U	0.3 U	19.1	40	7	0.06 U	18	0.4 U
RC/WC-06	Y2-WC06-S	Year 2 OMMP	5/15/2006	0-10 cm	1160432.2	702254.1	66.1	5.02	190	810	8 U (UJ)	8 U	0.3 U		52.2	28	0.08	20	0.5 U
RC/WC-06	WC-06-070517-G	Year 3 OMMP/City Sampling	5/17/2007	0-10 cm	1160432.54	702239	56.9	6.58											
RC/WC-06	WCBU-6A	Year 0 OMMP	4/7/2004	0-1 ft	1160432.2	702254.1	82.8	1.59			6 U	6 U	0.2 U	18	40.5	3	0.04 U	18	0.3 U
RC/WC-06	WCBU-6B	Year 0 OMMP	4/7/2004	1-2 ft	1160432.2	702254.1	86.4	0.397			6 U	6 U	0.2 U	26	42.6	3	0.04 U	21	0.3 U
RC/WC-06	Y2-WC06-C3	Year 2 OMMP	5/17/2006	2-3 ft	1160432.2	702254.1	85.3	1.04			6 U (UJ)	6 U	0.2 U		33.6	3	0.05 U	17	0.3 U
RC/WC-07	RC-07	Year 0 OMMP	4/8/2004	0-2 cm	1160463.1	702382.9	84.1	1.32			6 U	6 U	0.2 U	19.9	49.5	6	0.05 U	19	0.3 U
RC/WC-07	RC-07	Year 1 OMMP	5/11/2005	0-2 cm	1160463.1	702382.9	5.5	56.8	480	2100		10			73.9	70	0.22	25	
RC/WC-07	Y2-RC07-S	Year 2 OMMP	5/16/2006	0-2 cm	1160463.1	702382.9	52.7	6.01	600	2700	10 U (UJ)	10 U	0.6		69.9	70	0.15	26	0.6 U
RC/WC-07	Y3-RC07-S	Year 3 OMMP	5/16/2007	0-2 cm	1160462.79	702377	52.9	5.44	310	2200						64	0.15		
RC/WC-07	RC-07	City Sampling	12/2/2004	0-4 cm	1160463.1	702382.9	37.6		550	2100		20			118	140	0.4	32	
RC/WC-07	WC-07	Year 0 OMMP	4/8/2004	0-10 cm	1160463.1	702382.9	86.6	0.189			6 U	6 U	0.2 U	18.2	32.2	2	0.04 U	16	0.3 U
RC/WC-07	WC-07	City Sampling	12/2/2004	0-10 cm	1160463.1	702382.9	63.8		140	740		9 U			56	42	0.11	20	
RC/WC-07	WC-07	Year 1 OMMP	5/11/2005	0-10 cm	1160463.1	702382.9	2.53	80.2	140	600		7			45.3	23	0.07	20	
RC/WC-07	WC-7	Year 1 OMMP	5/11/2005	0-10 cm	1160463.1	702382.9	1.1	77.3									0.04		
RC/WC-07	Y2-WC07-S	Year 2 OMMP	5/16/2006	0-10 cm	1160463.1	702382.9	68.7	4.22	220	1100	8 U (UJ)	8 U	0.4		59	45	0.11	26	0.5 U
RC/WC-07	WC-07-070516-G	Year 3 OMMP/City Sampling	5/16/2007	0-10 cm	1160462.79	702377	58	4.65											
RC/WC-08/R-03	RC-08	Year 0 OMMP	4/8/2004	0-2 cm	1160586	702434.5	79.7	0.923			6 U	6 U	0.3 U	17.8	32.8	5	0.06 U	16	0.4 U
RC/WC-08/R-03	RC-08	Year 1 OMMP	5/11/2005	0-2 cm	1160586	702434.5	4.65	41.3	1000	3200		20			111	145	0.5	31	
RC/WC-08/R-03	Y2-RC08-S	Year 2 OMMP	5/12/2006	0-2 cm	1160586	702434.5	52.9	5.63	550	2200	10 U (UJ)	10	0.8		73.6	73	0.22	30	0.6 U
RC/WC-08/R-03	Y3-RC08-S	Year 3 OMMP	5/16/2007	0-2 cm	1160568.17	702433	47.8	3.36	490	3100						70	0.18		
RC/WC-08/R-03	Y3-RC15-S	Year 3 OMMP	5/16/2007	0-2 cm	1160568.17	702433	47.2	5.45	520	3100						76	0.2		
RC/WC-08/R-03	RC-08	City Sampling	12/1/2004	0-5 cm	1160586	702434.5	52.1		370	850		10			89	100	0.34	30	
RC/WC-08/R-03	WC-08	Year 0 OMMP	4/8/2004	0-10 cm	1160586	702434.5	82.6	0.881			6 U	6 U	0.2 U	17.2	33.9	4	0.05 U	16	0.3 U
RC/WC-08/R-03	WC-8	Year 1 OMMP	5/11/2005	0-10 cm	1160586	702434.5	1.4	72.5									0.07		
RC/WC-08/R-03	Y2-WC08-S	Year 2 OMMP	5/12/2006	0-10 cm	1160586	702434.5	59.4	4.17	470	1800	9 U (UJ)	9 U	0.8		72	64	0.19	24	0.6
RC/WC-08/R-03	WC-08-070516-G	Year 3 OMMP/City Sampling	5/16/2007	0-10 cm	1160568.17	702433	55.6	2.71											
RC/WC-09	RC-09	Year 0 OMMP	4/8/2004	0-2 cm	1160653.49	702452.3	67.3	2.86			8 U	8 U	0.3 U	25.6	64	15	0.07 U	23	0.5 U
RC/WC-09	RC-09	Year 1 OMMP	5/11/2005	0-2 cm	1160653.49	702452.3	4.66	40.9	1100	3700		20			117	144	0.5	32	
RC/WC-09	Y2-RC09-S	Year 2 OMMP	5/15/2006	0-2 cm	1160653.49	702452.3	47.9	5.12	740	2800	10 U (UJ)	10 U	0.7		73.5	76	0.28	26	0.7 U
RC/WC-09	Y3-RC09-S	Year 3 OMMP	5/16/2007	0-2 cm	1160653.49	702452	42.9	3.13	560	3600						86	0.2		
RC/WC-09	RC-09	City Sampling	12/1/2004	0-6 cm	1160653.49	702452.3	56.4		130	350		10			76.8	64	0.21	26	
RC/WC-09	WC-09	Year 0 OMMP	4/8/2004	0-10 cm	1160653.49	702452.3	71.7	2.99			7 U	7 U	0.3 U	18.4	39.8	7	0.05 U	18	0.4 U
RC/WC-09	WC-09	City Sampling	12/1/2004	0-10 cm	1160653.49	702452.3	61.4		37	110		9			57.4	32	0.11	22	
RC/WC-09	WC-9	Year 1 OMMP	5/11/2005	0-10 cm	1160653.49	702452.3	1.8	65.4									0.09		
RC/WC-09	Y2-WC09-S	Year 2 OMMP	5/15/2006	0-10 cm	1160653.49	702452.3	59.3	4.43	350	1300	9 U (UJ)	9 U	0.7		70.6	66	0.18	25	0.5 U
RC/WC-09	WC-09-070516-G	Year 3 OMMP/City Sampling	5/16/2007	0-10 cm	1160653.49	702452	55	4.3											
RC/WC-10	RC-10	Year 0 OMMP	4/9/2004	0-2 cm	1160570.7	702583.8	68.1	3.22			7 U	7 U	0.3 U	21.9	54.7	11	0.06 U	20	0.5
RC/WC-10	RC-10	Year 1 OMMP	5/11/2005	0-2 cm	1160570.7	702583.8	4.7	44.5	1200	3800		20			115	159	**0.6**	32	
RC/WC-10	Y2-RC10-S	Year 2 OMMP	5/16/2006	0-2 cm	1160570.7	702583.8	84.3	2.96	110	510	6 U (UJ)	6 U	0.2 U		24.3	15	0.04 U	20	0.4 U
RC/WC-10	Y3-RC10-S	Year 3 OMMP	5/16/2007	0-2 cm	1160568.47	702580	68.4	5.27	140	1000						33	0.08		
RC/WC-10	RC-10	City Sampling	12/1/2004	0-3 cm	1160570.7	702583.8	49.6		520	1700		10			95.3	123	0.48	27	
RC/WC-10	WC-10	Year 0 OMMP	4/9/2004	0-10 cm	1160570.7	702583.8	79.4	1.4			6 U	6 U	0.3 U	19.1	35.9	4	0.06 U	17	0.4 U
RC/WC-10	WC-10	City Sampling	12/1/2004	0-10 cm	1160570.7	702583.8	78.3		110	250		7			48.2	27	0.13	19	
RC/WC-10	WC-10 (City)	City Sampling	12/1/2004	0-10 cm	1160570.7	702583.8	74.4	1.4								30.8	0.06		
RC/WC-10	Y2-WC10-S	Year 2 OMMP	5/16/2006	0-10 cm	1160570.7	702583.8	84.1	1.99	68	290	6 U (UJ)	6 U	0.2 U		20.6	12	0.05 U	18	0.4 U
RC/WC-10	WC-10-070516-G	Year 3 OMMP/City Sampling	5/16/2007	0-10 cm	1160568.47	702580	86.6	0.861								10	0.04 U		
RC/WC-10	WCBU-10A	Year 0 OMMP	4/7/2004	0-1 ft	1160570.7	702583.8	88.7	0.402			5 U	5 U	0.2 U	17.4	31.2	3	0.04 U	17	0.3 U
RC/WC-10	WCBU-10A-Duplicate	Year 0 OMMP	4/7/2004	0-1 ft	1160570.7	702583.8	88.3	0.323			6 U	6 U	0.2 U	16.1	31.2	3	0.04 U	17	0.3 U
RC/WC-10	WCBU-10B	Year 0 OMMP	4/7/2004	1-2 ft	1160570.7	702583.8	94.7	0.145			5 U	5 U	0.2 U	20.2	46.7	2	0.05 U	20	0.3 U
RC/WC-10	Y2-WC10-C3	Year 2 OMMP	5/17/2006	1-3 ft	1160570.7	702583.8	87.4	0.225			5 U (UJ)	5 U	0.2 U		37.8	2	0.05 U	20	0.3 U
RC/WC-10	WCBU-10C	Year 0 OMMP	4/7/2004	2-3.3 ft	1160570.7	702583.8	93.1	0.299			5 U	5 U	0.2 U	13.1	21.1	2 U	0.04 U	12	0.3 U
RC/WC-11/R-04	RC-11	Year 0 OMMP	4/8/2004	0-2 cm	1160665.1	702724.8	67.6	2.95			8 U	20	0.5	25.2	132	35	0.13	28	0.5 U
RC/WC-11/R-04	RC-11(pre-City dredge)-CITY	City (pre-City dredge)	8/30/2004	0-2 cm	1160665.1	702724.8	58.9	1.6								45.7	0.191		
RC/WC-11/R-04	RC-11(pre-City dredge)-UTL	Utilities' (pre-City dredge)	8/30/2004	0-2 cm	1160665.1	702724.8	71.3					18			127	30	0.1	22	
RC/WC-11/R-04	RC-11(post-City dredge)-CITY	City (post-City dredge)	9/18/2004	0-2 cm	1160665.1	702724.8	39.1	3.2								160	**0.828**		
RC/WC-11/R-04	RC-11(post-City dredge)-UTL	Utilities' (post-City dredge)	9/18/2004	0-2 cm	1160665.1	702724.8	34.4					20			168	238	**0.8**	37	

Table F. Head of the Thea Foss Results 2004 - 2007

Location	Sample ID	Monitoring Type	Sample Date	Depth Below Mudline	Easting	Northing	Total Solids	TOC	TPH Diesel	TPH Motor Oil	Sb	As	Cd	Cr	Cu	Pb	Hg	Ni	Ag
		SQO									150	57	5.1		390	450	0.59	140	6.1
		Units					Percent	Percent	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG
RC/WC-11/R-04	RC-11	Year 1 OMMP	5/11/2005	0-2 cm	1160665.1	702724.8	4.52	41.8	2200	5700		20			132	178	**0.84**	35	
RC/WC-11/R-04	Y2-RC11-S	Year 2 OMMP	5/12/2006	0-2 cm	1160665.1	702724.8	84.9	4.32	140	660	6 U (UJ)	6 U	0.2 U		25.3	13	0.06 U	18	0.4 U
RC/WC-11/R-04	Y3-RC11-S	Year 3 OMMP	5/16/2007	0-2 cm	1160665.61	702713	48	6.08	490	3000						73	0.19		
RC/WC-11/R-04	WC-11	Year 0 OMMP	4/8/2004	0-10 cm	1160665.1	702724.8	84.2	2.07			6 U	16	0.2 U	21.5	168	14	0.05	24	0.4 U
RC/WC-11/R-04	WC-11(pre-City dredge)-CITY	City (pre-City dredge)	8/20/2004	0-10 cm	1160665.1	702724.8	66.3	3.6								43.7	0.147		
RC/WC-11/R-04	WC-11(post-City dredge)-CITY	City (post-City dredge)	9/18/2004	0-10 cm	1160665.1	702724.8	54	2.8								167	0.428		
RC/WC-11/R-04	WC-11 (Utilities' core)	City Sampling	11/22/2004	0-10 cm	1160665.1	702724.8	60.4		190	545		15			139	91	0.36	25	
RC/WC-11/R-04	WC-11 (City)	City Sampling	11/30/2004	0-10 cm	1160665.1	702724.8	59.6	4.8								158	0.24		
RC/WC-11/R-04	WC-11	Year 1 OMMP	5/11/2005	0-10 cm	1160665.1	702724.8	5.84	42.9	2100	5300		20			145	212	**0.7**	35	
RC/WC-11/R-04	Y2-WC11-S	Year 2 OMMP	5/12/2006	0-10 cm	1160665.1	702724.8	86.1	3.64	130	580	6 U (UJ)	6 U	0.2 U		17.9	11	0.06 U	16	0.4 U
RC/WC-11/R-04	Y2-WC15-S	Year 2 OMMP	5/12/2006	0-10 cm	1160665.1	702724.8	86.3	2.86	140	570	6 U (UJ)	6 U	0.2 U		20.5	11	0.05	20	0.4 U
RC/WC-11/R-04	WC-11-070516-G	Year 3 OMMP/City Sampling	5/16/2007	0-10 cm	1160665.61	702713	87.1	0.764								12	0.05 U		
RC/WC-12	RC-12	Year 0 OMMP	4/9/2004	0-2 cm	1160501.9	702722.3	88.4	0.365			5 U	5 U	0.2 U	27.3	48.5	4	0.05 U	22	0.3 U
RC/WC-12	RC-12	Year 1 OMMP	5/11/2005	0-2 cm	1160501.9	702722.3	4.81	43.8	1600	4400		20			121	186	**0.8**	31	
RC/WC-12	Y2-RC12-S	Year 2 OMMP	5/16/2006	0-2 cm	1160501.9	702722.3	76.2	3.74	160	720	6 U (UJ)	6 U	0.3 U		24.7	19	0.05 U	19	0.4 U
RC/WC-12	Y3-RC12-S	Year 3 OMMP	5/17/2007	0-2 cm	1160496.52	702715	61.4	4.91	220	1300						39	0.14		
RC/WC-12	RC-12	City Sampling	12/1/2004	0-3 cm	1160501.9	702722.3	46.1		380	720		20			123	190	**0.8**	33	
RC/WC-12	WC-12	Year 0 OMMP	4/9/2004	0-10 cm	1160501.9	702722.3	86.9	0.192			6 U	6 U	0.2 U	19.8	35.6	3	0.05 U	19	0.3 U
RC/WC-12	WC-12(pre-City dredge)-CITY	City (pre-City dredge)	8/20/2004	0-10 cm	1160501.9	702722.3		0.898								14.5	0.0692		
RC/WC-12	WC-12	City Sampling	12/1/2004	0-10 cm	1160501.9	702722.3	68.6		120	270		9			65.6	68	0.24	23	
RC/WC-12	WC-12 (City)	City Sampling	12/1/2004	0-10 cm	1160501.9	702722.3	65.7	3								71.9	0.122		
RC/WC-12	WC-12	Year 1 OMMP	5/11/2005	0-10 cm	1160501.9	702722.3	3	60.02									0.21		
RC/WC-12	Y2-WC12-S	Year 2 OMMP	5/16/2006	0-10 cm	1160501.9	702722.3	85.4	1.01	69	310	6 U (UJ)	6 U	0.2 U		16.9	10	0.05 U	18	0.3 U
RC/WC-12	WC-12-070517-G	Year 3 OMMP/City Sampling	5/17/2007	0-10 cm	1160496.52	702715	77.1	1.24								18	0.05 U		
RC/WC-12	Y2-WC12-C3	Year 2 OMMP	5/17/2006	1-2 ft	1160501.9	702722.3	89.7	0.139			6 U (UJ)	6 U	0.2 U		44.3	3	0.05 U	25	0.3 U
RC/WC-12	WCBU-12A	Year 0 OMMP	4/7/2004	0-1.7 ft	1160501.9	702722.3	90.9	0.02 U			5 U	5 U	0.2 U	20.1	39.4	2	0.04 U	20	0.3 U
RC-13	RC-13	Year 0 OMMP	4/8/2004	0-2 cm	1160541.6	701894.6	78.5	3.33			7 U	8	0.3 U	26.4	58.5	42	0.07	31	0.4 U
RC-13	RC-13	City Sampling	12/9/2004	0-2 cm	1160541.6	701894.6	75.2		96	450		6			38.6	23	0.06	25	
RC-13	RC-13	Year 1 OMMP	5/12/2005	0-2 cm	1160541.6	701894.6	11.7	70.7	210	910		8 U			53.3	38	0.08	26	
RC-13	Y2-RC13-S	Year 2 OMMP	5/16/2006	0-2 cm	1160541.6	701894.6	49.1	6.66	450	2800	10 U (UJ)	10 U	0.4 U		62.3	73	0.12	34	0.6 U
RC-13	Y3-RC13-S	Year 3 OMMP	5/16/2007	0-2 cm	1160565.9	701876	39.8	5.47	560	3800						113	0.2		
RC-14	RC-14	Year 0 OMMP	4/8/2004	0-2 cm	1160718.7	701872.7	65.9	6.96			8 U	9	0.5	30.1	73.3	54	0.1	31	0.5 U
RC-14	RC-14	City Sampling	12/9/2004	0-2 cm	1160718.7	701872.7	66.7		230	1400		7			50.9	52	0.08	30	
RC-14	RC-14	Year 1 OMMP	5/12/2005	0-2 cm	1160718.7	701872.7	7.43	61.3	390	1800		9			56.2	58	0.13	30	
RC-14	Y2-RC14-S	Year 2 OMMP	5/16/2006	0-2 cm	1160718.7	701872.7	57	7.09	470	2300	8 U (UJ)	9	0.4		63.9	67	0.13	31	0.5 U
RC-14	Y3-RC14-S	Year 3 OMMP	5/16/2007	0-2 cm	1160718.7	701873	52.4	7.33	300	2200						70	0.1		
RC-14B	RC-14B	Year 1 OMMP	5/12/2005	0-2 cm	1160727.9	701824.2	4.37	66.9	250	1200		7			44.6	37	0.08	26	
RC-14B	Y2-RC14B-S	Year 2 OMMP	5/16/2006	0-2 cm	1160727.9	701824.2	58.7	6.25	360	2400	8 U (UJ)	10	0.3 U		67.2	60	0.11	33	0.5 U
WC-13	WC-13	Year 0 OMMP	4/8/2004	0-10 cm	1160603.4	702459.5	84.7	0.955			5 U	5 U	0.2 U	24.2	44	4	0.05 U	22	0.3 U
WC-13	Y2-WC13-S	Year 2 OMMP	5/15/2006	0-10 cm	1160603.4	702459.5	62.2	3.92	330	1500	9 U (UJ)	9 U	0.5		61.3	51	0.2	23	0.5 U
WC-13	WC-13-070516-G	Year 3 OMMP/City Sampling	5/16/2007	0-10 cm	1160602.7	702477	55.4	3.33											
WC-14	WC-14	Year 0 OMMP	4/9/2004	0-10 cm	1160614.7	702408.5	74.4	2.3			7 U	7 U	0.3 U	18.2	36.1	4	0.05 U	18	0.4 U
WC-14	Y2-WC14-S	Year 2 OMMP	5/15/2006	0-10 cm	1160614.7	702408.5	46.8	4.51	650	3200	10 U (UJ)	10 U	0.7		78.3	70	0.2	28	0.7 U
WC-14	WC-14-070516-G	Year 3 OMMP/City Sampling	5/16/2007	0-10 cm	1160617.85	702398	57.1	2.84											
SC-01	SC-01	Year 0 OMMP	4/8/2004	0-10 cm	1160436.4	702702.2	91.5	0.223			5 U	5 U	0.2 U	18.9	30.7	3	0.05 U	19	0.3 U
SC-01	Y2-SC01-S	Year 2 OMMP	5/16/2006	0-10 cm	1160436.4	702702.2	94.3	0.462	14	75	5 U (UJ)	5 U	0.2 U		24.1	5	0.04 U	19	0.3 U
SC-02	SC-02	Year 0 OMMP	4/8/2004	0-10 cm	1160366.1	702445.9	90.3	0.177			5 U	5 U	0.2 U	19.7	41.6	2 U	0.04 U	18	0.3 U
SC-02	Y2-SC02-S	Year 2 OMMP	5/16/2006	0-10 cm	1160366.1	702445.9	81	2.75	160	770	6 U (UJ)	6 U	0.2 U		44.6	36	0.05 U	21	0.3 U
SC-03	SC-03	Year 0 OMMP	4/8/2004	0-10 cm	1160762.9	702185.7	89.3	0.536			5 U	5 U	0.2 U	19.8	33.9	4	0.04 U	20	0.3
SC-03	Y2-SC03-S	Year 2 OMMP	5/16/2006	0-10 cm	1160762.9	702185.7	60	5.52	380	2000	8 U (UJ)	8 U	0.3		78.8	58	0.1	29	0.5 U
SC-04	SC-04	Year 0 OMMP	4/8/2004	0-10 cm	1160729.6	702745.9	91.9	0.31			5 U	5 U	0.2 U	20.4	52.3	4	0.04 U	22	0.3 U
SC-04	Y2-SC04-S	Year 2 OMMP	5/16/2006	0-10 cm	1160729.6	702745.9	72.1	5.33	210	1100	7 U (UJ)	7 U	0.3 U		51.1	44	0.08	28	0.4 U
City Area Locations																			
S-15	Site 15(pre-City dredge)-CITY	City (pre-City dredge)	8/30/2004	0-2 cm	1160596.5	702760.4	62.6	1.6								72.1	0.307		
S-15	Site 15(post-City dredge)-UTL	Utilities' (post-City dredge)	9/18/2004	0-2 cm	1160596.5	702760.4	34.3					20			167	335	**1.4**	43	
S-15	Site 15(pre-City dredge)-UTL	Utilities' (pre-City dredge)	8/30/2004	0-10 cm	1160596.5	702760.4	64.8					20			81.5	80	0.2	27	
S-15	Site 15(post-City dredge)-CITY	City (post-City dredge)	9/18/2004	0-10 cm	1160596.5	702760.4	48.1	3.5								296	**1.48**		
S-15	S-15 (Utilities' core)	City Sampling	11/22/2004	0-10 cm	1160596.5	702760.4	53.1		1100	2300		11			104	140	**0.67**	27	
S-15	S-15 (City)	City Sampling	11/30/2004	0-10 cm	1160596.5	702760.4	43.7	7.7								240	0.328		
S-15	S-15	Year 1 OMMP	5/10/2005	0-10 cm	1160596.5	702760.4	4.24	49	1600	4300		10			106	162	**0.7**	37	
S-15	S-15A	City Sampling	5/10/2005	0-10 cm	1160596.5	702760.4	4.7	51.9									0.22		

Table F. Head of the Thea Foss Results 2004 - 2007

Location	Sample ID	Monitoring Type	Sample Date	Depth Below Mudline	Easting	Northing	Total Solids	TOC	TPH Diesel	TPH Motor Oil	Sb	As	Cd	Cr	Cu	Pb	Hg	Ni	Ag
		SQO									**150**	**57**	**5.1**		**390**	**450**	**0.59**	**140**	**6.1**
		Units					Percent	Percent	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG
S-15	Y2-S15-S	Year 2 OMMP	5/15/2006	0-10 cm	1160596.5	702760.4	82.8	3.77	130	670	6 U (UJ)	6 U	0.2 U		23.6	15	0.05 U	23	0.4 U
S-15	S-15-070516-G	Year 3 OMMP/City Sampling	5/16/2007	0-10 cm	1160587.62	702759	86	1.57								10	0.04 U		
S-15	S-15-070516-G-D	Year 3 OMMP/City Sampling	5/16/2007	0-10 cm	1160587.62	702759	85.8	0.977								12	0.05 U		
S-15A	S-15	City Sampling	5/10/2005	0-10 cm	1160596.5	702760.4	3.1	51.2									0.25		
S-16	S-16	City Sampling	11/30/2004	0-10 cm	1160669.5	702640.5	49.9		760	4200		20			162	220	**0.75**	38	
S-16	S-32 (Dup of S-16)	City Sampling	11/30/2004	0-10 cm	1160669.5	702640.5	51.1		580	1700		20			157	153	0.51	32	
S-16	S-16	City Sampling	5/10/2005	0-10 cm	1160669.5	702640.5	3.7	59.9									0.12		
S-17	S-17	City Sampling	11/30/2004	0-2 cm	1160673.6	702546.9	49.8		800	2200		13			119	125	0.48	26	
S-17	S-17 (City)	City Sampling	11/30/2004	0-10 cm	1160673.6	702546.9	74.4	1.9								38.6	0.075		
S-17	S-17	Year 1 OMMP	5/11/2005	0-10 cm	1160673.6	702546.9	4.09	55.1	680	2700		13			92.2	87	0.29	26	
S-17	Y2-S17-S	Year 2 OMMP	5/12/2006	0-10 cm	1160673.6	702546.9	86.8	3.91	95	400	6 U (UJ)	6 U	0.2 U		19.9	9	0.04 U	14	0.3 U
S-17	S-17-070516-G	Year 3 OMMP/City Sampling	5/16/2007	0-10 cm	1160673.6	702547	81.6	1.62								15	0.06 U		
S-18	S-18	City Sampling	12/1/2004	0-7 cm	1160699.9	702481.5	53.7		39	110		10			77	56	0.16	26	
S-18	S-18 (City)	City Sampling	12/1/2004	0-10 cm	1160699.9	702481.5	65.1	2.5								26.4	0.097		
S-19	S-19	City Sampling	11/30/2004	0-10 cm	1160598.8	702671	57.5		610	4500		20			127	182	**0.7**	29	
S-19	S-19	City Sampling	5/10/2005	0-10 cm	1160598.8	702671	5.7	51.1									0.23		
S-19	Y2-S19-S	Year 2 OMMP	5/15/2006	0-10 cm	1160598.8	702671	84.1	1.28	120	590	6 U (UJ)	6 U	0.2 U		22	16	0.05 U	18	0.4 U
S-19	S-19-070516-G	Year 3 OMMP/City Sampling	5/16/2007	0-10 cm	1160587.04	702660	88.4	0.848								11	0.04 U		
S-20	S-20	City Sampling	11/30/2004	0-2 cm	1160602.5	702537.4	62.7		620	2000		11			126	74	0.43	21	
S-20	S-20 (City)	City Sampling	11/30/2004	0-10 cm	1160602.5	702537.4	61.5	2.2								55.7	0.118		
S-20	S-20	City Sampling	5/10/2005	0-10 cm	1160602.5	702537.4	3.7	46.7									0.16		
S-21	S-21	City Sampling	12/1/2004	0-7 cm			42.3		660	1200		20			127	207	**0.9**	34	
S-21	S-33 (Dup of S-21)	City Sampling	12/1/2004	0-7 cm			41.9		490	960		20			145	202	**0.81**	32	
S-21	S-21 (City)	City Sampling	12/1/2004	0-10 cm			48.7	4.1								147	0.239		
S-22	S-22	City Sampling	12/1/2004	0-8 cm	1160543	702648	49.4		860	1800		10			73.1	89	0.42	22	
S-22	S-22 (City)	City Sampling	12/1/2004	0-10 cm	1160543	702648	66.5	1.9								44.8	0.123 J		
S-23	S-23	City Sampling	12/1/2004	0-3 cm			56.1		230	500		12			75.8	98	0.35	24	
S-24	S-24	City Sampling	12/1/2004	0-3 cm	1160509	702551	52.9		180	420		10			89.8	113	0.4	28	
S-24	S-24 (City)	City Sampling	12/1/2004	0-10 cm	1160509	702551	78.2	1								25.8	0.052		
S-24	S-24	Year 1 OMMP	5/11/2005	0-10 cm	1160509	702551	4.39	60.1	430	1700		9 U			66	59	0.2	22	
S-24	Y2-S24-S	Year 2 OMMP	5/12/2006	0-10 cm	1160509	702551	86.8	2.48	97	410	5 U (UJ)	5 U	0.2 U		18.7	11	0.17	14	0.3 U
S-24	S-24-070516-G	Year 3 OMMP/City Sampling	5/16/2007	0-10 cm	1160507.77	702549	85.3	2.4								23	0.05		
S-29	S-29 (City)	City Sampling	12/1/2004	0-10 cm	1160549	702609.4	70.3	1.7								48.6	0.0932		
S-29	S-29	City Sampling	5/10/2005	0-10 cm	1160549	702609.4	3.4	56.3									0.19		
S-30	S-30	City Sampling	5/11/2005	0-10 cm	1160510.9	702470.9	2.1	83.2									0.02		
CA-19B	CA-19B-03	City Sampling	5/10/2005	0-10 cm	1160456	702958	3.4	62.4									0.13		
CA-19B	CA-19B-06	City Sampling	5/10/2005	0-10 cm	1160456	702958	3	47.5									0.28		
CA-20	CA-20-01	City Sampling	5/10/2005	0-10 cm	1160658.5	702858.4	0.71	88.8									0.013 J		
CA-20	CA-20-04	City Sampling	5/10/2005	0-10 cm	1160658.5	702858.4	1.8	88.3									0.04		
CA-22	CA-22-02	City Sampling	5/10/2005	0-10 cm	1160556	702849	4.1	57.5									0.23		
CA-22	CA-22-05	City Sampling	5/10/2005	0-10 cm	1160556	702849	1.3	84.7									0.05		
Reference Locations																			
CI-1	Y2-CI-01	Year 2 OMMP	5/18/2006	0-10 cm	1103837.9	737635.8	63.7	0.796											
CI-2	Y2-CI-02	Year 2 OMMP	5/18/2006	0-10 cm	1103837.9	737635.8	73.5	0.692											
Rinsate Blanks									**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
FIELDQC	Y2-RB-01	Year 2 OMMP	5/15/2006	NA					0.25 U	0.5 U	0.05 U	0.05 U	0.002 U		0.002	0.04	0.0001 U	0.01 U	0.003 U
FIELDQC	Y2-RB-02	Year 2 OMMP	5/16/2006	NA					0.25 U	0.5 U	0.05 U	0.05 U	0.002 U		0.002 U	0.02 U	0.0001 U	0.01 U	0.003 U
FIELDQC	Y2-RB-03	Year 2 OMMP	5/17/2006	NA							0.05 U	0.05 U	0.002 U		0.004	0.02 U	0.0001 U	0.01 U	0.003 U
FIELDQC	Y3-RB-01	Year 3 OMMP	5/17/2007	NA					0.25 U	0.5 U						0.02 U	0.0001 U		
FIELDQC	WC-05-RB	Year 3 OMMP/City Sampling	5/17/2007	NA												0.02 U	0.0001 U		

Table F. Head of the Thea Foss Results 2004 - 2007

Location	Sample ID	Zn 410 MG/KG	Gravel Percent	Very Coarse Sand Percent	Coarse Sand Percent	Medium Sand Percent	Fine Sand Percent	Very Fine Sand Percent	Percent Silt Percent	Percent Clay Percent	Percent Fines Percent	Phenol 420 UG/KG	1,3-Dichloro benzene 170 UG/KG	1,4-Dichloro benzene 110 UG/KG	1,2-Dichloro benzene 50 UG/KG	Dibenzofuran 540 UG/KG	Benzyl Alcohol 73 UG/KG	2-Methyl phenol 63 UG/KG	4-Methyl phenol 670 UG/KG	Hexachloro ethane UG/KG
RC/WC-01	RC-01	74.3	25		40	17		6.1	7.2	4.9	12									
RC/WC-01	RC-01	71.9	25.8	19.7	31.5	14		1.8	3.8	2.5	6.3					57 U				
RC/WC-01	RC-01	289	21.3	8.6	15	10.1	7.3	7.9	18.1	11.7	29.8					220 U				
RC/WC-01	Y2-RC01-S	287	22	10.1	10.1	11.2	9.9	9.6	15.4	11.7	27.1					160 U				
RC/WC-01	Y3-RC01-S	380	31.7	16	10.1	7.3	5.5	5.1	14.2	10	24.2					150 U				
RC/WC-01	WC-01	41	28		42	16		6.1	4.8	3	7.8		39 U	39 U	39 U					
RC/WC-01	WC-01	68.5	46.8	10.4	18.8	12.2		3.3	4.7	2.5	7.2					59 U				
RC/WC-01	Y2-WC01-S	269	20.5	9.1	808	10.8	8.9	7.1	20.1	14.7	34.8	**650**	190 U	190 U	190 U	190 U	190 U	190 U	650	190 U
RC/WC-01	WC-01-070516-G											77 U				77 U				
WC-01B/R-01B	Y2-WC01B-C3	29.5	28.4	16.3	17.9	21.3	11.9	1.5	1.7	0.9	2.6	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
RC/WC-02	RC-02	71	1.2		8.7	21		33	19	18	36									
RC/WC-02	RC-02	261	0.4	1	6.4	15	17.2	9	34.7	16.2	50.9					78				
RC/WC-02	RC-2A (Dup of RC-2)	267	0.2	0.9	6.6	14.7	16.6	9	37.2	14.8	52					230 U				
RC/WC-02	Y2-RC02-S	254	0.8	3.8	16.2	15.9	11.6	0	34.7	17	51.7					160 U				
RC/WC-02	Y3-RC02-S	**539**	2.4	5.4	9.3	14.5	19.7	12.5	25.8	10.6	36.4					110 J				
RC/WC-02	RC-02	164	0.7	1.7	5.1	18.4		6.8	30.6	13.7	44.3					120 U				
RC/WC-02	WC-02	58	8.2		14	23		32	14	10	24		39 U	39 U	39 U					
RC/WC-02	WC-02 (City)	107 B														11.8				
RC/WC-02	WC-02	127	1.3	0.7	5.4	22	25.8	8	26.1	10.7	36.8					39				
RC/WC-02	Y2-WC02-S	252	0.6	3	5	11.7	19	10.9	33.6	23.7	57.3	120 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U
RC/WC-02	WC-02-070516-G											140 J				160 U				
RC/WC-03	RC-03	115	0.1		4.9	3.7		18	40	34	73									
RC/WC-03	RC-03	123	0.1	1	6.4	18.4	23.3	12.3	26.2	12.3	38.5					51				
RC/WC-03	Y2-RC03-S	166	3.8	2.4	5	15.4	17.8	9.2	32.7	13.6	46.3					120 U				
RC/WC-03	Y3-RC03-S	113	0.1	3.2	8.4	20.8	23.4	12.5	22	9.7	31.7					76 U				
RC/WC-03	WC-03	63	0.5		8.4	16		33	26	17	43		40 U	40 U	40 U					
RC/WC-03	WC-03 (City)	93 B														9.1 J				
RC/WC-03	Y2-WC03-S	99	1.53	1.9	5.3	15.7	23.1	12.3	26.2	14	40.2	73 U	73 U	73 U	73 U	73 U	73 U	73 U	73 U	73 U
RC/WC-03	WC-03-070516-G											69 U				69 U				
RC/WC-03	RC-03	90	1.1	0.7	1.5	9.9		18.5	33.7	20.5	54.2					99 U				
RC/WC-04/R-02	RC-04	70	4.1		18	20		24	18	16	34									
RC/WC-04/R-02	RC-04	254	0.2	0.6	5.7	8.7	9.5	7.5	49.7	18.1	67.8					120				
RC/WC-04/R-02	Y2-RC04-S	108	2.8	3.5	5.9	13.8	17.6	10.3	33.2	12.9	46.1					320 U				
RC/WC-04/R-02	Y3-RC04-S	227	0.7	0.8	5.3	13.6	15.5	11.2	35.8	17.1	52.9					110 U				
RC/WC-04/R-02	RC-04	128	5.9	5.1	8.7	14.3		7.7	29.7	15.8	45.5					120 U				
RC/WC-04/R-02	WC-04	52.2	14		25	20		25	9.8	6.4	16		20 U	20 U	20 U					
RC/WC-04/R-02	WC-04-Duplicate	48.2	14		24	20		25	11	6.7	18		20 U	20 U	20 U					
RC/WC-04/R-02	S-34 (Dup of WC-04)	98	3	5.3	7.8	19.3		7.8	23.6	14.8	38.4					98 U				
RC/WC-04/R-02	WC-04	95	4.5	4	9.6	18.9		7.6	22.6	14.8	37.4					140 U				
RC/WC-04/R-02	WC-04	113	9.3	5.8	10.4	17.1	12.9	7	24.6	12.8	37.4					36 U				
RC/WC-04/R-02	Y2-WC04-S	133	7.1	5.2	9.5	19.3	15.7	7.2	24	12.1	36.1	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
RC/WC-04/R-02	WC-04-070517-G											66 U				66 U				
RC/WC-04/R-02	WCBU-4A	35.3	15		33	26		22	2.6	1.3	3.9		19 U	19 U	19 U	19 U				
RC/WC-04/R-02	WCBU-4B	38	25		43	21		9.8	0.8	0.5	1.3		19 U	19 U	19 U	19 U				
RC/WC-04/R-02	WCBU-4C	36.9	28		44	19		7.3	1.1	0.5	1.6		19 U	19 U	19 U	19 U				
RC/WC-04/R-02	Y2-WC04-C3	40.8	20.5	17.1	20.3	23.8	12.7	2.9	2.7	0	2.7	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
RC/WC-05	RC-05	70	0.1		5.3	8		32	32	22	54									
RC/WC-05	RC-05-Duplicate	69	3.4		3.6	7.9		33	31	21	53									
RC/WC-05	RC-05	187	0.1	0.6	3.6	9.9	16	9.9	45.4	14.6	60					130				
RC/WC-05	Y2-RC05-S	189	0.4	3.7	4.8	12	16.5	11.2	34.4	16.9	51.3					150 U				
RC/WC-05	Y3-RC05-S	220	0.7	3.1	5.3	12.4	15.7	11.8	34.3	16.7	51					150 U				
RC/WC-05	WC-05	48	3.2		13	17		36	20	11	31		20 U	20 U	20 U					
RC/WC-05	WC-05	138	0.5	0.4	1	6.2		16.2	41.7	19.5	61.2					120 U				
RC/WC-05	WC-05	111	2.6	3.4	5.4	11.3	16.3	13.2	32.6	15.2	47.8					41 U				
RC/WC-05	Y2-WC05-S	63	1.4	2.2	3.6	11.6	19	11.3	35.5	15.3	50.8	99 U	99 U	99 U	99 U	99 U	99 U	99 U	99 U	99 U
RC/WC-05	WC-05-070516-G											92 U				92 U				
RC/WC-05	RC-05	117	0.2	0.6	1	7.8		17.8	39.4	18.7	58.1					110 U				
RC/WC-05	WCBU-5A	28.9	29		30	22		18	0.8	0.4	1.2		19 U	19 U	19 U	19 U				
RC/WC-05	Y2-WC05-C3	34.7	21.1	13.9	17.9	24.7	17	2.8	2.6	0	2.6	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
RC/WC-06	RC-06	56	2.2		2.6	17		52	14	12	26									
RC/WC-06	RC-06	216	0.3	1.1	5.4	15	15.7	8	39.2	15.3	54.5					76				

Table F. Head of the Thea Foss Results 2004 - 2007

Location	Sample ID	Zn 410 MG/KG	Gravel Percent	Very Coarse Sand Percent	Coarse Sand Percent	Medium Sand Percent	Fine Sand Percent	Very Fine Sand Percent	Percent Silt Percent	Percent Clay Percent	Percent Fines Percent	Phenol 420 UG/KG	1,3-Dichloro benzene 170 UG/KG	1,4-Dichloro benzene 110 UG/KG	1,2-Dichloro benzene 50 UG/KG	Dibenzofuran 540 UG/KG	Benzyl Alcohol 73 UG/KG	2-Methyl phenol 63 UG/KG	4-Methyl phenol 670 UG/KG	Hexachloro ethane UG/KG
RC/WC-06	Y2-RC06-S	121	3.6	4.4	11	24.9	19.8	6.9	20.7	8.9	29.6					87 U				
RC/WC-06	Y2-RC15-S	122	6.3	4.5	10.7	23.7	20.2	6.6	19.9	8	27.9					86 U				
RC/WC-06	Y3-RC06-S	227	4.6	2.5	5.5	17.7	15.8	8.8	35.8	9.3	45.1					120 U				
RC/WC-06	RC-06	153	0.9	0.6	3.2	16.5		3.4	37	15.6	52.6					130 U				
RC/WC-06	WC-06	38.8	0.7		16	36		37	6.5	4.2	11		20 U	20 U	20 U					
RC/WC-06	Y2-WC06-S	80.7	1	2.1	6.4	25.7	30.4	8.4	16.8	9.3	26.1	60 U	60 U	60 U	60 U	60 U	60 U	60 U	60 U	60 U
RC/WC-06	WC-06-070517-G											85 U				85 U				
RC/WC-06	WCBU-6A	39.4	28		27	21		21	2	1.2	3.2		20 U	20 U	20 U	20 U				
RC/WC-06	WCBU-6B	40	35		34	18		10	1.9	1.5	3.4		20 U	20 U	20 U	20 U				
RC/WC-06	Y2-WC06-C3	31.5	13.1	14.9	20.3	28	16.8	3.3	2	1.7	3.7	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
RC/WC-07	RC-07	40.6	26		27	22		18	3	3.2	6.2									
RC/WC-07	RC-07	141	11.5	5.3	9.6	23	16.6	7.8	17.3	8.9	26.2					69				
RC/WC-07	Y2-RC07-S	169	4	3.3	7.73	18.5	18	7.7	32.7	8.07	40.8					120 U				
RC/WC-07	Y3-RC07-S	173	3.7	2.6	9.6	26	17.9	6.8	22.8	10.8	33.6					96 U				
RC/WC-07	RC-07	238	47.3	1.2	2.3	6.3		6.3	23.9	9.3	33.2					180 U				
RC/WC-07	WC-07	30.7	33		37	18		9.2	2	0.5	2.5		19 U	19 U	19 U					
RC/WC-07	WC-07	93	21.3	2.8	6.7	24.1		3.8	11.3	6	17.3					62 U				
RC/WC-07	WC-07	62.2	40.4	8.5	10.5	21.3	10.4	1.7	4.3	2.9	7.2					25 U				
RC/WC-07	WC-7																			
RC/WC-07	Y2-WC07-S	112	9.7	4.2	10.8	27.8	21.8	4.4	14.7	6.6	21.3	83 U	83 U	83 U	83 U	83 U	83 U	83 U	83 U	83 U
RC/WC-07	WC-07-070516-G											84 U				84 U				
RC/WC-08/R-03	RC-08	33	1.6		18	39		37	2.5	2.7	5.2									
RC/WC-08/R-03	RC-08	215	2.7	3.6	7.6	9.9	8	5.9	42.5	19.6	62.1					120 U				
RC/WC-08/R-03	Y2-RC08-S	150	2.3	2.4	7	17.8	16	7.6	31.8	15	46.8					92 U				
RC/WC-08/R-03	Y3-RC08-S	184	0.8	1.3	8.4	21.2	17.9	9	29.4	12	41.4					120 U				
RC/WC-08/R-03	Y3-RC15-S	194	0.8	1.5	8	21.2	17.7	8.9	29.6	12.4	42					110 U				
RC/WC-08/R-03	RC-08	180	4.1	4.2	10.7	17.7		4.2	31.1	16	47.1					150 U				
RC/WC-08/R-03	WC-08	31.8	19		28	27		23	1.6	1.7	3.3		19 U	19 U	19 U					
RC/WC-08/R-03	WC-8																			
RC/WC-08/R-03	Y2-WC08-S	134	2.8	2.9	7.7	20	20	8.4	24.5	13.7	38.2	94 U	94 U	94 U	94 U	94 U	94 U	94 U	94 U	94 U
RC/WC-08/R-03	WC-08-070516-G											46				24 J				
RC/WC-09	RC-09	53.3	2.2		9.3	25		39	14	10	25									
RC/WC-09	RC-09	211	0.2	0.5	4.6	11.5	12.3	7.2	43.6	20.2	63.8					120 U				
RC/WC-09	Y2-RC09-S	158	0.2	3.4	5.6	13.2	13.3	6.7	38.9	18.6	57.5					110 U				
RC/WC-09	Y3-RC09-S	221	0.6	1.3	6.6	17.6	16.4	8.3	34.6	14.5	49.1					130 U				
RC/WC-09	RC-09	126	0	0.5	3.5	19.3		26.3	25.8	14.4	40.2					120 U				
RC/WC-09	WC-09	37.4	4.4		13	26		45	7.1	4	11		20 U	20 U	20 U					
RC/WC-09	WC-09	81	1.1	0.6	2	17.7		34.6	19.5	11.8	31.3					89 U				
RC/WC-09	WC-9																			
RC/WC-09	Y2-WC09-S	130	0.5	3.1	7.4	21.7	20.3	6.8	25.9	14.4	40.3	90 U	90 U	90 U	90 U	90 U	90 U	90 U	90 U	90 U
RC/WC-09	WC-09-070516-G											23 J				24 J				
RC/WC-10	RC-10	43.7	5.3		11	16		48	12	7.6	20									
RC/WC-10	RC-10	203	2.2	2.7	3	9.2	11.1	6.6	44.9	20.1	65					180				
RC/WC-10	Y2-RC10-S	52	55.6	12.7	11.6	8	3.2	1.3	4.9	2.6	7.5					26 U				
RC/WC-10	Y3-RC10-S	102	20.2	11.1	16.1	20.9	9.4	3.7	12.6	5.9	18.5					67 U				
RC/WC-10	RC-10	182	6.9	1.8	4.7	15.1		5.6	35.6	16.3	51.9					190				
RC/WC-10	WC-10	34.5	7.9		18	29		38	4.3	2.8	7.1		20 U	20 U	20 U					
RC/WC-10	WC-10	66	10.5	6.6	10.7	26.3		5.6	9.7	5.3	15					67 U				
RC/WC-10	WC-10 (City)	54.9 B														30.4 J				
RC/WC-10	Y2-WC10-S	44	47.4	11.5	15.5	15.4	4.6	1	2.9	1.8	4.7	20 U	20 U	20 U	20 U	64	20 U	20 U	20 U	20 U
RC/WC-10	WC-10-070516-G	49	61.1	11.9	9.6	8.8	3.6	1	2.4	1.4	3.9	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
RC/WC-10	WCBU-10A	33.7	11		24	31		32	1.5	0.6	2.1		20 U	20 U	20 U	20 U				
RC/WC-10	WCBU-10A-Duplicate	31	14		23	31		31	1.1	0.7	1.8		20 U	20 U	20 U	20 U				
RC/WC-10	WCBU-10B	35.6	34		35	20		10	0.2	0.6	0.8		20 U	20 U	20 U	20 U				
RC/WC-10	Y2-WC10-C3	33.7	26.2	13.7	19.4	25.9	12.5	1.3	1	0	1	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
RC/WC-10	WCBU-10C	19.9	35		40	17		7.2	0.4	0.9	1.3		19 U	19 U	19 U	19 U				
RC/WC-11/R-04	RC-11	82.8	48		17	0.7		10	15	9	24									
RC/WC-11/R-04	RC-11(pre-City dredge)-CITY	99.6														99 U				
RC/WC-11/R-04	RC-11(pre-City dredge)-UTL	86.3														200 U				
RC/WC-11/R-04	RC-11(post-City dredge)-CITY	205											79	79	**85**	**740**				
RC/WC-11/R-04	RC-11(post-City dredge)-UTL	280														**800**				

Table F. Head of the Thea Foss Results 2004 - 2007

Location	Sample ID	Zn 410 MG/KG	Gravel Percent	Very Coarse Sand Percent	Coarse Sand Percent	Medium Sand Percent	Fine Sand Percent	Very Fine Sand Percent	Percent Silt Percent	Percent Clay Percent	Percent Fines Percent	Phenol 420 UG/KG	1,3-Dichloro benzene 170 UG/KG	1,4-Dichloro benzene 110 UG/KG	1,2-Dichloro benzene 50 UG/KG	Dibenzofuran 540 UG/KG	Benzyl Alcohol 73 UG/KG	2-Methyl phenol 63 UG/KG	4-Methyl phenol 670 UG/KG	Hexachloro ethane UG/KG
RC/WC-11/R-04	RC-11	231	0.2	0.8	2	3.5	6.2	8.1	54.6	24.6	79.2					190				
RC/WC-11/R-04	Y2-RC11-S	56.9	59.6	10.4	10.7	7.1	2.4	1	5.7	3	8.7					48 U				
RC/WC-11/R-04	Y3-RC11-S	195	9.7	6.5	12.6	12.2	5.2	4.2	35.7	13.9	49.6					60 U				
RC/WC-11/R-04	WC-11	60.5	57		18	4.5		7.7	8.6	4.4	13		39 U	39 U	39 U					
RC/WC-11/R-04	WC-11(pre-City dredge)-CITY	90.3											5.87	5.8	4.68	18				
RC/WC-11/R-04	WC-11(post-City dredge)-CITY	239											78	78	**78**	340				
RC/WC-11/R-04	WC-11 (Utilities' core)	135	36.3	6	5.4	7.2		7.1	20.3	12.4	32.7					83				
RC/WC-11/R-04	WC-11 (City)	168 B														34 UJ				
RC/WC-11/R-04	WC-11	257	1	0.8	2.2	4.4	6.8	7.8	52.5	24.4	76.9					180				
RC/WC-11/R-04	Y2-WC11-S	44.2	49.4	15.4	14.4	9.4	2.6	1	5.5	2.6	8.1	44 U	44 U	44 U	44 U	44 U	44 U	44 U	44 U	44 U
RC/WC-11/R-04	Y2-WC15-S	41.6	53.7	13.3	14.1	8.3	2.3	0.9	5	2.3	7.3	44 U	44 U	44 U	44 U	44 U	44 U	44 U	44 U	44 U
RC/WC-11/R-04	WC-11-070516-G	53	60.3	13.7	10.7	7.8	1.9	0.5	3.1	1.9	5.1	22	20 U	20 U	20 U	20 U	20 U	20 U	14 J	20 U
RC/WC-12	RC-12	43.9	29		47	17		5	0.8	1.1	1.9									
RC/WC-12	RC-12	217	2	2.4	4	5.4	6.6	7.6	45.9	26.1	72					340				
RC/WC-12	Y2-RC12-S	59.9	42.2	8.5	12.2	17.5	6.4	2	8.1	3.3	11.4					20 U				
RC/WC-12	Y3-RC12-S	109	29.6	11.2	13.3	13.4	5	3	17.2	7.5	24.7					72 U				
RC/WC-12	RC-12	241	5.9	2.6	4.3	7		6.9	47.3	19.5	66.8					250 U				
RC/WC-12	WC-12	35.9	20		44	23		11	1.1	0.9	2		19 U	19 U	19 U					
RC/WC-12	WC-12(pre-City dredge)-CITY	44.8											5	4.9	3.98	5.4				
RC/WC-12	WC-12	111	33.6	13	10.7	10.3		5.2	16.7	8.4	25.1					100 U				
RC/WC-12	WC-12 (City)	89.7 B														39.3 J				
RC/WC-12	WC-12																			
RC/WC-12	Y2-WC12-S	39.4	72.2	8.8	5.7	5.3	2.2	0.8	3.3	1.7	5	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
RC/WC-12	WC-12-070517-G	62	58.9	11.8	10.5	8.1	2.7	1	4.6	2.4	7.1	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
RC/WC-12	Y2-WC12-C3	38.1	28.7	15.4	20.4	23.9	9.5	0.9	1.2	0	1.2	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
RC/WC-12	WCBU-12A	34.3	27		35	24		13	1.1	0.4	1.5		20 U	20 U	20 U	20 U				
RC-13	RC-13	99.3	28		34	12		7.9	10	7.9	18									
RC-13	RC-13	71.2	46.3	12.2	18.9	11.2		3.5	3.9	2.4	6.3					58 U				
RC-13	RC-13	118	32.3	12.6	19.7	12.3	5	2.8	9.6	5.7	15.3					28 U				
RC-13	Y2-RC13-S	208	7.6	8.1	12.2	9.4	12.5	14.4	25.3	10.5	35.8					120 U				
RC-13	Y3-RC13-S	256	4.6	6.3	7.7	10.2	17.1	13.6	27.2	13.2	40.4					120 J				
RC-14	RC-14	167	13		31	11		11	20	14	34									
RC-14	RC-14	135	31.6	11.9	24.1	12.4		6.4	8.4	4.3	12.7					69 U				
RC-14	RC-14	203	18.1	9.8	19.5	15	9.6	7.8	12.8	7.4	20.2					40 U				
RC-14	Y2-RC14-S	219	31.5	7.5	12.4	9.9	8	7.7	15	8.2	23.2					110 U				
RC-14	Y3-RC14-S	209	13.6	7	11.2	13.5	16.4	14.9	15.7	7.8	23.5					72 J				
RC-14B	RC-14B	117	25.5	13.2	21.8	13.3	4.6	3.3	11.4	6.8	18.2					86 U				
RC-14B	Y2-RC14B-S	194	34.5	8.7	14.8	8.9	4.1	4.4	16.1	8.6	24.7					94 U				
WC-13	WC-13	38.5	31		30	19		14	3.4	2.3	5.7		20 U	20 U	20 U					
WC-13	Y2-WC13-S	116	3.6	3.8	9	20.5	19.7	8.4	21.6	13.4	35	69 U	69 U	69 U	69 U	69 U	69 U	69 U	69 U	69 U
WC-13	WC-13-070516-G											33 J				34 J				
WC-14	WC-14	34.4	2.8		18	30		41	5.4	3.6	9		19 U	19 U	19 U					
WC-14	Y2-WC14-S	160	0.6	2.5	4.5	12.7	18	9.6	32.8	19.5	52.3	96 U	96 U	96 U	96 U	96 U	96 U	96 U	96 U	96 U
WC-14	WC-14-070516-G											32 J				21 J				
SC-01	SC-01	33	13		27	32		27	0.7	0.6	1.3		19 U	19 U	19 U					
SC-01	Y2-SC01-S	36.6	56.2	10.6	10.6	11.9	7.3	1.8	0.7	1	1.7	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
SC-02	SC-02	31.1	30		34	21		14	0.4	0.7	1.1		19 U	19 U	19 U					
SC-02	Y2-SC02-S	87.3	29.5	13.7	20.5	17	7.9	2.1	6.4	2.9	9.3	21 U	21 U	21 U	21 U	21 U	21 U	21 U	21 U	21 U
SC-03	SC-03	36.3	18		37	24		15	4.3	2.4	6.7		20 U	20 U	20 U					
SC-03	Y2-SC03-S	169	45.9	4.9	8.5	8.6	6.5	4.3	13.9	7.3	21.2	88 U	88 U	88 U	88 U	88 U	88 U	88 U	88 U	88 U
SC-04	SC-04	35.7	20		43	25		11	0.9	0.2	1.1		19 U	19 U	19 U					
SC-04	Y2-SC04-S	119	61.3	6	8.4	7.1	4.5	2.2	6.1	4.4	10.5	79 U	79 U	79 U	79 U	79 U	79 U	79 U	40 J	79 U
City Area Locations																				
S-15	Site 15(pre-City dredge)-CITY	79.6														99 U				
S-15	Site 15(post-City dredge)-UTL	363														**1800**				
S-15	Site 15(pre-City dredge)-UTL	79.6														200 U				
S-15	Site 15(post-City dredge)-CITY	360											78	78	**78**	**2400**				
S-15	S-15 (Utilities' core)	179	5.4	3.9	5	10.5		8.8	34.6	17.8	52.4					250				
S-15	S-15 (City)	232 B														404				
S-15	S-15	200	2.9	3.9	9.3	10.8	9.1	6.3	39.7	18	57.7					380				
S-15	S-15A																			

Table F. Head of the Thea Foss Results 2004 - 2007

Location	Sample ID	Zn 410	Gravel	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Percent Silt	Percent Clay	Percent Fines	Phenol 420	1,3-Dichloro benzene 170	1,4-Dichloro benzene 110	1,2-Dichloro benzene 50	Dibenzofuran 540	Benzyl Alcohol 73	2-Methyl phenol 63	4-Methyl phenol 670	Hexachloro ethane
		MG/KG	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG
S-15	Y2-S15-S	58.8	52.9	11.1	10.7	10.9	4.7	1.3	5.7	3.6	9.3	51 U	51 U	51 U	51 U	51 U	51 U	51 U	51 U	51 U
S-15	S-15-070516-G	55	57	13	10.5	10.5	3.1	0.6	3.5	2	5.3	14 J	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
S-15	S-15-070516-G-D	52	53.6	11.5	10.8	12.7	4.5	0.9	3.8	2.4	6.1	18 J	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
S-15A	S-15																			
S-16	S-16	279	58.6	2.6	2.4	2.4		5.5	42.1	9.8	61.6					75				
S-16	S-32 (Dup of S-16)	207	47.2	3.3	2.7	2.8		4.1	23.6	12.6	36.2					92				
S-16	S-16																			
S-17	S-17	173	23.2	8.8	5.7	4.8		5.1	32.8	14.9	47.7					91				
S-17	S-17 (City)	64.3 B														30.1 J				
S-17	S-17	134	7	2.7	5.4	14.7	18.8	8.6	29	13.7	42.7					86 U				
S-17	Y2-S17-S	43.4	59.1	14.1	12.1	6.9	0.8	1.3	3.4	2.1	5.5	40 U	40 U	40 U	40 U	40 U	40 U	40 U	40 U	40 U
S-17	S-17-070516-G	58	48.2	13.5	12.6	11.2	4.8	1.4	5.2	3.2	8.3	22	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
S-18	S-18	122	2	1.4	3.6	16.9		25.4	25	14.8	39.8					120 U				
S-18	S-18 (City)	54.6 B														11				
S-19	S-19	220	52.4	7.1	7.1	3.2		6.6	40.4	8.9	59.5					95				
S-19	S-19																			
S-19	Y2-S19-S	50	52.3	12	12.2	9.1	2.8	1.4	6.2	4.2	10.4	48 U	48 U	48 U	48 U	48 U	48 U	48 U	48 U	48 U
S-19	S-19-070516-G	55	61.2	14.7	10.8	6.3	1.8	0.6	2.7	1.7	4.5	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
S-20	S-20	111	37.8	3.4	5.8	14		4.5	13.1	7.6	20.7					50				
S-20	S-20 (City)	83.9 B														80.6				
S-20	S-20																			
S-21	S-21	257	0.7	1	3.2	7.9		8.4	47.5	21.2	68.7					300				
S-21	S-33 (Dup of S-21)	251	0.4	0.8	3	7.6		8	49.3	20.7	70					410				
S-21	S-21 (City)	159 B														206				
S-22	S-22	133	1.8	0.9	4.5	18.6		6.8	32.3	15.5	47.9					160 U				
S-22	S-22 (City)	71.6 B														76.9				
S-23	S-23	145	1.6	1.5	6.2	26.3		4.6	25.3	13.4	38.7					140 U				
S-24	S-24	175	5.6	2.9	7	18.1		6.1	29.2	13.8	43					150 U				
S-24	S-24 (City)	48.6 B														16.6 J				
S-24	S-24	105	4.4	4.5	7.8	25.4	26.3	6.5	16.5	8.6	25.1					42				
S-24	Y2-S24-S	40.3	67.5	11.4	7.3	5.8	3	0.9	2.7	1.5	4.2	39 U	39 U	39 U	39 U	39 U	39 U	39 U	39 U	39 U
S-24	S-24-070516-G	69	65.9	9.2	6.9	6.4	3.3	1.4	4.8	2.1	6.9	22	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
S-29	S-29 (City)	71.7 B														93.8				
S-29	S-29																			
S-30	S-30																			
CA-19B	CA-19B-03																			
CA-19B	CA-19B-06																			
CA-20	CA-20-01																			
CA-20	CA-20-04																			
CA-22	CA-22-02																			
CA-22	CA-22-05																			
Reference Locations																				
CI-1	Y2-CI-01		0	0.2	0.5	5.8	22.8	22.8	39.3	8.5	47.8									
CI-2	Y2-CI-02		0.1	0.2	1.5	12.7	37.2	21	22.3	5.2	27.5									
Rinsate Blanks		**mg/L**										**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**
FIELDQC	Y2-RB-01	0.016										1 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U	1 U
FIELDQC	Y2-RB-02	0.014										1 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U	1 U
FIELDQC	Y2-RB-03	0.017										1 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U	1 U
FIELDQC	Y3-RB-01	0.01 U														1 U				
FIELDQC	WC-05-RB	0.01 U										1 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U	1 U

Table F. Head of the Thea Foss Results 2004 - 2007

Location	Sample ID	2,4-Dimethylphenol 29 UG/KG	Benzoic Acid 650 UG/KG	1,2,4-Trichlorobenzene 51 UG/KG	Hexachlorobutadiene 11 UG/KG	N-Nitrosodiphenylamine 28 UG/KG	Hexachlorobenzene 22 UG/KG	Pentachlorophenol 360 UG/KG	Naphthalene 2100 UG/KG	Acenaphthylene 1300 UG/KG	Acenaphthene 500 UG/KG	Fluorene 540 UG/KG	Phenanthrene 1500 UG/KG	Anthracene 960 UG/KG	2-Methylnaphthalene 670 UG/KG	LPAH 5200 UG/KG	Fluoranthene 2500 UG/KG	Pyrene 3300 UG/KG	Benzo(a)anthracene 1600 UG/KG	Chrysene 2800 UG/KG
RC/WC-01	RC-01								39 U	39 U	39 U	39 U	160	39 U	39 U	160	480	360	140	260
RC/WC-01	RC-01								120	57 U	57 U	57 U	340	91	57 U	550	680	560	250	380
RC/WC-01	RC-01								260	220 U	220 U	220 U	**1700**	380	220 U	2300	**4300**	**4000**	1200	2000
RC/WC-01	Y2-RC01-S								160 U	160 U	160 U	100 J	**1600**	230	160 U	1900 J	**3900**	2200	1100	1800
RC/WC-01	Y3-RC01-S								110 J	150 U	150 U	100 J	**1500**	300	150 U	2000 J	**2800**	2000	900	1600
RC/WC-01	WC-01			39 U					39 U	39 U	39 U	39 U	85	39 U	39 U	85	250	140	75	130
RC/WC-01	WC-01								59 U	59 U	59 U	59 U	220	59 U	59 U	220	490	390	180	290
RC/WC-01	Y2-WC01-S	190 U	1900 U	190 U	3.5 U	190 U	3.5 U	960 U	190 U	190 U	190 U	190 U	810	160 J	190 U	970 J	2100	1400	670	1100
RC/WC-01	WC-01-070516-G								64 J	77 U	77 U	47 J	680	120	77 U	910 J	1500	1100	540	750
WC-01B/R-01B	Y2-WC01B-C3	20 U	200 U	20 U	1 U	20 U	1 U	98 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
RC/WC-02	RC-02								47	20 U	22	20 U	99	29	20 U	200	230	160	70	100
RC/WC-02	RC-02								420	74	220	190	1300	490	150	2800	**3900**	**3800**	1300	2000
RC/WC-02	RC-2A (Dup of RC-2)								530	230 U	250	230 U	**1600**	570	230 U	3000	**4600**	**4600**	**1600**	2300
RC/WC-02	Y2-RC02-S								190	160 U	140 J	150 J	**1700**	370	160 U	2600 J	**5300**	**3500**	**1600**	2700
RC/WC-02	Y3-RC02-S								150 J	170 U	110 J	160 J	**2500**	430	170 U	3400 J	**5000**	**4700**	**2000**	**3100**
RC/WC-02	RC-02								140	120 U	120 U	120 U	650	210	120 U	1000	1500	1100	540	790
RC/WC-02	WC-02			39 U					39 U	39 U	39 U	39 U	70	39 U	39 U	70	150	120	54	78
RC/WC-02	WC-02 (City)								52.7	18 J	34.5	31.7	230 J	92.9	22.3	480	820	441	183	265 B
RC/WC-02	WC-02								140	29 U	82	70	650	190	51	1200	1700	1600	540	780
RC/WC-02	Y2-WC02-S	120 U	1200 U	120 U	3.5 U	120 U	3.5 U	580 U	210	60 J	130	110 J	1400	360	120 U	2300 J	**4200**	3100	1200	2200
RC/WC-02	WC-02-070516-G								93 J	160 U	94 J	120 J	**2100**	320	160 U	2700 J	**4800**	**3300**	**1600**	2200
RC/WC-03	RC-03								130	20 U	67	41	240	73	35	590	500	360	150	220
RC/WC-03	RC-03								320	50	160	120	700	290	100	1700	2000	2000	650	920
RC/WC-03	Y2-RC03-S								150	120 U	120 U	120 U	820	210	120 U	1200	2400	1700	790	1200
RC/WC-03	Y3-RC03-S								100	76 U	40 J	76 U	570	120	39 J	830 J	1400	1300	540	790
RC/WC-03	WC-03			40 U					78	40 U	41	40 U	85	40 U	40 U	200	120	110	45	60
RC/WC-03	WC-03 (City)								65.4	20.9 J	33.4	28	152 J	62.5	19.9	380	356	393	121	170
RC/WC-03	Y2-WC03-S	73 U	730 U	73 U	3.5 U	73 U	3.5 U	370 U	99	73 U	73 U	73 U	440	140	73 U	680	1200	920	400	570
RC/WC-03	WC-03-070516-G								50 J	69 U	69 U	69 U	340	76	69 U	470 J	900	770	330	480
RC/WC-03	RC-03								120	99 U	99 U	99 U	270	120	99 U	510	590	520	230	300
RC/WC-04/R-02	RC-04								44	19 U	24	19 U	98	25	19 U	190	180	150	56	82
RC/WC-04/R-02	RC-04								980	140	480	350	**1600**	860	320	4700	**4500**	**4600**	**1600**	2100
RC/WC-04/R-02	Y2-RC04-S								320 U	320 U	190 J	190 J	1400	270 J	320 U	2100 J	**2900**	2600	960	1500
RC/WC-04/R-02	Y3-RC04-S								130	110 U	61 J	63 J	930	190	110 U	1400 J	2300	2000	840	1300
RC/WC-04/R-02	RC-04								220	120 U	130	120 U	600	240	120 U	1200	1500	940	480	660
RC/WC-04/R-02	WC-04			20 U					78	20 U	51	26	120	40	21	340	160	120	54	72
RC/WC-04/R-02	WC-04-Duplicate			20 U					92	20 U	61	30	140	45	24	390	190	140	64	81
RC/WC-04/R-02	S-34 (Dup of WC-04)								170	98 U	110	98 U	440	190	98 U	910	1100	730	360	490
RC/WC-04/R-02	WC-04								160	140 U	140 U	140 U	400	170	140 U	730	950	600	320	440
RC/WC-04/R-02	WC-04								170	36 U	86	61	400	180	57	950	1200	1200	390	540
RC/WC-04/R-02	Y2-WC04-S	100 U	1000 U	100 U	3.5 U	100 U	3.5 U	520 U	190	100 U	120	120	840	220	100 U	1500	2400	1900	780	1100
RC/WC-04/R-02	WC-04-070517-G								91	66 U	47 J	34 J	440	99	34 J	750 J	940	1000	420	600
RC/WC-04/R-02	WCBU-4A			19 U					19 U	19 U	19 U	19 U	33	19 U	19 U	33	54	50	20	27
RC/WC-04/R-02	WCBU-4B			19 U					19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U
RC/WC-04/R-02	WCBU-4C			19 U					19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U
RC/WC-04/R-02	Y2-WC04-C3	20 U	200 U	20 U	1 U	20 U	1 U	98 U	20 U	20 U	20 U	20 U	36	20 U	20 U	36	66	68	25	34
RC/WC-05	RC-05								34	20 U	20 U	20 U	40	20 U	20 U	74	73	49	22	30
RC/WC-05	RC-05-Duplicate								36	20 U	20 U	20 U	47	20 U	20 U	83	72	53	23	30
RC/WC-05	RC-05								1000	170	**530**	360	**1700**	**1000**	350	5100	**4500**	**4900**	**1700**	2000
RC/WC-05	Y2-RC05-S								150 U	150 U	150 U	150 U	690	220	150 U	910	1700	1600	690	1100
RC/WC-05	Y3-RC05-S								110 J	150 U	150 U	150 U	680	140 J	150 U	930 J	1800	1500	640	960
RC/WC-05	WC-05			20 U					25	20 U	20 U	20 U	39	20 U	20 U	64	63	50	20 U	24
RC/WC-05	WC-05								180	120 U	140	120 U	580	260	120 U	1200	1100	890	420	550
RC/WC-05	WC-05								280	49	140	100	550	300	95	1500	1600	1700	550	690
RC/WC-05	Y2-WC05-S	99 U	990 U	99 U	3.5 U	99 U	3.5 U	500 U	200	99 U	140	130	**1500**	310	99 U	2300	**2700**	2400	760	1800
RC/WC-05	WC-05-070516-G								130	92 U	81 J	51 J	740	180	55 J	1200 J	1900	1600	720	1000
RC/WC-05	RC-05								110	110 U	110 U	110 U	320	150	110 U	580	580	500	230	300
RC/WC-05	WCBU-5A			19 U					19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U
RC/WC-05	Y2-WC05-C3	20 U	200 U	20 U	1 U	20 U	1 U	100 U	20 U	20 U	20 U	20 U	11 J	20 U	20 U	11 J	27	32	12 J	15 J
RC/WC-06	RC-06								54	39 U	39 U	39 U	110	39 U	39 U	160	230	160	75	110
RC/WC-06	RC-06								650	100	260	200	1100	540	220	3100	**3100**	**3300**	1100	1400

Table F. Head of the Thea Foss Results 2004 - 2007

Location	Sample ID	2,4-Dimethylphenol 29 UG/KG	Benzoic Acid 650 UG/KG	1,2,4-Trichlorobenzene 51 UG/KG	Hexachlorobutadiene 11 UG/KG	N-Nitrosodiphenylamine 28 UG/KG	Hexachlorobenzene 22 UG/KG	Pentachlorophenol 360 UG/KG	Naphthalene 2100 UG/KG	Acenaphthylene 1300 UG/KG	Acenaphthene 500 UG/KG	Fluorene 540 UG/KG	Phenanthrene 1500 UG/KG	Anthracene 960 UG/KG	2-Methylnaphthalene 670 UG/KG	LPAH 5200 UG/KG	Fluoranthene 2500 UG/KG	Pyrene 3300 UG/KG	Benzo(a)anthracene 1600 UG/KG	Chrysene 2800 UG/KG
RC/WC-06	Y2-RC06-S								87 U	87 U	87 U	87 U	610	130	87 U	740	1400	1300	540	820
RC/WC-06	Y2-RC15-S								86 U	86 U	86 U	86 U	600	140	86 U	740	1300	1300	510	800
RC/WC-06	Y3-RC06-S								160	120 U	59 J	62 J	910	180	60 J	1400 J	2400	2100	860	1300
RC/WC-06	RC-06								430	130 U	220	130	740	320	130 U	1800	1200	930	500	630
RC/WC-06	WC-06			20 U					20 U	20 U	20 U	20 U	33	20 U	20 U	33	78	67	24	38
RC/WC-06	Y2-WC06-S	60 U	600 U	60 U	3.4 U	60 U	3.4 U	300 U	62	60 U	60 U	60 U	290	85	60 U	440	760	580	270	390
RC/WC-06	WC-06-070517-G								84 J	85 U	44 J	85 U	520	110	85 U	760 J	1400	1200	470	720
RC/WC-06	WCBU-6A			20 U					20 U	20 U	20 U	20 U	30	20 U	20 U	30	41	30	20 U	20 U
RC/WC-06	WCBU-6B			20 U					20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
RC/WC-06	Y2-WC06-C3	20 U	200 U	20 U	1 U	20 U	1 U	98 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	21	23	20 U	10 J
RC/WC-07	RC-07								19 U	19 U	19 U	19 U	26	19 U	19 U	26	55	39	20	32
RC/WC-07	RC-07								490	72	220	160	880	400	160	2400	2400	2400	810	1000
RC/WC-07	Y2-RC07-S								120 J	120 U	110 J	100 J	800	220	120 U	1400 J	2200	1600	760	1200
RC/WC-07	Y3-RC07-S								130	96 U	61 J	52 J	690	150	52 J	1100 J	1600	1500	640	960
RC/WC-07	RC-07								860	180 U	**530**	320	**1800**	760	280	4600	**3100**	2200	1300	1600
RC/WC-07	WC-07			19 U					19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U
RC/WC-07	WC-07								120	62 U	78	62 U	270	120	62 U	590	490	380	200	280
RC/WC-07	WC-07								120	25 U	46	29	180	87	36	500	700	660	200	250
RC/WC-07	WC-7								97.4	9.5 J	34.4	26.7	125	51.9	30	370	272	264	113	140
RC/WC-07	Y2-WC07-S	83 U	830 U	83 U	3.5 U	83 U	3.5 U	410 U	90	83 U	54 J	83 U	310	110	83 U	560 J	880	700	320	450
RC/WC-07	WC-07-070516-G								120	84 U	74 J	50 J	700	170	47 J	1200 J	1800	1400	660	940
RC/WC-08/R-03	RC-08								19 U	19 U	19 U	19 U	28	19 U	19 U	28	50	37	20	28
RC/WC-08/R-03	RC-08								960	150	430	300	**1600**	890	310	4600	**3800**	**4600**	**1600**	1700
RC/WC-08/R-03	Y2-RC08-S								330	84 J	170	130	950	310	120	2100 J	2400	2000	930	1300
RC/WC-08/R-03	Y3-RC08-S								200	120 U	87 J	74 J	890	200	76 J	1500 J	1900	1900	800	1200
RC/WC-08/R-03	Y3-RC15-S								220	110 U	100 J	90 J	1000	240	93 J	1700 J	2400	2300	920	1400
RC/WC-08/R-03	RC-08								990	200	**710**	420	**1800**	**1000**	360	**5500**	**3300**	2800	1300	1500
RC/WC-08/R-03	WC-08			19 U					19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	26	19 U	19 U	19 U
RC/WC-08/R-03	WC-8								171	36.2	64.1	43.9	226	165	51.9	760	570	645	217	208
RC/WC-08/R-03	Y2-WC08-S	94 U	940 U	94 U	3.5 U	94 U	3.5 U	470 U	290	64 J	150	110	710	270	99	1700 J	1600	1700	700	890
RC/WC-08/R-03	WC-08-070516-G								160	31	94	57 J	530	160	60	1100 J	1100	1000	440	630
RC/WC-09	RC-09								56	38 U	38 U	38 U	74	38 U	38 U	130	120	110	51	69
RC/WC-09	RC-09								1200	130	460	320	**1600**	940	380	5000	**3900**	**4700**	**1700**	1800
RC/WC-09	Y2-RC09-S								340	110 U	180	110 U	940	330	120	1900	2000	2100	950	1300
RC/WC-09	Y3-RC09-S								150	130 U	130 U	130 U	860	190	130 U	1200	2300	1900	800	1300
RC/WC-09	RC-09								580	140	380	240	1100	660	200	3300	**2500**	2000	950	1100
RC/WC-09	WC-09			20 U					21	20 U	20 U	20 U	36	20 U	20 U	57	67	53	22	30
RC/WC-09	WC-09								190	89 U	140	89 U	440	250	89 U	1000	1000	690	360	420
RC/WC-09	WC-9								277	65.3	114	83.4	382	319	89.8	1300	717	1050	323	276
RC/WC-09	Y2-WC09-S	90 U	900 U	90 U	3.5 U	90 U	3.5	450 U	300	90 U	170	120	700	280	100	1700	1200	1600	660	800
RC/WC-09	WC-09-070516-G								130	36	73 J	47 J	450	150	45	930 J	1100	950	380	560
RC/WC-10	RC-10								44	19 U	22	19 U	67	26	19 U	160	91	74	36	44
RC/WC-10	RC-10								2000	310	**1000**	**640**	**3000**	**1900**	**720**	**9600**	**5300**	**6500**	**2500**	2600
RC/WC-10	Y2-RC10-S								26 U	26 U	26 U	26 U	65	14 J	26 U	79 J	160	130	62	94
RC/WC-10	Y3-RC10-S								44 J	67 U	67 U	67 U	310	60 J	67 U	410 J	720	660	280	450
RC/WC-10	RC-10								1800	410	**1600**	**870**	**3500**	**2200**	**690**	**11000**	**5500**	**4500**	**2400**	2500
RC/WC-10	WC-10			20 U					22	20 U	20 U	20 U	46	20	20 U	88	53	61	22	28
RC/WC-10	WC-10								270	67 U	240	130	570	340	110	1700	960	740	400	460
RC/WC-10	WC-10 (City)								274	90 U	201	115	507	268	125	1500	634	823	286	328
RC/WC-10	Y2-WC10-S	20 U	200 U	20 U	3.5 U	20 U	3.5 U	98 U	13 J	20 U	78	120	680	80	20 U	970 J	580	300	120	160
RC/WC-10	WC-10-070516-G	20 U	200 U	20 U	20 U	20 U	20 U	99 U	12 J	20 U	20 U	20 U	94	18 J	20 U	120 J	210	180	82	130
RC/WC-10	WCBU-10A			20 U					20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
RC/WC-10	WCBU-10A-Duplicate			20 U					20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
RC/WC-10	WCBU-10B			20 U					20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
RC/WC-10	Y2-WC10-C3	20 U	200 U	20 U	1 U	20 U	1 U	97 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
RC/WC-10	WCBU-10C			19 U					19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U
RC/WC-11/R-04	RC-11								110	39 U	42	39 U	130	56	39 U	340	200	150	78	100
RC/WC-11/R-04	RC-11(pre-City dredge)-CITY								210	99 U	99	99 U	430	180	99 U	920	680	1000	330	420
RC/WC-11/R-04	RC-11(pre-City dredge)-UTL								200 U	200 U	200 U	200 U	240	200 U		240	520	360	200 U	230
RC/WC-11/R-04	RC-11(post-City dredge)-CITY			**85**					**3700**	410	**3100**	**2300**	**17000**	**4400**	**2200**	**31000**	**4400**	**19000**	**5800**	**6300**
RC/WC-11/R-04	RC-11(post-City dredge)-UTL								**4500**	980	**5500**	**3200**	**15000**	**5800**		**35000**	**12000**	**11000**	**5200**	**5300**

Table F. Head of the Thea Foss Results 2004 - 2007

Location	Sample ID	2,4-Dimethylphenol 29 UG/KG	Benzoic Acid 650 UG/KG	1,2,4-Trichlorobenzene 51 UG/KG	Hexachlorobutadiene 11 UG/KG	N-Nitrosodiphenylamine 28 UG/KG	Hexachlorobenzene 22 UG/KG	Pentachlorophenol 360 UG/KG	Naphthalene 2100 UG/KG	Acenaphthylene 1300 UG/KG	Acenaphthene 500 UG/KG	Fluorene 540 UG/KG	Phenanthrene 1500 UG/KG	Anthracene 960 UG/KG	2-Methylnaphthalene 670 UG/KG	LPAH 5200 UG/KG	Fluoranthene 2500 UG/KG	Pyrene 3300 UG/KG	Benzo(a)anthracene 1600 UG/KG	Chrysene 2800 UG/KG
RC/WC-11/R-04	RC-11								1800	360	**1400**	**800**	**2900**	**1900**	**700**	**9900**	**5400**	**6700**	**2400**	2600
RC/WC-11/R-04	Y2-RC11-S								48 U	48 U	48 U	48 U	110	48 U	48 U	110	290	200	82	170
RC/WC-11/R-04	Y3-RC11-S								120	60 U	60	52 J	630	150	48 J	1000 J	1500	1400	610	1000
RC/WC-11/R-04	WC-11			39 U					41	39 U	39 U	39 U	53	39 U	39 U	94	110	73	41	52
RC/WC-11/R-04	WC-11(pre-City dredge)-CITY			5.85					115	45.3	106	58.2	330	146	55.3	800	452	490	163	195
RC/WC-11/R-04	WC-11(post-City dredge)-CITY			**78**					2000	220	**1500**	**970**	**6000**	**2200**	570	**13000**	**3800**	**9400**	**2100**	2400
RC/WC-11/R-04	WC-11 (Utilities' core)								500	160	**670**	360	**1500**	880	200	4300	1900	2000	860	910
RC/WC-11/R-04	WC-11 (City)								303	125	205	141	435	259	118	1600	876	947	357	471
RC/WC-11/R-04	WC-11								689	400	**608**	**710**	**2800**	**999**	**690**	**9200**	**5500**	**7500**	**2600**	**2800**
RC/WC-11/R-04	Y2-WC11-S	44 U	440 U	44 U	3.4 U	44 U	3.4 U	220 U	44 U	44 U	44 U	44 U	91	44 U	44 U	91	240	180	71	140
RC/WC-11/R-04	Y2-WC15-S	44 U	440 U	44 U	3.4 U	44 U	3.4 U	220 U	44 U	44 U	44 U	44 U	89	44 U	44 U	89	240	180	74	140
RC/WC-11/R-04	WC-11-070516-G	20 U	200 U	20 U	20 U	20 U	20 U	99 U	11 J	20 U	20 U	20 U	67	14 J	20 U	92 J	170	160	70	110
RC/WC-12	RC-12								20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	22	20 U	20 U	20 U
RC/WC-12	RC-12								**3000**	510	**2700**	**1400**	**6200**	**3600**	**1100**	**19000**	**8900**	**11000**	**3800**	**3500**
RC/WC-12	Y2-RC12-S								39	12 J	30	24	230	61	20 U	400 J	580	360	190	310
RC/WC-12	Y3-RC12-S								130	72 U	76	48 J	500	150	54 J	900 J	1100	980	420	620
RC/WC-12	RC-12								760	250 U	**1200**	**620**	**2600**	**1500**	320	**7000**	**3100**	3100	1500	1600
RC/WC-12	WC-12			19 U					19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U
RC/WC-12	WC-12(pre-City dredge)-CITY			4.98					59.2	17.6	34.4	18.4	93.8	41.2	18.2	280	145	174	60	70
RC/WC-12	WC-12								380	130	**630**	340	**1500**	820	170	4000	1700	1700	830	880
RC/WC-12	WC-12 (City)								297	100	306	199	712	401	137	2200	709	945	324	355
RC/WC-12	WC-12								638	128	**525**	308	1460	765	244	4100	1730	2060	919	845
RC/WC-12	Y2-WC12-S	20 U	200 U	20 U	3.4 U	20 U	3.4 U	98 U	12 J	20 U	20 U	20 U	90	19 J	20 U	120 J	230	160	75	120
RC/WC-12	WC-12-070517-G	20 U	200 U	20 U	20 U	20 U	20 U	99 U	26	20 U	30	16 J	190	43	12 J	320 J	320	280	130	200
RC/WC-12	Y2-WC12-C3	20 U	200 U	20 U	1 U	20 U	1 U	99 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	15 J	20 U	20 U
RC/WC-12	WCBU-12A			20 U					20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
RC-13	RC-13								38 U	38 U	38 U	38 U	260	43	38 U	300	870	510	240	410
RC-13	RC-13								58 U	58 U	58 U	58 U	200	58 U	58 U	200	440	340	160	250
RC-13	RC-13								73	28 U	32	33	460	88	28 U	690	1300	1200	380	590
RC-13	Y2-RC13-S								120 U	120 U	120 U	120 U	970	160	120 U	1100	**2600**	1600	820	1300
RC-13	Y3-RC13-S								130	120 U	130	180	**2800**	460	64 J	3700	**6200**	**5300**	**2400**	**3500**
RC-14	RC-14								77 U	77 U	77 U	77 U	570	88	77 U	660	1600	890	460	760
RC-14	RC-14								69 U	69 U	69 U	69 U	260	69 U	69 U	260	580	430	200	300
RC-14	RC-14								70	40 U	48	48	710	120	40 U	1000	2100	1900	580	880
RC-14	Y2-RC14-S								110 U	110 U	110 U	110 U	710	120	110 U	830	1800	1100	590	920
RC-14	Y3-RC14-S								74 J	120 U	86 J	110 J	**1600**	270	120 U	2100 J	**3400**	2600	1200	1800
RC-14B	RC-14B								86 U	86 U	86 U	86 U	380	86 U	86 U	380	1100	1000	320	520
RC-14B	Y2-RC14B-S								94 U	94 U	94 U	94 U	620	110	94 U	730	1800	1100	530	920
WC-13	WC-13			20 U					20 U	20 U	20 U	20 U	21	20 U	20 U	21	53	37	20 U	27
WC-13	Y2-WC13-S	69 U	690 U	69 U	3.5 U	69 U	3.5 U	350 U	210	69 U	150	110	590	210	69 U	1300	960	1200	510	630
WC-13	WC-13-070516-G								220	69 J	140	82	710	250	88 J	1500 J	1400	1400	590	960
WC-14	WC-14			19 U					19 U	19 U	19 U	19 U	20	19 U	19 U	20	38	28	19 U	19 U
WC-14	Y2-WC14-S	96 U	960 U	96 U	3.6 U	96 U	3.6 U	480 U	240	96 U	130	98	680	260	96 U	1400	1600	1700	690	880
WC-14	WC-14-070516-G								110	30 J	63 J	52 J	400	120	44	820 J	980	910	380	520
SC-01	SC-01			19 U					19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U
SC-01	Y2-SC01-S	20 U	200 U	20 U	1 U	20 U	1 U	98 U	20 U	20 U	20 U	20 U	30	20 U	20 U	30	63	59	26	38
SC-02	SC-02			19 U					19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U
SC-02	Y2-SC02-S	21 U	480	21 U	1 U	21 U	1 U	73 J	20 J	21 U	17 J	22	250	77	21 U	390 J	580	270	150	260
SC-03	SC-03			20 U					20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	43	30	20 U	23
SC-03	Y2-SC03-S	88 U	880 U	88 U	3.5 U	88 U	3.5 U	440 U	88 U	88 U	88 U	88 U	700	150	88 U	850	1800	1100	570	940
SC-04	SC-04			19 U					19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U
SC-04	Y2-SC04-S	79 U	790 U	79 U	3.5 U	79 U	3.5 U	400 U	65 J	79 U	53 J	79 U	380	100	79 U	600 J	750	610	290	450
City Area Locations																				
S-15	Site 15(pre-City dredge)-CITY								950	99 U	**700**	460	560	230	99	**5400**	710	960	380	440
S-15	Site 15(post-City dredge)-UTL								**11000**	**2000**	**14000**	**8000**	**35000**	**14000**		**84000**	**24000**	**22000**	**10000**	**10000**
S-15	Site 15(pre-City dredge)-UTL								780	210	**780**	460	580	360		**5600**	**3200**	690	400	480
S-15	Site 15(post-City dredge)-CITY			**78**					**8200**	820	**7700**	**9300**	**48000**	**9200**	**4400**	**62000**	**26000**	**45000**	**7500**	**8100**
S-15	S-15 (Utilities' core)								890	320	**2300**	**1300**	**5800**	**2300**	410	**13000**	**3700**	**4800**	**1900**	2100
S-15	S-15 (City)								2010	**1390**	**3690**	**2410**	**8980**	**4260**	**1040**	**24000**	**7390**	**10200**	**3200**	**3350**
S-15	S-15								**3000**	560	**4200**	**1700**	**7300**	**4100**	**1300**	**22000**	**10000**	**13000**	**4600**	**4700**
S-15	S-15A								1020	363	**1200**	**649**	**2510**	**1450**	470	**7700**	**2750**	**3400**	1510	1480

Table F. Head of the Thea Foss Results 2004 - 2007

Location	Sample ID	2,4-Dimethylphenol 29 UG/KG	Benzoic Acid 650 UG/KG	1,2,4-Trichlorobenzene 51 UG/KG	Hexachlorobutadiene 11 UG/KG	N-Nitrosodiphenylamine 28 UG/KG	Hexachlorobenzene 22 UG/KG	Pentachlorophenol 360 UG/KG	Naphthalene 2100 UG/KG	Acenaphthylene 1300 UG/KG	Acenaphthene 500 UG/KG	Fluorene 540 UG/KG	Phenanthrene 1500 UG/KG	Anthracene 960 UG/KG	2-Methylnaphthalene 670 UG/KG	LPAH 5200 UG/KG	Fluoranthene 2500 UG/KG	Pyrene 3300 UG/KG	Benzo(a)anthracene 1600 UG/KG	Chrysene 2800 UG/KG
S-15	Y2-S15-S	51 U	510 U	51 U	3.5 U	51 U	3.5 U	260 U	51 U	51 U	51 U	51 U	120	51 U	51 U	120	230	250	98 J (JIS)	160 J (JIS)
S-15	S-15-070516-G	20 U	200 U	20 U	20 U	20 U	20 U	98 U	15 J	20 U	20 U	20 U	87	20	20 U	120 J	200	160	73	120
S-15	S-15-070516-G-D	20 U	200 U	20 U	20 U	20 U	20 U	98 U	13 J	20 U	20 U	20 U	91	20 J	20 U	120 J	230	180	81	140
S-15A	S-15								1340	444	**1430**	**773**	**2990**	**1770**	599	**9300**	**3230**	**4140**	**1810**	1810
S-16	S-16								550	330	**560**	**700**	**2800**	800	500	**8900**	**4600**	**4500**	930	990
S-16	S-32 (Dup of S-16)								680	170	**770**	400	**1700**	**1100**	280	5100	**2700**	2600	1300	1400
S-16	S-16								236	86.2	164	101	518	298	97.6	1500	744	939	410	413
S-17	S-17								850	190	**650**	370	**1500**	**1100**	310	5000	**2900**	2600	1400	1500
S-17	S-17 (City)								270	83	178	130	376	194	89.1	1300	790	988	269	293
S-17	S-17								590	86 U	240	140	870	510	190	2500	2100	2700	900	980
S-17	Y2-S17-S	40 U	400 U	40 U	3.4 U	40 U	3.4 U	200 U	40 U	40 U	40 U	40 U	71	40 U	40 U	71	170	150	59	100
S-17	S-17-070516-G	20 U	200 U	20 U	20 U	20 U	20 U	100 U	22	20 U	11 J	20 U	100	26	20 U	160 J	220	210	95	150
S-18	S-18								300	120 U	240	150	760	440	120 U	1900	1800	1400	680	820
S-18	S-18 (City)								122	34.8 J	62.1	52.6	202 J	123	45.3	640	659	323	176	199
S-19	S-19								660	340	**760**	**980**	**3900**	**2400**	640	4900	**5800**	**5700**	**2600**	2600
S-19	S-19								405	112	296	162	812	474	141	2400	1030	1280	553	553
S-19	Y2-S19-S	48 U	480 U	48 U	3.5 U	48 U	3.5 U	240 U	54	48 U	48 U	48 U	160	59	48 U	270	350	290	140	200
S-19	S-19-070516-G	20 U	200 U	20 U	20 U	20 U	20 U	100 U	19 J	20 U	15 J	12 J	82	23	20 U	150 J	130	150	64	88
S-20	S-20								420	110	320	210	940	600	160	2800	1700	1600	800	870
S-20	S-20 (City)								521	235	**572**	344	1380	620	286	4000	1530	2070	687	730
S-20	S-20								306	132	297	159	903	490	120	2400	1330	1500	665	702
S-21	S-21								1400	530	**3100**	**1600**	**6700**	**3400**	**740**	**17000**	**5900**	**5400**	**2800**	**3100**
S-21	S-33 (Dup of S-21)								1900	660	**4000**	**2100**	**8600**	**4300**	**900**	**22000**	**8000**	**7200**	**3700**	**3900**
S-21	S-21 (City)								1070	816	**1840**	**1330**	**4400**	**1960**	**719**	**12000**	**3530**	**4760**	**1760**	1860
S-22	S-22								1000	280	**1200**	**620**	**2400**	**1600**	410	**7500**	**3800**	3200	**1700**	1800
S-22	S-22 (City)								610	150	469	362	1190	717	243	3700	1390	1760	762	872
S-23	S-23								500	190	**650**	350	**1600**	940	220	4500	2400	2100	1100	1300
S-24	S-24								**2600**	170	**1000**	420	**1600**	860	**730**	**7400**	2400	1900	1100	1200
S-24	S-24 (City)								199	48.2	127	82.5	326	181	72.2	1000	522	645	212	314
S-24	S-24								390	72	190	130	680	390	140	2000	1400	1600	600	730
S-24	Y2-S24-S	39 U	390 U	39 U	3.4 U	39 U	3.4 U	200 U	39 U	39 U	39 U	39 U	100	24 J	39 U	120 J	230	200	80	120
S-24	S-24-070516-G	20 U	200 U	20 U	20 U	20 U	20 U	100 U	22	20 U	11 J	11 J	150	30	20 U	220 J	350	300	140	210
S-29	S-29 (City)								844	182	**515 J**	384	1260	757	328	4300	1620	2070 J	908	1070
S-29	S-29								324	100	237	131	662	359	120	1900	931	1070	460	484
S-30	S-30								157	37.9	63.9	48.6	233	167	47.1	750	490	565	289	216
CA-19B	CA-19B-03								365	97.7	406	207	934	540	132	2700	900	1090	449	434
CA-19B	CA-19B-06								486	180	**759**	436	**1760**	912	227	4800	1550	1850	838	809
CA-20	CA-20-01								78.9	21.2 J	58.8	32	130	73.3	22.1 J	420	190	212	108	117
CA-20	CA-20-04								87.4	15.9 J	56.9	38.6	146	70.5	23.7	440	191	198	89	93.6
CA-22	CA-22-02								**2560**	469	**2960**	**1680**	**6720**	**2560**	**839**	**18000**	**4090**	**5680**	**2290**	2170
CA-22	CA-22-05								99.9	25.5	77.9	38.5	174	107	35.9	560	257	255	125	127
Reference Locations																				
CI-1	Y2-CI-01																			
CI-2	Y2-CI-02																			
Rinsate Blanks		**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**
FIELDQC	Y2-RB-01	1 U	10 U	1 U	0.05 U	1 U	0.05 U	5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
FIELDQC	Y2-RB-02	1 U	10 U	1 U	0.05 U	1 U	0.05 U	5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
FIELDQC	Y2-RB-03	1 U	10 U	1 U	0.05 U	1 U	0.05 U	5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
FIELDQC	Y3-RB-01								1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
FIELDQC	WC-05-RB	1 U	10 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U		1 U	1 U	1 U	1 U

Table F. Head of the Thea Foss Results 2004 - 2007

Location	Sample ID	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(b+k)fluoranthenes	Benzo(a)pyrene	Indeno(1,2,3-cd)pyrene	Dibenz(a,h)anthracene	Benzo(g,h,i)perylene	HPAH	Dimethylphthalate	Diethylphthalate	Di-n-Butylphthalate	Butylbenzylphthalate	bis(2-Ethylhexyl)phthalate	Di-n-Octylphthalate	4,4'-DDD	4,4'-DDE	4,4'-DDT	Aroclor 1016	Aroclor 1221
				3600	**1600**	**690**	**230**	**720**	**17000**	**160**	**200**	**1400**	**900**	**1300**	**6200**	**16**	**9**	**34**		
		UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG
RC/WC-01	RC-01	320	220	540	170	90	39 U	87	2700	39 U	39 U	48	91	**1300**	45	0.44	0.38 U	2.3 U	3.8 U	7.6 U
RC/WC-01	RC-01	280	280	560	320	230	57 U	180	3200	57 U	57 U	57 U	120	**1300 B**	57 U	2 U	2 U	2 U	20 U	20 U
RC/WC-01	RC-01	2400	2000	**4400**	**1600**	540	220 U	530	**19000**	220 U	220 U	410	520	**8200**	330	4.4 J	9.4 U	15 J	20 U	20 U
RC/WC-01	Y2-RC01-S	1600	1700	3300	1400	410	160 U	480	15000					**8300**					9.9 U	9.9 U
RC/WC-01	Y3-RC01-S	1500	1500	3000	960	380	93 J	410	12000 J					**14000**					9.9 U	9.9 U
RC/WC-01	WC-01	120	85	210	79	53	39 U	50	1200	39 U	39 U	39 U	39 U	550	41	0.39 U	0.39 U	0.39 U	3.9 U	7.8 U
RC/WC-01	WC-01	220	220	440	240	160	59 U	130	2300	59 U	59 U	59 U	70	810 B	59 U	2 U	2 U	2 U	20 U	20 U
RC/WC-01	Y2-WC01-S	1200	660	1900	690	260	190 U	330	8400	190 U	190 U	160 J	180 J	**4300**	420	7 U	7 U	7 U	9.9 U	9.9 U
RC/WC-01	WC-01-070516-G	710	850	1600	580	220	53 J	210	6500 J	77 U	77 U	77 U	180	**2300**	72 J					
WC-01B/R-01B	Y2-WC01B-C3	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20	20 U	2 U	2 U	2 U	9.7 U	9.7 U
RC/WC-02	RC-02	100	79	180	64	27	20 U	24	1000	20 U	20 U	20 U	29	470	120	0.68	0.39 U	1.3 U	3.9 U	7.8 U
RC/WC-02	RC-02	1700	1700	3400	**1600**	600	190	600	**17000**	67 U	67 U	320	540	**7300**	230	9.1 U	4.5 J	18 U	20 U	20 U
RC/WC-02	RC-2A (Dup of RC-2)	2300	1900	**4200**	**1900**	660	230 U	640	**21000**	230 U	230 U	470	580	**13000**	320	10 J	15 U	27 J	59 U	59 U
RC/WC-02	Y2-RC02-S	2700	2300	**5000**	**2100**	620	100 J	**790**	**22000 J**					**8700**					9.8 U	9.8 U
RC/WC-02	Y3-RC02-S	3300	3600	**6900**	**2300**	**870**	**390**	**900**	**26000**					**9500**					9.8 U	9.8 U
RC/WC-02	RC-02	670	670	1300	680	340	120 U	280	6600	120 U	120 U	120 U	270	**2700 B**	120 U	2.4	1.9 U	3.7 U	19 U	19 U
RC/WC-02	WC-02	74	62	140	50	39 U	39 U	39 U	720	39 U	39 U	39 U	39 U	330	39 U	0.64	0.39 U	1.1 U	3.9 U	7.8 U
RC/WC-02	WC-02 (City)			340	194	106	39.3	130	2500	3.7 J	6.7 J	58.5 J	4	371 J	54	5.5	3.47 J	12.5	5.3 U	5.3 U
RC/WC-02	WC-02	710	710	1400	670	250	89	240	7300	29 U	29 U	130	200	**2700**	70	5.1 J	2 U	5 U	20 U	20 U
RC/WC-02	Y2-WC02-S	2200	1800	**4000**	**1600**	480	81 J	620	**17000 J**	120 U	120 U	170 J (JB)	380	**7700**	190	7 U	7 U	12 U	9.8 U	9.8 U
RC/WC-02	WC-02-070516-G	2900	2000	**4900**	**1700**	600	**230**	570	**20000**	160 U	160 U	160 U	350	**4900**	260					
RC/WC-03	RC-03	190	210	400	140	56	20 U	53	2300	20 U	20 U	19 J	62	1100	58	0.78	1.1 U	1.4 U	3.9 U	7.9 U
RC/WC-03	RC-03	830	830	1700	810	240	83	240	8600	44 U	44 U	150	240	**3200**	130	7.3 J	8.4 U	18 U	20 U	20 U
RC/WC-03	Y2-RC03-S	1100	1000	2100	970	410	120 U	520	10000					**5100**					9.8 U	9.8 U
RC/WC-03	Y3-RC03-S	920	960	1900	620	260	61 J	270	7100 J					**2600**					9.7 U	9.7 U
RC/WC-03	WC-03	58	42	100	40 U	40 U	40 U	40 U	540	40 U	40 U	40 U	40 U	240	40 U	0.68	0.4 U	1.1 U	4 U	7.9 U
RC/WC-03	WC-03 (City)			240	125	89.4	34.9	92.9	1600	4.5 UJ	8.2 UJ	35.7 B	4.9 U	275 B	4.2 U	3.74 J	3.72 J	12.2	5.6 U	5.6 U
RC/WC-03	Y2-WC03-S	530	480	1000	480	250	73 U	320	5200	73 U	73 U	200 J (JB)	130	**2300**	100	7 U	7 U	7 U	10 U	10 U
RC/WC-03	WC-03-070516-G	540	600	1100	410	160	39 J	150	4400 J	69 U	69 U	50 J	94	**1800**	67 J					
RC/WC-03	RC-03	250	250	500	260	120	99 U	99 U	2500	99 U	99 U	99 U	99 U	940 B	99 U	2 U	2 U	2 U	20 U	20 U
RC/WC-04/R-02	RC-04	76	74	150	56	23	19 U	21	870	19 U	19 U	19 U	27	360	19 U	0.75	0.39 U	1.3 U	3.9 U	7.7 U
RC/WC-04/R-02	RC-04	1900	1900	**3800**	**1900**	550	200	580	**20000**	72 U	72 U	250	520	**6700**	250	5.8	8.1 U	11	20 U	20 U
RC/WC-04/R-02	Y2-RC04-S	1600	920	2500	1100	670	320 U	**910**	13000					**5900**					10 U	10 U
RC/WC-04/R-02	Y3-RC04-S	1300	1500	2800	1000	410	82 J	420	11000 J					**5100**					9.9 U	9.9 U
RC/WC-04/R-02	RC-04	600	600	1200	610	260	120 U	220	5900	120 U	120 U	120 U	180	**1800 B**	120 U	1.4 J	2 U	2 U	20 U	20 U
RC/WC-04/R-02	WC-04	54	66	120	47	20 U	20 U	20 U	690	20 U	20 U	20 U	20 U	260	20 U	0.77	0.39 U	0.93 U	3.9 U	7.8 U
RC/WC-04/R-02	WC-04-Duplicate	70	66	140	55	20 U	20 U	20 U	800	20 U	20 U	20 U	20 U	290	25	0.89	0.4 U	1.1 U	4 U	8 U
RC/WC-04/R-02	S-34 (Dup of WC-04)	450	450	900	440	200	98 U	160	4400	98 U	98 U	98 U	140	**1300 B**	98 U	1.5 J	2 U	2 U	20 U	20 U
RC/WC-04/R-02	WC-04	400	400	800	400	170	140 U	140	3800	140 U	140 U	140 U	140 U	1000 B	140 U	2.1	2 U	20	20 U	20 U
RC/WC-04/R-02	WC-04	580	510	1100	490	150	50	140	5300	36 U	36 U	92	160	**1700**	70	5.7 U	2 U	11 J	20 U	20 U
RC/WC-04/R-02	Y2-WC04-S	1400	640	2000	860	300	63 J	350	9800 J	100 U	100 U	290	200	**4600**	180	7 U	7 U	7 U	9.8 U	9.8 U
RC/WC-04/R-02	WC-04-070517-G	730	690	1400	510	190	40 J	200	5300 J	66 U	66 U	66 U	200	**2300**	53 J					
RC/WC-04/R-02	WCBU-4A	22	19 J	41 J	20	19 U	19 U	19 U	190	19 U	19 U	19 U	23	73	19 U	0.38 U	0.38 U	0.38 U	3.8 U	7.6 U
RC/WC-04/R-02	WCBU-4B	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	0.39 U	0.39 U	0.39 U	3.9 U	7.8 U
RC/WC-04/R-02	WCBU-4C	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	0.39 U	0.39 U	0.39 U	3.9 U	7.8 U
RC/WC-04/R-02	Y2-WC04-C3	38	19 J	57 J	26	16 J	20 U	22	310 J	20 U	20 U	14 J	20 U	120	20 U	2 U	2 U	2 U	9.8 U	9.8 U
RC/WC-05	RC-05	23	19 J	42	20	20 U	20 U	20 U	260	20 U	20 U	20 U	20 U	110	20 U	0.66	0.39 U	0.39 U	3.9 U	7.8 U
RC/WC-05	RC-05-Duplicate	20	18 J	38	20 J	20 U	20 U	20 U	240	20 U	20 U	20 U	20 U	100	20 U	0.39 U	0.39 U	0.39 U	3.9 U	7.9 U
RC/WC-05	RC-05	1800	1800	**3600**	**1900**	490	180	510	**20000**	75 U	75 U	220	480	**5600**	240	12 J	10 U	19 J	20 U	20 U
RC/WC-05	Y2-RC05-S	820	1100	1900	840	240	150 U	280	8400					**5400**					9.8 U	9.8 U
RC/WC-05	Y3-RC05-S	1100	870	2000	740	400	83 J	390	8500 J					**4000**					9.7 U	9.7 U
RC/WC-05	WC-05	21	20	41	20 U	20 U	20 U	20 U	220	20 U	20 U	20 U	20 U	76	20 U	0.39 U	0.39 U	0.5 U	3.9 U	7.8 U
RC/WC-05	WC-05	350	350	700	490	340	120 U	290	4800	120 U	120 U	120 U	230	**1300 B**	120 U	2.4	2 U	2 U	20 U	20 U
RC/WC-05	WC-05	640	640	1300	650	180	56	170	6900	41 U	41 U	92	170	**2200**	92	6.7 U	8.8 U	12	20 U	20 U
RC/WC-05	Y2-WC05-S	1200	760	2000	810	230	99 U	280	11000	99 U	99 U	240 J (JB)	160 J (JIS)	**3600**	150 J (JIS)	7 U	7 U	7 U	9.8 U	9.8 U
RC/WC-05	WC-05-070516-G	1200	1100	2300	850	530	110 J	600	9600 J	92 U	92 U	66 J	210	**4000**	130					
RC/WC-05	RC-05	200	200	400	280	190	110 U	150	2600	110 U	110 U	110 U	120	940 B	110 U	2 U	2 U	2 U	20 U	20 U
RC/WC-05	WCBU-5A	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	46	19 U	0.39 U	0.39 U	0.39 U	3.9 U	7.8 U
RC/WC-05	Y2-WC05-C3	19 J	20 U	19 J	11 J	20 U	20 U	10 J	130 J	20 U	20 U	11 J	20 U	63	20 U	2 U	2 U	2 U	9.6 U	9.6 U
RC/WC-06	RC-06	91	69	160	68	44	39 U	43	1100	39 U	39 U	39 U	38 J	500	38 J	0.65	0.39 U	1.7 U	3.9 U	7.9 U
RC/WC-06	RC-06	1300	1300	2600	1300	340	120	350	14000	67 U	67 U	210	350	**4400**	150	8 J	7.3 U	12 J	20 U	20 U

Table F. Head of the Thea Foss Results 2004 - 2007

Location	Sample ID	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(b+k)fluoranthenes	Benzo(a)pyrene	Indeno(1,2,3-cd)pyrene	Dibenz(a,h)anthracene	Benzo(g,h,i)perylene	HPAH	Dimethylphthalate	Diethylphthalate	Di-n-Butyl phthalate	Butylbenzylphthalate	bis(2-Ethylhexyl) phthalate	Di-n-Octyl phthalate	4,4'-DDD	4,4'-DDE	4,4'-DDT	Aroclor 1016	Aroclor 1221
				3600	**1600**	**690**	**230**	**720**	**17000**	**160**	**200**	**1400**	**900**	**1300**	**6200**	**16**	**9**	**34**		
		UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG
RC/WC-06	Y2-RC06-S	750	780	1500	660	220	87 U	280	6800					**3900**					9.8 U	9.8 U
RC/WC-06	Y2-RC15-S	900	590	1500	640	210	86 U	240	6500					**3800**					9.9 U	9.9 U
RC/WC-06	Y3-RC06-S	1400	1700	3100	990	440	84 J	460	12000 J					**5600**					9.8 U	9.8 U
RC/WC-06	RC-06	510	510	1000	610	260	130 U	220	5400	130 U	130 U	130 U	190	**1700 B**	130 U	2.9	1.9 U	1.9 U	19 U	19 U
RC/WC-06	WC-06	28	32	60	27	18 J	20 U	18 J	350	20 U	20 U	20 U	20 U	160	20 U	0.4 U	0.4 U	0.55 U	4 U	8 U
RC/WC-06	Y2-WC06-S	400	280	680	310	150	60 U	200	3300	60 U	60 U	210 J (JB)	110	**1600**	60 U	7 U	7 U	7 U	9.8 U	9.8 U
RC/WC-06	WC-06-070517-G	920	800	1700	590	210	85 U	220	6500	85 U	85 U	85 U	160	**2800**	93					
RC/WC-06	WCBU-6A	20 U	20 U	20 U	20 U	20 U	20 U	20 U	71	20 U	20 U	20 U	20 U	92	20 U	0.4 U	0.4 U	0.4 U	4 U	8 U
RC/WC-06	WCBU-6B	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	63	20 U	0.4 U	0.4 U	0.4 U	4 U	8 U
RC/WC-06	Y2-WC06-C3	20 U	20 U	20 U	20 U	20 U	20 U	20 U	54 J	20 U	20 U	10 J	20 U	29	20 U	2 U	2 U	2 U	9.7 U	9.7 U
RC/WC-07	RC-07	25	27	52	20	19 U	19 U	19 U	270	19 U	19 U	19 U	19 U	180	19	0.38 U	0.38 U	0.38 U	3.8 U	7.6 U
RC/WC-07	RC-07	840	810	1700	880	290	88 J	300	9800	42 U	42 U	200	270	**4400**	120	4.8 J	5.8 U	7.4 U	19 U	19 U
RC/WC-07	Y2-RC07-S	890	890	1800	780	450	120 U	610	9400					**5400**					9.9 U	9.9 U
RC/WC-07	Y3-RC07-S	980	990	2000	770	380	77 J	400	8300 J					**3700**					9.9 U	9.9 U
RC/WC-07	RC-07	1300	1300	2600	**1600**	650	180 U	550	14000	180 U	180 U	180 U	420	**4500 B**	180 U	3	2 U	2 U	20 U	20 U
RC/WC-07	WC-07	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	0.39 U	0.39 U	0.39 U	3.9 U	7.8 U
RC/WC-07	WC-07	200	200	400	240	120	62 U	99	2200	62 U	62 U	62 U	100	**3800 B**	62 U	1.7 J	1.9 U	1.9 U	19 U	19 U
RC/WC-07	WC-07	220	280	500	210	52	25 U	51	2600	25 U	25 U	62	150	730	30	2 U	2 U	5 U	20 U	20 U
RC/WC-07	WC-7			250	139	90.7	19.2 J	97.2	1400					557		0.56 J	1.87 J		6.5 U	6.5 U
RC/WC-07	Y2-WC07-S	500	320	820	370	110	83 U	130	3800	83 U	83 U	45 J	120	**1800**	53 J	7 U	7 U	7 U	9.8 U	9.8 U
RC/WC-07	WC-07-070516-G	1000	1200	2100	760	460	90 J	490	8700 J	84 U	84 U	72 J	240	**3600**	130					
RC/WC-08/R-03	RC-08	20	19 J	39	19	19 U	19 U	19 U	210	19 U	19 U	19 U	19 U	110	19 U	0.39 U	0.39 U	0.39 U	3.9 U	7.7 U
RC/WC-08/R-03	RC-08	1700	1000	2700	**1700**	530	170	510	**17000**	120 U	120 U	160	370	**3500**	130	11 J	9 U	14 U	20 U	20 U
RC/WC-08/R-03	Y2-RC08-S	1600	1000	2600	1100	330	130	410	11000					**5400**					9.8 U	9.8 U
RC/WC-08/R-03	Y3-RC08-S	1400	1100	2500	1000	600	**270**	650	11000					**4300**					9.9 U	9.9 U
RC/WC-08/R-03	Y3-RC15-S	1700	1400	3100	1100	420	93 J	440	12000 J					**5100**					9.8 U	9.8 U
RC/WC-08/R-03	RC-08	1300	1300	2600	1500	600	150 U	500	14000	150 U	150 U	150 U	400	**3100 B**	150 U	3.5	2 U	2 U	19 U	19 U
RC/WC-08/R-03	WC-08	19 U	19 U	19 U	19 U	19 U	19 U	19 U	26	19 U	19 U	19 U	19 U	49	19 U	0.38 U	0.38 U	0.38 U	3.8 U	7.6 U
RC/WC-08/R-03	WC-8			300	237	115	34.1	129	2500					220		5.68	4.28		39.4 U	39.4 U
RC/WC-08/R-03	Y2-WC08-S	1000	790	1800	850	230	94 U	280	8000	94 U	94 U	94 U	170	**3400**	130	7 U	7 U	7 U	9.8 U	9.8 U
RC/WC-08/R-03	WC-08-070516-G	770	790	1600	600	260	86	280	6000	27 U	27 U	41	150	**2000**	54 J					
RC/WC-09	RC-09	44	47	91	45	38 U	38 U	38 U	580	38 U	38 U	38 U	38 U	230	38 U	0.88	0.38 U	1.7 U	3.8 U	7.6 U
RC/WC-09	RC-09	2600	2600	**5200**	**1800**	600	190	600	**20000**	**350**	120 U	180	360	**3500**	170	14 J	11 U	18 U	20 U	20 U
RC/WC-09	Y2-RC09-S	1600	940	2500	1200	270	110 U	320	11000					**4700**					9.8 U	9.8 U
RC/WC-09	Y3-RC09-S	1200	1600	2800	950	410	100 J	410	11000 J					**6200**					9.8 U	9.8 U
RC/WC-09	RC-09	980	980	2000	1100	480	120 U	390	10000	120 U	120 U	120 U	290	**2600 B**	120 U	3.9	1.9 U	1.9 U	19 U	19 U
RC/WC-09	WC-09	34	20 U	34	21	20 U	20 U	20 U	260	20 U	20 U	20 U	20 U	120	20 U	0.39 U	0.39 U	0.39 U	3.9 U	7.9 U
RC/WC-09	WC-09	380	380	760	410	180	89 U	140	4000	89 U	89 U	89 U	130	900 B	89 U	2 U	2 U	2 U	20 U	20 U
RC/WC-09	WC-9			520	386	198	51.8 J	206	3700					289		1.12 J	1.7 J		37.9 U	37.9 U
RC/WC-09	Y2-WC09-S	840	760	1600	800	200	90 U	250	7100	90 U	90 U	340 J (JB)	210 J (JIS)	**4700**	120 J (JIS)	7 U	7 U	7 U	9.7 U	9.7 U
RC/WC-09	WC-09-070516-G	550	800	1400	500	230	48	240	5300	16 J	26 U	78	120	**2200**	74 J					
RC/WC-10	RC-10	28	29	57	33	19 U	19 U	19 U	390	19 U	19 U	19 U	19 U	80	19 U	0.55	0.39 U	0.39 U	3.9 U	7.8 U
RC/WC-10	RC-10	2300	1800	**4100**	**2800**	670	**240**	620	**25000**	150 U	150 U	250	390	**3600**	150 U	**17 J**	12 U	20 U	20 U	20 U
RC/WC-10	Y2-RC10-S	97	56	150	59	45	26 U	61	760					420					9.9 U	9.9 U
RC/WC-10	Y3-RC10-S	550	460	1000	340	160	35 J	170	3800 J					**1600**					9.8 U	9.8 U
RC/WC-10	RC-10	2000	2000	**4000**	**2700**	**930**	220	660	**23000**	180 U	180 U	470 B	360	**2800 B**	180 U	7	2 U	2 U	20 U	20 U
RC/WC-10	WC-10	20 U	20 U	20 U	22	20 U	20 U	20 U	190	20 U	20 U	20 U	20 U	63	20 U	0.4 U	0.4 U	0.4 U	4 U	7.9 U
RC/WC-10	WC-10	350	350	700	450	150	67 U	120	4000	67 U	67 U	67 U	67 U	620 B	67 U	1.3 J	2 U	2 U	20 U	20 U
RC/WC-10	WC-10 (City)			440 U	312	144	86.7	168	2800	25.5 U	47 UJ	50.5 UJ	27.9 U	464	24 U	1.98 J	1.66 J	5.91	3.7 U	3.7 U
RC/WC-10	Y2-WC10-S	110	130	240	88	29	20 U	36	1600	20 U	20 U	18 J	26	460	30	7 U	7 U	7 U	9.9 U	9.9 U
RC/WC-10	WC-10-070516-G	100	160	260	98	72	24	80	1100	20 U	20 U	20 U	24	410	12 J	2 U	2 U	2 U	9.9 U	9.9 U
RC/WC-10	WCBU-10A	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	69	20 U	0.39 U	0.39 U	0.39 U	3.9 U	7.8 U
RC/WC-10	WCBU-10A-Duplicate	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	21	20 U	20 U	75	20 U	0.39 U	0.39 U	0.39 U	3.9 U	7.8 U
RC/WC-10	WCBU-10B	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	0.4 U	0.4 U	0.4 U	4 U	7.9 U
RC/WC-10	Y2-WC10-C3	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	38	20 U	2 U	2 U	2 U	9.8 U	9.8 U
RC/WC-10	WCBU-10C	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	37	19 U	0.39 U	0.39 U	0.39 U	3.9 U	7.7 U
RC/WC-11/R-04	RC-11	74	66	140	73	39 U	39 U	39 U	880	39 U	39 U	39 U	39 U	280	39 U	1.7	1.6 U	2.4 U	3.9 U	7.9 U
RC/WC-11/R-04	RC-11(pre-City dredge)-CITY			700	350	220	99 U	280	4000	19	99 U	99 U	220	**1600**	140	2.4 U	2.4 U	3.6	13 U	13 U
RC/WC-11/R-04	RC-11(pre-City dredge)-UTL	200 U	200 U	200 U	220	200 U	200 U	200 U	1300	200 U	200 U	200 U	200 U	940	200 U	3.2 U	3.2 U	3.2 U	32 U	32 U
RC/WC-11/R-04	RC-11(post-City dredge)-CITY			**8100**	**5500**	**2500**	**950**	**2900**	**55000**	79 U	79 U	190	**1200**	**12000**	1800	**20.9**	**11.3**	18.6	19 U	19 U
RC/WC-11/R-04	RC-11(post-City dredge)-UTL	3600	3600	**7200**	**5100**	**1800**	**550**	**1500**	**50000**	470 U	470 U	470 U	820	**6400**	470 U	**29**	10 U	21 U	33 U	33 U

Table F. Head of the Thea Foss Results 2004 - 2007

Location	Sample ID	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(b+k)fluoranthenes	Benzo(a)pyrene	Indeno(1,2,3-cd)pyrene	Dibenz(a,h)anthracene	Benzo(g,h,i)perylene	HPAH	Dimethylphthalate	Diethylphthalate	Di-n-Butyl phthalate	Butylbenzylphthalate	bis(2-Ethylhexyl) phthalate	Di-n-Octyl phthalate	4,4'-DDD	4,4'-DDE	4,4'-DDT	Aroclor 1016	Aroclor 1221
				3600	1600	690	230	720	17000	160	200	1400	900	1300	6200	16	9	34		
		UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG
RC/WC-11/R-04	RC-11	1900	1900	**3800**	**2600**	**700**	**240**	650	**25000**	37 U	37 U	110	480	**3500**	99	**27 J**	18 U	33 U	20 U	20 U
RC/WC-11/R-04	Y2-RC11-S	140	120	260	99	49	48 U	61	1200					1100					9.8 U	9.8 U
RC/WC-11/R-04	Y3-RC11-S	1300	980	2300	750	350	79	380	8300					**6100**					9.9 U	9.9 U
RC/WC-11/R-04	WC-11	39 U	44	44	41	39 U	39 U	39 U	410	39 U	39 U	39 U	39 U	220	39 U	0.54	0.38 U	0.96 U	3.8 U	7.6 U
RC/WC-11/R-04	WC-11(pre-City dredge)-CITY			280	170	115	54.6	130	2000	13.5 U	24.9 U	12.5 U	14.8 U	447 B	12.7 U	0.859	0.286 U	0.336 U	4.18 U	4.18 U
RC/WC-11/R-04	WC-11(post-City dredge)-CITY			**3900**	**2600**	**1300**	**340**	**1500**	**27000**	78 U	78 U	120	**940**	**4300**	1500	14.7	8.4	13.8	17 U	17 U
RC/WC-11/R-04	WC-11 (Utilities' core)	720	720	1400	990	390	90	290	8900	26 U	26 U	27	210	**1500**	26 U	6.5	1.9 U	1.9 U	19 U	19 U
RC/WC-11/R-04	WC-11 (City)			520	379	179	69	211	4000	32 U	59.1 UJ	56.3 UJ	186 J	675	88.6 J	13.3	**11**	16	4.9 U	4.9 U
RC/WC-11/R-04	WC-11	2000	2000	**4000**	**2800**	**760**	79.8	**803**	**27000**	38 U	38 U	160	520	**3500**	80	**19 J**	**19.3**	23 U	20 U	20 U
RC/WC-11/R-04	Y2-WC11-S	120	120	240	86	42 J	44 U	48	1000 J	44 U	44 U	44 U	51	960	84	7 U	7 U	7 U	9.7 U	9.7 U
RC/WC-11/R-04	Y2-WC15-S	160	86	250	90	41 J	44 U	51	1100 J	44 U	44 U	63 J (JB)	41 J	990	86	7 U	7 U	7 U	10 U	10 U
RC/WC-11/R-04	WC-11-070516-G	78	150	230	82	54	12 J	64	950 J	20 U	20 U	20 U	29	640	30	1.9 U	1.9 U	1.9 U	9.7 U	9.7 U
RC/WC-12	RC-12	20 U	20 U	20 U	20 U	20 U	20 U	20 U	22	20 U	20 U	20 U	20 U	60	20 U	0.39 U	0.39 U	0.39 U	3.9 U	7.9 U
RC/WC-12	RC-12	2400	3500	**5900**	**4200**	**1000**	**360**	**990**	**40000**	49 U	49 U	180	500	**3800**	63	**21 J**	14 U	21 J	20 U	20 U
RC/WC-12	Y2-RC12-S	300	230	530	210	82	14 J	100	2400 J					**1300**					9.8 U	9.8 U
RC/WC-12	Y3-RC12-S	820	560	1400	510	190	48 J	190	5400 J					**2200**					9.8 U	9.8 U
RC/WC-12	RC-12	1200	830	2000	**1600**	**890**	250 U	**750**	15000	250 U	250 U	250 U	300	**1800 B**	250 U	15	1.9 U	13 U	19 U	19 U
RC/WC-12	WC-12	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	0.38 U	0.38 U	0.38 U	3.8 U	7.7 U
RC/WC-12	WC-12(pre-City dredge)-CITY			110	59.6	41.5	24.2	48.6	730	11.5 U	21.2 U	18.3	12.6 U	171 B	10.8 U	0.237 U	0.232 U	0.273 U	3.41 U	3.41 U
RC/WC-12	WC-12	490	490	980	880	590	110	460	8100	100 U	100 U	100 U	180	880 B	100 U	5.7	2 U	2 U	20 U	20 U
RC/WC-12	WC-12 (City)			430	316	146	73.6	179	3500	150 U	150 UJ	150 B	299 U	309	299 U	2.86	6.1	8.1	4.4 U	4.4 U
RC/WC-12	WC-12			1100	1000	405	56.9	520	8600					823		3.2	8.5		11 U	11 U
RC/WC-12	Y2-WC12-S	120	88	210	84	45	20 U	60	980	20 U	20 U	23	28	590	32	7 U	7 U	7 U	9.7 U	9.7 U
RC/WC-12	WC-12-070517-G	170	230	400	160	88	18 J	90	1700 J	20 U	20 U	13 J	33	640	21	2 U	2 U	2 U	9.9 U	9.9 U
RC/WC-12	Y2-WC12-C3	20 U	20 U	20 U	20 U	20 U	20 U	20 U	15 J	20 U	20 U	20 U	20 U	20 J	20 U	2 U	2 U	2 U	9.7 U	9.7 U
RC/WC-12	WCBU-12A	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	49	20 U	0.4 U	0.4 U	0.4 U	4 U	7.9 U
RC-13	RC-13	500	330	830	260	120	38 U	110	4200	38 U	38 U	57	130	**1400**	98	1.1	3.4 U	3.7 U	3.9 U	7.8 U
RC-13	RC-13	210	210	420	210	120	58 U	97	2000	58 U	58 U	58 U	85	830 B	58 U	2 U	2 U	2 U	20 U	20 U
RC-13	RC-13	800	570	1400	510	180	60	170	5800	28 U	28 U	120	170	**2100**	81	2 U	2 U	12 U	20 U	20 U
RC-13	Y2-RC13-S	1700	820	2500	960	280	120 U	340	10000					**3700**					9.9 U	9.9 U
RC-13	Y3-RC13-S	3400	4400	**7800**	**2700**	**1200**	**240**	**1100**	**30000**					**7300**					9.8 U	9.8 U
RC-14	RC-14	740	640	1400	480	210	77 U	200	7400	77 U	77 U	77 U	180	**3000**	150	1.7	3.1 U	4.9 U	3.9 U	7.7 U
RC-14	RC-14	250	250	500	240	130	69 U	100	2500	69 U	69 U	69 U	85	790 B	69 U	1.9 U	1.9 U	3.2	19 U	19 U
RC-14	RC-14	930	930	1900	760	260	86	260	8700	40 U	40 U	320	190	**3600**	93	5.2 J	7.2 U	11 J	20 U	20 U
RC-14	Y2-RC14-S	860	820	1700	650	210	110 U	260	7200					**3600**					9.9 U	9.9 U
RC-14	Y3-RC14-S	2000	2100	**4100**	1400	560	130	540	16000					**4200**					10 U	10 U
RC-14B	RC-14B	580	550	1100	430	150	86 U	140	4800	86 U	86 U	100	140	**1900**	86 U	2 U	2 U	5 U	20 U	20 U
RC-14B	Y2-RC14B-S	1100	620	1700	680	210	94 U	250	7200					**3800**					9.8 U	9.8 U
WC-13	WC-13	20 U	21	21	20 U	20 U	20 U	20 U	160	20 U	20 U	20 U	20 U	100	20 U	0.39 U	0.39 U	0.39 U	3.9 U	7.8 U
WC-13	Y2-WC13-S	570	670	1200	610	140	69 U	180	5500	69 U	69 U	160 J (JB)	140 J (JIS)	**2000**	87 J (JIS)	7 U	7 U	7 U	9.7 U	9.7 U
WC-13	WC-13-070516-G	1000	1100	2100	840	320	69 J	340	8000 J	34 U	34 U	42	150	**2700**	74 J					
WC-14	WC-14	19 U	19 U	19 U	19 U	19 U	19 U	19 U	66	19 U	19 U	32	19 U	76	19 U	0.39 U	0.39 U	0.39 U	3.9 U	7.7 U
WC-14	Y2-WC14-S	1300	560	1900	790	200	96 U	240	8000	96 U	96 U	150 J (JB)	180 J (JIS)	**3700**	170 J (JIS)	7 U	7 U	7 U	9.8 U	9.8 U
WC-14	WC-14-070516-G	670	720	1400	490	220	45	230	5200	32 U	32 U	27 J	120	**2100**	61					
SC-01	SC-01	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	26	19 U	0.39 U	0.39 U	0.39 U	3.9 U	7.7 U
SC-01	Y2-SC01-S	31	31	62	28	24	20 U	24	320	20 U	20 U	20 U	20 U	85	20 U	2 U	2 U	2 U	9.7 U	9.7 U
SC-02	SC-02	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	35	19 U	31	19 U	0.4 U	0.4 U	0.4 U	4 U	7.9 U
SC-02	Y2-SC02-S	200 J	200 J	400 J	180 J	130 J	36 J	120 J	2100 J	21 U	21 U	38	62	1000	57	2 U	2 U	2 U	9.9 U	9.9 U
SC-03	SC-03	25	22	22	20 U	20 U	20 U	20 U	170	20 U	20 U	24	20 U	91	20 U	0.4 U	0.4 U	0.4 U	4 U	8 U
SC-03	Y2-SC03-S	900	700	1600	670	260	88 U	340	7300	88 U	88 U	110	190	**3400**	140	7 U	7 U	7 U	9.9 U	9.9 U
SC-04	SC-04	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	94	19 U	0.38 U	0.38 U	0.38 U	3.8 U	7.7 U
SC-04	Y2-SC04-S	490	250	740	340	170	79 U	220	3600	79 U	79 U	50 J	130	**1500**	62 J	7 U	7 U	7 U	9.8 U	9.8 U
City Area Locations																				
S-15	Site 15(pre-City dredge)-CITY			750	450	**740**	99 U	**890**	4300	24	99 U	99 U	450	**3100**	99 U	6.9	3.4 U	3.4	19 U	19 U
S-15	Site 15(post-City dredge)-UTL	6200	6200	**12000**	**9900**	**3100**	**1100**	**2600**	**95000**	510 U	510 U	510 U	630	**5100**	510 U	**64**	16 U	16 U	33 U	33 U
S-15	Site 15(pre-City dredge)-UTL	420	360	780	460	560	200 U	470	3800	200 U	200 U	200 U	480	980	200 U	9	3.2 U	3.2 U	32 U	32 U
S-15	Site 15(post-City dredge)-CITY			**19000**	**7800**	**5500**	**2000**	**6400**	**81000**	78 U	78 U	250	**940**	**4500**	1600	**53.9**	**13.8**	**47**	20 U	20 U
S-15	S-15 (Utilities' core)	1200	1200	2400	**2100**	**860**	**310**	620	**19000**	48 U	48 U	48 U	120	1100	48 U	**28**	10 U	23 U	19 U	19 U
S-15	S-15 (City)			**3900**	**3600**	**1330**	**651**	**1450**	**35000**	43.6 U	80.3 UJ	193 UJ	47.6 U	1250	40.9 U	**35.3**	**23.3**	30.2	6.2 U	6.2 U
S-15	S-15	2900	2900	**5800**	**4700**	**1500**	**510**	**1500**	**46000**	140 U	140 U	210	260	**3000**	140 U	**22 J**	9.8 U	**34 J**	20 U	20 U
S-15	S-15A			2200	**1670**	**828**	188	**832**	15000					775		5.9	**18**		9.5 U	9.5 U

Table F. Head of the Thea Foss Results 2004 - 2007

Location	Sample ID	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(b+k)fluoranthenes	Benzo(a)pyrene	Indeno(1,2,3-cd)pyrene	Dibenz(a,h)anthracene	Benzo(g,h,i)perylene	HPAH	Dimethylphthalate	Diethylphthalate	Di-n-Butyl phthalate	Butylbenzylphthalate	bis(2-Ethylhexyl) phthalate	Di-n-Octyl phthalate	4,4'-DDD	4,4'-DDE	4,4'-DDT	Aroclor 1016	Aroclor 1221
		3600	**1600**	**690**	**230**	**720**	**17000**	**160**	**200**	**1400**	**900**	**1300**	**6200**	**16**	**9**	**34**		
		UG/KG	**UG/KG**	**UG/KG**	**UG/KG**	**UG/KG**	**UG/KG**	**UG/KG**	**UG/KG**	**UG/KG**	**UG/KG**	**UG/KG**	**UG/KG**	**UG/KG**	**UG/KG**	**UG/KG**	**UG/KG**	**UG/KG**	**UG/KG**	**UG/KG**
S-15	Y2-S15-S	200	110	310	120	51 U	51 U	51 U	1200 J	51 U	51 U	65 J (JB)	51 U	930	76 J (JIS)	7 U	7 U	7 U	9.6 U	9.6 U
S-15	S-15-070516-G	120	130	250	94	55	14 J	57	1000 J	20 U	20 U	20 U	25	500	24	1.9 U	1.9 U	1.9 U	9.7 U	9.7 U
S-15	S-15-070516-G-D	180	110	290	100	56	13 J	59	1100 J	20 U	20 U	20 U	26	590	28	1.9 U	1.9 U	1.9 U	9.8 U	9.8 U
S-15A	S-15			2700	**2100**	**1060**	**234**	**1050**	**18000**					937		7.9	**17.4**		13.3 U	13.3 U
S-16	S-16	800	800	**3600**	**2500**	**850**	60	680	9300	60 U	60 U	47 U	460	**3600**	60 U	6.2	5.6 U	2 U	20 U	20 U
S-16	S-32 (Dup of S-16)	1000	1000	2000	1400	520	140	420	12000	44 U	44 U	64	240	**2400**	44 U	3	2 U	2 U	20 U	20 U
S-16	S-16			650	451	264	56	255	4200					629		2.67 J	1.67 J		7.5 U	7.5 U
S-17	S-17	1400	1200	2600	**1600**	560	200	480	14000	47 U	47 U	84	320	**2900**	47 U	4.8	1.9 U	1.9 U	19 U	19 U
S-17	S-17 (City)			510	333	170	93.2	175	3600	25.4 U	46.8 UJ	62.8 UJ	27.7 U	698 J	124	2.5	2.27 U	6.42	3.8 U	3.8 U
S-17	S-17	760	750	1500	960	380	120	400	10000	86 U	86 U	98	190	**2000**	86 U	4.5 J	4.3 U	5 U	20 U	20 U
S-17	Y2-S17-S	120	74	190	76	30 J	40 U	38 J	820 J	40 U	40 U	40 U	28 J	570	45	7 U	7 U	7 U	9.9 U	15 U
S-17	S-17-070516-G	130	190	320	120	59	16 J	60	1300 J	20 U	20 U	20 U	32	620	26	2 U	2 U	2 U	10 U	10 U
S-18	S-18	740	740	1500	800	340	120 U	270	7600	120 U	120 U	120 U	270	**2000 B**	120 U	2.9	2 U	2 U	20 U	20 U
S-18	S-18 (City)			260	170	78	27.7	88.1	2000	2.9 UJ	5.4 UJ	43.3 B	92.4	313 B	2.8 U	2.55	1.42	8.63	4.2 U	4.2 U
S-19	S-19	860	860	**4000**	**2800**	450	**260**	**790**	**26000**	70 U	70 U	72	410	**3200**	70 U	7.9	3.4 U	2 U	20 U	20 U
S-19	S-19			890	639	346	70.8	329	5700					601		15.4	**12.3**		11.6 U	11.6 U
S-19	Y2-S19-S	240	140	380	170	48 U	48 U	53	1600	48 U	48 U	62 J (JB)	48 U	880	66	7 U	7 U	7 U	9.8 U	9.8 U
S-19	S-19-070516-G	120	72	190	81	39	20 U	38	780	20 U	20 U	20	18 J	300	12 J	1.9 U	1.9 U	1.9 U	9.8 U	9.8 U
S-20	S-20	730	730	1500	950	340	94	270	8100	31 U	31 U	55	460	**1500**	31 U	1.7	2 U	2 U	20 U	20 U
S-20	S-20 (City)			960	741	348	171	347	7600	30.5 U	56.2 UJ	84 UJ	274 J	674	28.6 U	4.43	2.87 UJ	10.7	4.4 U	4.4 U
S-20	S-20			1200	777	440	92.4	423	7100					965		11	**12.4**		7.9 U	7.9 U
S-21	S-21	1700	1700	3400	**3100**	**1100**	**320**	**820**	**26000**	230 U	230 U	230 U	280	**2000 B**	230 U	**26**	8.8 U	26 U	20 U	20 U
S-21	S-33 (Dup of S-21)	2400	2400	**4800**	**4000**	**1300**	**390**	**960**	**34000**	230 U	230 U	230 U	340	**2600 B**	230 U	5.2	2 U	2 U	20 U	20 U
S-21	S-21 (City)			2200	**1740**	**770**	**277**	**875**	**18000**	39.4 U	72.6 UJ	36.6 UJ	43 U	652	187 J	**17.5**	**13.6**	18.5	5.8 U	5.8 U
S-22	S-22	1300	1300	2600	**1800**	660	160	490	16000	160 U	160 U	160 U	320	**2200 B**	160 U	3.5	2 U	2 U	20 U	20 U
S-22	S-22 (City)			1000	763	385	114	421	7500	28.5 U	52.5 U	121 J	220 J	**1310**	63 J	5.18	2.44 J	7.75	3.86 U	3.86 U
S-23	S-23	740	740	1500	1300	600	190	460	11000	140 U	140 U	140 U	190	**1500 B**	140 U	4.6	2 U	2 U	20 U	20 U
S-24	S-24	830	830	1700	1200	520	150 U	390	10000	150 U	150 U	150 U	260	**2000 B**	150 U	6.5	1.9 U	1.9 U	19 U	19 U
S-24	S-24 (City)			340	231	129	73.1	128	2600	24.6 U	45.3 UJ	22.9 UJ	26.9 U	558	23.1 U	1.84 J	0.963 J	5.66	3.6 U	3.6 U
S-24	S-24	640	640	1300	690	160	58	160	6700	28 U	28 U	110	200	**2000**	43	6.6 J	5.5 U	8.9 J	20 U	20 U
S-24	Y2-S24-S	150	98	250	96	39 J	39 U	45	1100 J	39 U	39 U	39 U	26 J	550	34 J	7 U	7 U	7 U	9.9 U	9.9 U
S-24	S-24-070516-G	210	250	460	160	72	18 J	73	1800 J	20 U	20 U	14 J	54	790	29	1.9 U	1.9 U	1.9 U	9.8 U	9.8 U
S-29	S-29 (City)			1300	931	448	100	516	8900	28.5 U	51.9 UJ	130 J	307	**1940**	95.6 J	4.94	2.07 J	7.67	3.86 U	3.86 U
S-29	S-29			760	531	295	62.4	290	4900					687		7.4	**9.8**		7.6 U	7.6 U
S-30	S-30			260	189	114	20.3	131	2300					224		0.571 J	1.82 J		33.5 U	33.5 U
CA-19B	CA-19B-03			660	505	238	49.3	229	4600					209		6.7	**9.9**		5.3 U	5.3 U
CA-19B	CA-19B-06			1200	956	452	102	426	8200					363		5.6	**18.1**		7 U	7 U
CA-20	CA-20-01			190	135	85.9	16.1 J	74.5	1100					169 J		0.215 U	0.75 J		3.3 U	3.3 U
CA-20	CA-20-04			150	98.9	65.9	11.4 J	55.2	960					159 J		0.71 J	1.15 J		3.3 U	3.3 U
CA-22	CA-22-02			3200	**2590**	**1210**	**267**	**1150**	**23000**					580		2.27 J	**14.4**		8.6 U	8.6 U
CA-22	CA-22-05			210	134	86.1	15.7 J	76.7	1300					206 J		1.45 J	1.25 J		4.3 U	4.3 U
Reference Locations																				
CI-1	Y2-CI-01																			
CI-2	Y2-CI-02																			
Rinsate Blanks		**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**
FIELDQC	Y2-RB-01	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.1 U	0.1 U	0.1 U	1 U	1 U
FIELDQC	Y2-RB-02	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.1 U	0.1 U	0.1 U	1 U	1 U
FIELDQC	Y2-RB-03	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.1 U	0.1 U	0.1 U	1 U	1 U
FIELDQC	Y3-RB-01	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U					1 U					1 U	1 U
FIELDQC	WC-05-RB	1 U	1 U		1 U	1 U	1 U	1 U		1 U	1 U	1 U	1 U	1 U	1 U	0.1 U	0.1 U	0.1 U	1 U	1 U

Table F. Head of the Thea Foss Results 2004 - 2007

Location	Sample ID	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Total PCBs 300
		UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG
RC/WC-01	RC-01	3.8 U	3.8 U	3.8 U	5.7	3.8 U	5.7
RC/WC-01	RC-01	20 U	20 U	20 U	20 U	39 U	39 U
RC/WC-01	RC-01	20 U	20 U	36 J	92 J	72	200 J
RC/WC-01	Y2-RC01-S	20 U	9.9 U	20 U	40	55 J (JC)	95 J
RC/WC-01	Y3-RC01-S	9.9 U	9.9 U	30 U	100	72	170
RC/WC-01	WC-01	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	7.8 U
RC/WC-01	WC-01	20 U	20 U	20 U	20 U	20 U	20 U
RC/WC-01	Y2-WC01-S	15 U	9.9 U	9.9 U	28	44 J (JC)	72 J
RC/WC-01	WC-01-070516-G						
WC-01B/R-01B	Y2-WC01B-C3	9.7 U	9.7 U	9.7 U	9.7 U	9.7 U	9.7 U
RC/WC-02	RC-02	3.9 U	3.9 U	3.9 U	6.3	3.9 U	6.3
RC/WC-02	RC-02	20 U	20 U	50 J	130 J	120	**300 J**
RC/WC-02	RC-2A (Dup of RC-2)	59 U	59 U	61	180 J	110	**350 J**
RC/WC-02	Y2-RC02-S	9.8 U	9.8 U	23	77	69	170
RC/WC-02	Y3-RC02-S	9.8 U	9.8 U	39 Y (U)	78	55	130
RC/WC-02	RC-02	19 U	19 U	19 U	30	23	53
RC/WC-02	WC-02	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	7.8 U
RC/WC-02	WC-02 (City)	5.3 U	5.3 U	5.3 U	34.5	31.9	66
RC/WC-02	WC-02	20 U	20 U	25 J	57 J	43	130 J
RC/WC-02	Y2-WC02-S	9.8 U	9.8 U	27	69	64	160
RC/WC-02	WC-02-070516-G						
RC/WC-03	RC-03	3.9 U	3.9 U	3.9 U	7.2	3.9 U	7.2
RC/WC-03	RC-03	20 U	20 U	34 J	71 J	73 J	180 J
RC/WC-03	Y2-RC03-S	9.8 U	9.8 U	32 J (JP)	58	44	130 J
RC/WC-03	Y3-RC03-S	9.7 U	9.7 U	15 Y (U)	26 (JC)	38	64 (JC)
RC/WC-03	WC-03	4 U	4 U	4 U	5.7	4 U	5.7
RC/WC-03	WC-03 (City)	5.6 U	5.6 U	5.6 U	30.3	25.5	56 J
RC/WC-03	Y2-WC03-S	10 U	10 U	24	47	36	110
RC/WC-03	WC-03-070516-G						
RC/WC-03	RC-03	20 U	20 U	20 U	20 U	20 U	20 U
RC/WC-04/R-02	RC-04	3.9 U	3.9 U	3.9 U	5.7	3.9 U	5.7
RC/WC-04/R-02	RC-04	20 U	20 U	37	71 J	64	170 J
RC/WC-04/R-02	Y2-RC04-S	10 U	10 U	20	46	42	110
RC/WC-04/R-02	Y3-RC04-S	9.9 U	9.9 U	25 Y (U)	67	73	140
RC/WC-04/R-02	RC-04	20 U	20 U	20 U	22 J	20 U	22
RC/WC-04/R-02	WC-04	3.9 U	3.9 U	3.9 U	5.4	3.9 U	5.4
RC/WC-04/R-02	WC-04-Duplicate	4 U	4 U	4 U	5.6	4 U	5.6
RC/WC-04/R-02	S-34 (Dup of WC-04)	20 U	20 U	20 U	21 J	20 U	21
RC/WC-04/R-02	WC-04	20 U	20 U	20 U	22 J	20 U	22
RC/WC-04/R-02	WC-04	20 U	20 U	21 J	39 J	29	89 J
RC/WC-04/R-02	Y2-WC04-S	9.8 U	9.8 U	17	36	33	86
RC/WC-04/R-02	WC-04-070517-G						
RC/WC-04/R-02	WCBU-4A	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	7.6 U
RC/WC-04/R-02	WCBU-4B	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	7.8 U
RC/WC-04/R-02	WCBU-4C	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	7.8 U
RC/WC-04/R-02	Y2-WC04-C3	9.8 U	9.8 U	9.8 U	9.8 U	9.8 U	9.8 U
RC/WC-05	RC-05	3.9 U	3.9 U	3.9 U	4.3	3.9 U	4.3
RC/WC-05	RC-05-Duplicate	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	7.9 U
RC/WC-05	RC-05	20 U	20 U	53 J	120 J	100 J	270 J
RC/WC-05	Y2-RC05-S	9.8 U	9.8 U	29 J (JP)	60	53	140 J
RC/WC-05	Y3-RC05-S	9.7 U	9.7 U	29 U	61	82	140
RC/WC-05	WC-05	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	7.8 U
RC/WC-05	WC-05	20 U	20 U	20 U	24	20 U	24
RC/WC-05	WC-05	20 U	20 U	20 U	47 J	37	84 J
RC/WC-05	Y2-WC05-S	9.8 U	9.8 U	31 J (JP)	56	48	140 J
RC/WC-05	WC-05-070516-G						
RC/WC-05	RC-05	20 U	20 U	20 U	20 U	20 U	20 U
RC/WC-05	WCBU-5A	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	7.8 U
RC/WC-05	Y2-WC05-C3	9.6 U	9.6 U	9.6 U	9.6 U	9.6 U	9.6 U
RC/WC-06	RC-06	3.9 U	3.9 U	3.9 U	9.2	3.9 U	9.2
RC/WC-06	RC-06	20 U	20 U	40 J	92 J	60	190 J

Table F. Head of the Thea Foss Results 2004 - 2007

Location	Sample ID	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Total PCBs 300
		UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG
RC/WC-06	Y2-RC06-S	9.8 U	9.8 U	26 J (JP)	49	38	110 J
RC/WC-06	Y2-RC15-S	9.9 U	9.9 U	26 J (JP)	42	37	110 J
RC/WC-06	Y3-RC06-S	9.8 U	9.8 U	29 U	54	72	130
RC/WC-06	RC-06	19 U	19 U	19 U	34	24	58
RC/WC-06	WC-06	4 U	4 U	4 U	4 U	4 U	8 U
RC/WC-06	Y2-WC06-S	9.8 U	9.8 U	9.8 U	25	19	44
RC/WC-06	WC-06-070517-G						
RC/WC-06	WCBU-6A	4 U	4 U	4 U	4 U	4 U	8 U
RC/WC-06	WCBU-6B	4 U	4 U	4 U	4 U	4 U	8 U
RC/WC-06	Y2-WC06-C3	9.7 U	9.7 U	9.7 U	9.7 U	9.7 U	9.7 U
RC/WC-07	RC-07	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	7.6 U
RC/WC-07	RC-07	19 U	19 U	25	46 J	49	120 J
RC/WC-07	Y2-RC07-S	20 U	9.9 U	20 U	43	54 J (JC)	97 J
RC/WC-07	Y3-RC07-S	9.9 U	9.9 U	25 Y (U)	52	53	110
RC/WC-07	RC-07	20 U	20 U	20 U	31	23	54
RC/WC-07	WC-07	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	7.8 U
RC/WC-07	WC-07	19 U	19 U	19 U	21 J	19 U	21
RC/WC-07	WC-07	20 U	20 U	20 U	20 U	20 U	20 U
RC/WC-07	WC-7	6.5 U	6.5 U	6.5 U	26.2	28.9	55
RC/WC-07	Y2-WC07-S	20 U	9.8 U	20 U	38	50 J (JC)	88 J
RC/WC-07	WC-07-070516-G						
RC/WC-08/R-03	RC-08	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	7.7 U
RC/WC-08/R-03	RC-08	20 U	20 U	45	75 J	68	190 J
RC/WC-08/R-03	Y2-RC08-S	9.8 U	9.8 U	22	50	40	110
RC/WC-08/R-03	Y3-RC08-S	9.9 U	9.9 U	35 Y (U)	56	80	140
RC/WC-08/R-03	Y3-RC15-S	9.8 U	9.8 U	19 (JC)	49	66	130 (JC)
RC/WC-08/R-03	RC-08	19 U	19 U	25	32	21 J	78
RC/WC-08/R-03	WC-08	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	7.6 U
RC/WC-08/R-03	WC-8	39.4 U	39.4 U	39.4 U	21.6 U	67.4 J	67 J
RC/WC-08/R-03	Y2-WC08-S	9.8 U	9.8 U	18	47	46	110
RC/WC-08/R-03	WC-08-070516-G						
RC/WC-09	RC-09	3.8 U	3.8 U	3.8 U	6.5	3.8 U	6.5
RC/WC-09	RC-09	20 U	20 U	46	90 J	83	220 J
RC/WC-09	Y2-RC09-S	9.8 U	9.8 U	46 J (JP)	94	86	230 J
RC/WC-09	Y3-RC09-S	9.8 U	9.8 U	29 Y (U)	60	62	120
RC/WC-09	RC-09	19 U	19 U	25	42	27	94
RC/WC-09	WC-09	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	7.9 U
RC/WC-09	WC-09	20 U	20 U	18 J	28	18 J	64
RC/WC-09	WC-9	37.9 U	37.9 U	37.9 U	20.8 U	107 J	110 J
RC/WC-09	Y2-WC09-S	9.7 U	9.7 U	32 J (JP)	56	48	140 J
RC/WC-09	WC-09-070516-G						
RC/WC-10	RC-10	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	7.8 U
RC/WC-10	RC-10	20 U	20 U	52	110 J	110	270 J
RC/WC-10	Y2-RC10-S	9.9 U	9.9 U	9.9 U	11 J	17 J	28 J
RC/WC-10	Y3-RC10-S	9.8 U	9.8 U	9.8 U	20 (JC)	20	40 (JC)
RC/WC-10	RC-10	20 U	20 U	38	52	33	120
RC/WC-10	WC-10	4 U	4 U	4 U	4 U	4 U	7.9 U
RC/WC-10	WC-10	20 U	20 U	20 U	19 J	20 U	19
RC/WC-10	WC-10 (City)	3.7 U	3.7 U	3.7 U	36.6	36.1	73
RC/WC-10	Y2-WC10-S	9.9 U	9.9 U	9.9 U	8 J	10 J	18 J
RC/WC-10	WC-10-070516-G	9.9 U	9.9 U	9.9 U	9.9 U	9.9 U	9.9 U
RC/WC-10	WCBU-10A	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	7.8 U
RC/WC-10	WCBU-10A-Duplicate	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	7.8 U
RC/WC-10	WCBU-10B	4 U	4 U	4 U	4 U	4 U	7.9 U
RC/WC-10	Y2-WC10-C3	9.8 U	9.8 U	9.8 U	9.8 U	9.8 U	9.8 U
RC/WC-10	WCBU-10C	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	7.7 U
RC/WC-11/R-04	RC-11	3.9 U	3.9 U	3.9 U	11	3.9 U	11
RC/WC-11/R-04	RC-11(pre-City dredge)-CITY	13 U	13 U	13 U	27	35	62
RC/WC-11/R-04	RC-11(pre-City dredge)-UTL	32 U	32 U	32 U	32 U	32 U	32 U
RC/WC-11/R-04	RC-11(post-City dredge)-CITY	19 U	19 U	19 U	162	139	**300**
RC/WC-11/R-04	RC-11(post-City dredge)-UTL	33 U	33 U	66	130	84	280

Table F. Head of the Thea Foss Results 2004 - 2007

Location	Sample ID	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Total PCBs 300
		UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG
RC/WC-11/R-04	RC-11	20 U	20 U	81 J	150 J	150	**380 J**
RC/WC-11/R-04	Y2-RC11-S	9.8 U	9.8 U	9.8 U	9.8 U	9.8 U	9.8 U
RC/WC-11/R-04	Y3-RC11-S	9.9 U	9.9 U	25 Y (U)	57	65	120
RC/WC-11/R-04	WC-11	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	7.6 U
RC/WC-11/R-04	WC-11(pre-City dredge)-CITY	4.18 U	4.18 U	4.18 U	54.1	39.5	94
RC/WC-11/R-04	WC-11(post-City dredge)-CITY	17 U	17 U	17 U	103	86	190
RC/WC-11/R-04	WC-11 (Utilities' core)	19 U	19 U	23	48	28	99
RC/WC-11/R-04	WC-11 (City)	4.9 U	4.9 U	4.9 U	111	96	210
RC/WC-11/R-04	WC-11	20 U	20 U	61 J	312	96	**620**
RC/WC-11/R-04	Y2-WC11-S	9.7 U	9.7 U	9.7 U	9.7 U	9.7 U	9.7 U
RC/WC-11/R-04	Y2-WC15-S	10 U	10 U	10 U	10 U	10 U	10 U
RC/WC-11/R-04	WC-11-070516-G	9.7 U	9.7 U	9.7 U	9.7 U	9.7 U	9.7 U
RC/WC-12	RC-12	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	7.9 U
RC/WC-12	RC-12	20 U	20 U	65 J	110 J	100	280 J
RC/WC-12	Y2-RC12-S	9.8 U	9.8 U	9.8 U	16 J	27 J (JC)	43 J
RC/WC-12	Y3-RC12-S	9.8 U	9.8 U	24 Y (U)	32	40	72
RC/WC-12	RC-12	19 U	19 U	64	89	59	210
RC/WC-12	WC-12	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	7.7 U
RC/WC-12	WC-12(pre-City dredge)-CITY	3.41 U	3.41 U	3.41 U	13.7	14.7	28
RC/WC-12	WC-12	20 U	20 U	24	41	27	92
RC/WC-12	WC-12 (City)	4.4 U	4.4 U	4.4 U	81.7	75.5	160
RC/WC-12	WC-12	11 U	11 U	11 U	144	163	**310**
RC/WC-12	Y2-WC12-S	9.7 U	9.7 U	9.7 U	5 J	7 J	12 J
RC/WC-12	WC-12-070517-G	9.9 U	9.9 U	9.9 U	9.9 U	9.9 U	9.9 U
RC/WC-12	Y2-WC12-C3	9.7 U	9.7 U	9.7 U	9.7 U	9.7 U	9.7 U
RC/WC-12	WCBU-12A	4 U	4 U	4 U	4 U	4 U	7.9 U
RC-13	RC-13	3.9 U	3.9 U	3.9 U	13 U	3.9 U	7.8 U
RC-13	RC-13	20 U	20 U	20 U	20 U	20 U	20 U
RC-13	RC-13	20 U	20 U	20 U	42 J	38	80 J
RC-13	Y2-RC13-S	20 U	9.9 U	20 U	40	58 J (JC)	98 J
RC-13	Y3-RC13-S	9.8 U	9.8 U	30 Y (U)	82	110	190
RC-14	RC-14	3.9 U	3.9 U	3.9 U	14 U	3.9 U	7.7 U
RC-14	RC-14	19 U	19 U	19 U	19 U	19 U	19 U
RC-14	RC-14	20 U	20 U	20 U	57 J	53 J	110 J
RC-14	Y2-RC14-S	15 U	9.9 U	15 U	24	38 J (JC)	62 J
RC-14	Y3-RC14-S	10 U	10 U	20 Y (U)	60	62	120
RC-14B	RC-14B	20 U	20 U	20 U	20 U	19 J	19 J
RC-14B	Y2-RC14B-S	15 U	9.8 U	15 U	28	53 J (JC)	81 J
WC-13	WC-13	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	7.8 U
WC-13	Y2-WC13-S	9.7 U	9.7 U	26	54	51	130
WC-13	WC-13-070516-G						
WC-14	WC-14	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	7.7 U
WC-14	Y2-WC14-S	9.8 U	9.8 U	38 J (JP)	77	72	190 J
WC-14	WC-14-070516-G						
SC-01	SC-01	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	7.7 U
SC-01	Y2-SC01-S	9.7 U	9.7 U	9.7 U	9.7 U	9.7 U	9.7 U
SC-02	SC-02	4 U	4 U	4 U	4 U	4 U	7.9 U
SC-02	Y2-SC02-S	9.9 U	9.9 U	9.9 U	28	32 J (JC)	60 J
SC-03	SC-03	4 U	4 U	4 U	4 U	4 U	8 U
SC-03	Y2-SC03-S	20 U	9.9 U	20 U	36	35 J (JC)	71 J
SC-04	SC-04	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	7.7 U
SC-04	Y2-SC04-S	20 U	9.8 U	20 U	44	31 J (JC)	75 J
City Area Locations							
S-15	Site 15(pre-City dredge)-CITY	19 U	19 U	19 U	48	46	94
S-15	Site 15(post-City dredge)-UTL	33 U	33 U	130	230	180	**540**
S-15	Site 15(pre-City dredge)-UTL	32 U	32 U	32 U	72	47	35
S-15	Site 15(post-City dredge)-CITY	20 U	20 U	20 U	287	243	**530**
S-15	S-15 (Utilities' core)	19 U	19 U	62	120	93	280
S-15	S-15 (City)	6.2 U	6.2 U	6.2 U	165	170	**340**
S-15	S-15	20 U	20 U	98	180 J	180	**460 J**
S-15	S-15A	9.5 U	9.5 U	9.5 U	295	243	**540**

Table F. Head of the Thea Foss Results 2004 - 2007

Location	Sample ID	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Total PCBs 300
		UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG
S-15	Y2-S15-S	9.6 U	9.6 U	9.6 U	12	11	23
S-15	S-15-070516-G	9.7 U	9.7 U	9.7 U	9.7 U	9.7 U	9.7 U
S-15	S-15-070516-G-D	9.8 U	9.8 U	9.8 U	9.8 U	9.8 U	9.8 U
S-15A	S-15	13.3 U	13.3 U	13.3 U	300	284	**580**
S-16	S-16	20 U	20 U	43	50	79	220
S-16	S-32 (Dup of S-16)	20 U	20 U	20 U	31	20 U	31
S-16	S-16	7.5 U	7.5 U	7.5 U	104	99.7	200
S-17	S-17	19 U	19 U	20 J	42	26	88
S-17	S-17 (City)	3.8 U	3.8 U	3.8 U	41.4	34.7	76
S-17	S-17	20 U	20 U	20 U	30 J	29 J	59 J
S-17	Y2-S17-S	9.9 U	9.9 U	9.9 U	9.9 U	9.9 U	15 U
S-17	S-17-070516-G	10 U	10 U	10 U	10 U	10 U	10 U
S-18	S-18	20 U	20 U	22 J	35	23 J	80
S-18	S-18 (City)	4.2 U	4.2 U	4.2 U	38.1	31.8	70
S-19	S-19	20 U	20 U	30	61	44	140
S-19	S-19	11.6 U	11.6 U	11.6 U	219	178	**400**
S-19	Y2-S19-S	9.8 U	9.8 U	9.8 U	11 J	12	23 J
S-19	S-19-070516-G	9.8 U	9.8 U	9.8 U	9.8 U	9.8 U	9.8 U
S-20	S-20	20 U	20 U	20 U	18	20 U	18
S-20	S-20 (City)	4.4 U	4.4 U	4.4 U	61.9	59.9	120
S-20	S-20	7.9 U	7.9 U	7.9 U	96.2	85.7	180
S-21	S-21	20 U	20 U	90	160	120	**370**
S-21	S-33 (Dup of S-21)	20 U	20 U	25	35	22 J	82
S-21	S-21 (City)	5.8 U	5.8 U	5.8 U	145	145	290
S-22	S-22	20 U	20 U	23	32	19 J	74
S-22	S-22 (City)	3.86 U	3.86 U	3.86 U	60.3	47.5	110
S-23	S-23	20 U	20 U	30	40	26	96
S-24	S-24	19 U	19 U	36	56	37	130
S-24	S-24 (City)	3.6 U	3.6 U	3.6 U	27.4	29	56
S-24	S-24	20 U	20 U	24	52 J	56	130 J
S-24	Y2-S24-S	9.9 U	9.9 U	9.9 U	9.9 U	9.9 U	9.9 U
S-24	S-24-070516-G	9.8 U	9.8 U	9.8 U	9.8 U	18	18
S-29	S-29 (City)	3.86 U	3.86 U	3.86 U	66	49.7	120
S-29	S-29	7.6 U	7.6 U	7.6 U	140	129	270
S-30	S-30	33.5 U	33.5 U	33.5 U	18.4 U	33.1 J	33 J
CA-19B	CA-19B-03	5.3 U	5.3 U	5.3 U	118	113	230
CA-19B	CA-19B-06	7 U	7 U	7 U	210	216	**430**
CA-20	CA-20-01	3.3 U	3.3 U	3.3 U	11.1 J	9.4 J	21 J
CA-20	CA-20-04	3.3 U	3.3 U	3.3 U	21.3	19	40
CA-22	CA-22-02	8.6 U	8.6 U	8.6 U	240	239	**480**
CA-22	CA-22-05	4.3 U	4.3 U	4.3 U	24.1	25.6	50
Reference Locations							
CI-1	Y2-CI-01						
CI-2	Y2-CI-02						
Rinsate Blanks		**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**
FIELDQC	Y2-RB-01	1 U	1 U	1 U	1 U	1 U	1 U
FIELDQC	Y2-RB-02	1 U	1 U	1 U	1 U	1 U	1 U
FIELDQC	Y2-RB-03	1 U	1 U	1 U	1 U	1 U	1 U
FIELDQC	Y3-RB-01	1 U	1 U	1 U	1 U	1 U	1 U
FIELDQC	WC-05-RB	1 U	1 U	1 U	1 U	1 U	

Footnotes:

Laboratory Data Qualifiers

U = result was not detected at or above the method detection limit

J (for organics) = result is an estimated concentrations that is less than the reporting limit but greater than or equal to the detection limit

B (for metals) = result is an estimated concentrations that is less than the reporting limit but greater than or equal to the detection limit

B (for organics) = Analyte detected in an associated Method Blank at a concentration greater than one-half of ARI's Reporting limit or 5% of the regulatory limit or 5% of the analyte concentration in the sample.

Y = The analyte is not detected at or above the reported concentration. The reporting limit is raised due to chromatographic interference. The Y flag is equivalent to the U flag with a raised reporting limit.

Data Validation Qualifiers

U= nondetected at the associated value

J = associated value is considered an estimate; less than verifiable lower calibration point

Acronyms

mg/kg = milligrams per kilogram

ug/kg = micrograms per kilogram

mg/L = milligrams per liter

ug/L = micrograms per liter

SQO = Sediment Quality Objectives for Thea Foss Waterway

Concentrations in bold font indicate an SQO exceedance

APPENDIX G

LABORATORY DATA REPORTS

(Located on Enclosed CD)

APPENDIX H

YEAR 3 ASSESSMENT OF UTILITIES' CAP RECONTAMINATION

YEAR 3 ASSESSMENT OF UTILITIES' CAP RECONTAMINATION
HEAD OF THEA FOSS WATERWAY PROJECT
TACOMA, WASHINGTON

Prepared for:

PacifiCorp Environmental Remediation Company

And

Puget Sound Energy

Dalton, Olmsted & Fuglevand, Inc. *Environmental Consultants*

August 2007

YEAR 3 ASSESSMENT OF UTILITIES' CAP RECONTAMINATION
HEAD OF THEA FOSS WATERWAY PROJECT
TACOMA, WASHINGTON

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YEAR 3 ASSESSMENT OF UTILITIES' CAP RECONTAMINATION
HEAD OF THEA FOSS WATERWAY PROJECT
TACOMA, WASHINGTON

1.0 INTRODUCTION

This report was prepared on behalf of the "*Utilities*" consisting of the Advance Ross Sub Company, PacifiCorp Environmental Remediation Company and Puget Sound Energy. The purpose of the report is to present an updated assessment of the cause of recontamination of the Utilities' cap in the Thea Foss Waterway since the cap was installed in February 2004. Previous recontamination assessments are presented in the following reports:

- Assessment of Utilities' Cap Recontamination And Data Summary Report, Head of Thea Foss Waterway Remediation Project by Dalton, Olmsted & Fuglevand, Inc. and Tetra Tech EC, Inc., July 2005.

- Results of Year 1 Operation, Maintenance and Monitoring Plan Sampling, Head of Thea Foss Waterway Remediation Project by Dalton, Olmsted & Fuglevand, Inc., October 2005.

- Year 2 Assessment of Utilities' Cap Recontamination, Head of Thea Foss Waterway Project, Tacoma, Washington by Dalton, Olmsted & Fuglevand, Inc. – Appendix J in Results of Year 2 Operations, Maintenance, and Monitoring Plan Sampling, Head of Thea Foss Waterway Remediation Project by Tetra Tech EC, Inc.

This updated assessment incorporates the results of Year 3 monitoring completed as part of the Utilities' Operation, Maintenance and Monitoring Plan or OMMP (Tetra Tech FW and DOF 2003). The update also includes an analysis of the supplemental sampling conducted by the City of Tacoma to assess conditions related to recontamination of the top of the Utilities' cap. Year 3 sampling occurred in May 2007 and was coordinated between the City and the Utilities.

The Thea Foss Waterway is part of the CB/NT Superfund site, located in Tacoma, Washington. The waterway (previously known as the City Waterway) extends north to south along approximately 1.5 miles of the downtown shoreline of the City of Tacoma (City) (Figure 1). For remediation purposes, the waterway was divided into the "*City Work Area*" and the "*Utilities' Work Area*".

In the Remedial Design/Remedial Action (RD/RA) Consent Decree (CD) between EPA and the Utilities, the Utilities are responsible for cleanup of Remedial Action Areas (RAs) 23 and 24 (RA23/24) from waterway station 72+00 to 80+00. As a result of CD negotiations with the City, the Utilities also agreed to take responsibility for the southern portions of RAs 19b, 20 and 22. As a result, the Utilities' Work Area (also known as the "*Head of Thea Foss Waterway Project*") extends from waterway station 70+10 located

north of the SR509 bridge, to the southern end of the waterway (station 80+00), including shoreline areas at or below an elevation of +12 feet mean lower low water (MLLW National Tidal Datum Epoch 1960-1978) (Figure 2). A "*transition zone*" is present between the City's Work Area and the Utilities' Work Area and extends from waterway station 70+00 to 70+10. A structural submarine sheet pile wall was installed as a delineator between the two work areas. The Utilities' Work Area covers an area of approximately 9.0 acres.

Construction of the remedy for the Utilities' Work Area was completed in February 2004 (DOF 2004). The Utilities' received Certification of Completion of Remedial Action Construction from the Environmental Protection Agency (EPA) on September 29, 2006 (EPA 2006). The selected remedy for the Utilities' area of responsibility was containment of contaminated sediments south of waterway station 70+10. The primary components of the remedy are listed below and are shown on Figure 2.

- Installation of a sheet pile wall at waterway station 70+10.
- Dredging beneath the current location of the scour protection apron at the head of the waterway and placement of capping and scour protection material where stormwater discharges from outfalls known as the "Twin 96" outfalls".
- Placement of a high density polyethylene (HDPE) cap over the former location of the "SR509 seep".
- Placement of a sand cap over contaminated sediments and over the HDPE cap.
- Placement of slope cap and armor material on waterway slopes.

The City is responsible for remediation north of the sheet pile wall installed at waterway station 70+10. Immediately north of the Utilities' Work Area, the City's selected remedy consisted of dredging and capping to maintain the required navigation depth of –19 feet mean lower low water (MLLW). During the 2003 to 2005 construction seasons, the City completed dredging and capping in part of the area next to the Utilities' sheet pile wall (RA19B, RA20 and RA22 – shown on Figure 3). In September 2004, it was discovered that City dredging had caused suspension and migration of contaminated sediments in the water column. Some of the suspended sediment accumulated on and recontaminated the northern portion of the Utilities' cap (DOF and Tetra Tech EC 2005; DOF 2005). To respond to the dredging recontamination, in December 2005, the City recapped the contaminated portion of the Utilities' cap (generally north of the SR509 bridge) with 6 to 18 inches of fine to medium sand (City of Tacoma et al. 2006). The recapped area is shown on Figure 2.

2.0 YEAR 3 OMMP SAMPLING

Year 3 OMMP sampling occurred between May 16 and May 17, 2007. Sample locations are shown on Figure 3. Sampling was completed by Tetra Tech, EC and the City of Tacoma in accordance with the Utilities' OMMP and several sampling amendments as outlined below. The first set of OMMP revisions called for the addition of a number of

sampling locations to monitor the effectiveness of the capping material placed by the City in December 2005 within the northern portion of the Utilities Work Area. The samples were added to address dredging recontamination that occurred during the last quarter of 2004 and included locations S-15, S-17, S-19 and S-24. The Utilities worked with the City and EPA to develop a scope of work that was acceptable to all parties. The final plan for sampling the area of additional cap material placement was submitted to EPA on April 28, 2006 and approved on May 4, 2006.

The second set of OMMP revisions was developed to respond to SQO exceedances for bis(2-ethylhexyl)phthalate (BEHP) related to stormwater discharges to the head of the waterway. On November 28, 2006, the City of Tacoma submitted a technical memorandum to EPA outlining their proposal for additional sampling to monitor concentrations of phthalates and polycyclic aromatic hydrocarbons (PAHs) within the Utilities' Work Area. After further discussions between the parties, a revised supplemental sampling plan was submitted to EPA on March 28, 2007 and approved on April 12, 2007.

The Utilities and City coordinated the Year 3 OMMP sampling requirements and a single sampling event was conducted on May 16 and 17, 2007. The Utilities were responsible for the collection and analysis of early warning samples while the City was responsible for the collection and analysis of compliance samples. All laboratory analyses were completed by Analytical Resources Inc. (ARI). Field sampling procedures and observations, data summaries, and comparison of sediment quality data to the SQOs are presented in the Year 3 OMMP report prepared by Tetra Tech EC (2007). DMD, Inc. (Raleigh Farlow) completed the data quality review (DMD 2007) of the early warning samples collected by Tetra Tech on behalf of the Utilities. The City of Tacoma conducted the data quality review of the compliance samples collected by Floyd Snider on behalf of the City of Tacoma.

Consistent with the OMMP, in 2007 the Utilities collected Early Warning Recontamination Samples. Early warning samples (0 to 2 cm depth interval) are being collected to provide warning from possible *"top-down"* recontamination in surface sediments from sources such as stormwater. Early warning samples were collected from the sediment surface at fourteen locations (RC-1 to RC-14). At any given point in time, this sediment represents the newest deposited sediment for the sample location. Early warning samples were analyzed for the following constituents:

- Total organic carbon (TOC)
- Grain size
- Petroleum hydrocarbons (diesel and heavy-oil range hydrocarbons)
- Metals (lead, mercury, and zinc)
- Polycyclic aromatic hydrocarbons (PAHs)
- Bis(2-ethylhexyl)phthalate (BEHP)
- Polychlorinated biphenyls (PCBs)

The results of the Utilities' analyses are summarized in Table 1. The results of the City compliance analyses are also summarized in Table 1.

In addition to the Utilities OMMP sample locations collected in May 2007, Figure 3 shows other locations that were sampled in 2004 and 2005 to assess the impacts of dredging recontamination. These include supplemental surface sample locations S16, S18, S20, S22, S29 and S30, and core locations S15 and WC11. The results of the sample analyses for these and other locations were used to confirm the top down source of dredging recontamination and define the impacted area. The 2004 and 2005 sample results are discussed in DOF and Tetra Tech EC (2005). In 2007, the City collected compliance samples (0 to 10 cm) from locations WC-01 to WC-14, S15, S17, S19 and S24.

3.0 POSSIBLE SEDIMENT CONTAMINATION SOURCES

The point of compliance (POC) is the 0 to 10 cm interval below the sediment surface (or mudline). Sources of contamination to surface sediment include:

- **Bottom-up contamination.** This potential source consists of contaminated sediment and coal tar derived material that underlie and are contained by the Utilities' cap (including the SR-509 seep). Year 2 OMMP core data indicate the cap is functioning as intended. Cores were not obtained in May 2007 as part of the OMMP work but will be obtained and analyzed in Year 4.

- **Top-down contamination.** Previous work has identified two primary sources of top-down recontamination. These include City dredging contamination that occurred during the fall of 2004 and stormwater discharges to the head of the Thea Foss Waterway. Four stormwater outfalls discharge to the head of the waterway including 237A and 237B (together termed the *"Twin 96" Outfalls"*), 235 and 243 (Figures 2 and 3). The drainage areas and general land uses upstream of these outfalls are summarized below (City of Tacoma 2005):

Outfall	Drainage Area (acres)	Landuse
o 237A	2,794	residential, commercial, industrial
o 237B	1,821	residential
o 235	181	residential, commercial, industrial
o 243	45	industrial

In May 2007 visual observations of the former SR509 seep were made during seasonal low tides (Tetra Tech 2007). No visual sheens were observed. The lack of visual sheens indicates that the hybrid cap (HDPE covered by sand) placed over the former SR509 seep is functioning as intended.

4.0 DATA EVALUATION AND INTERPRETATION

Available data continue to indicate that recontamination of waterway sediments, after the Utilities' cap was installed in the southern portion of the Thea Foss Waterway, occurred from top-down sources. This finding is based on the following lines of evidence.

4.1 Accumulation of Fine-Grained Sediment

Since the Utilities' cap was installed, fine-grained sediment has accumulated on the top of cap. Table 2 summarizes the thicknesses and percent fines for sampling rounds completed in April 2004 (Year 0 OMMP), November/December 2004, May 2005 (Year 1 OMMP), May 2006 (Year 2 OMMP) and May 2007 (Year 3 OMMP). By May 2007, approximately 7 cm to more than 13 cm of fine-grained sediment had accumulated within the small boat turning basin south of the bridge as illustrated on Figure 4. Lesser thicknesses (1 to 4 cm) were present within the area capped by the City in December 2005.

Figure 5 illustrates how thicknesses of accumulated sediment varied between April 2004 and May 2007. At most locations south of the bridge, the greatest thickness of accumulated sediment was measured in May 2007. Thicknesses of fine-grained sediment were lower north of the bridge where capping work was completed by the City in 2005 to resolve the dredging recontamination issue.

The change in fine grained sediment thicknesses between May 2006 and May 2007 is illustrated on Figure 6. At most locations sediment thicknesses increased between approximately 0.5 cm and 2 cm. The greatest increase was at station RC/WC-7 where the change in thickness was approximately 6 cm. There is insufficient data at station RC/WC-2 for both Year 2 and Year 3 to document the true thickness of fine grained material. In both years, the penetration of the grab sampler was shallower than the thickness of fine grained sediment.

As noted in previous reports, the accumulated fine-grained sediment is distinctly different from the more granular underlying capping material. The capping material, based on grain size analyses of core samples, has a fines content (herein defined as particle sizes less than 62.5 microns) generally less than 4 percent. This compares with a fines content of up to 58 percent for accumulated sediment in the Utilities' Work Area.

Overall the fines content of the early warning samples collected in May 2006 and May 2007 are similar as summarized below. In May 2006 the fines content averaged approximately 34% as compared to 37% in May 2007.

Percent Fines Content of Early Warning Sample Sediment in 2006 and 2007

	0 to 2 cm	
	Range (%)	**Avg. (%)**
May 2006	7.5-58	34
May 2007	19-53	37

In areas where the fine grained sediment accumulation is less than the sample interval, the sample may be composed of coarser grained material; a mixture of capping and accumulated sediment. For example, in May 2007, sample RC-10 was the coarsest grained sample (fines content of 19%). This sample was obtained from 0 to 2 cm and included approximately 1 cm of fine grained sediment.

The source of accumulated fine-grained sediment above the capping material is predominately stormwater that discharges to the head of the waterway. This finding is based on comparison of the chemical quality of the accumulated fine-grained sediment with stormwater sediment (collected by in-line sediment traps) that discharges to the waterway as discussed further below.

4.2 Compliance Sample Quality Comparison to SQOs

Compliance samples (0 to 10 cm) were obtained and analyzed by the City of Tacoma at locations WC-01 to WC-14 and S15, S-17, S-19 and S-24 (Table 1). Comparison of the analytical results of the compliance samples to the SQOs indicates that in Year 3, BEHP exceeded its SQO (1,300 ug/kg) by the greatest amount in samples south of the SR509 bridge. BEHP concentrations ranged between approximately 2,000 ug/kg to 4,900 ug/kg in samples from WC-01 to WC-09 and WC-13 and WC-14. PAH concentrations (phenanthrene, most individual HPAHs and sum of HPAHs) also exceeded the SQOs at location WC-02. The highest BEHP concentration (4,900 ug/kg) and highest HPAH concentration (20,000 ug/kg) were co-located at station WC-02.

Compliance sample concentrations of BEHP and HPAH south of the SR509 bridge appear to have generally declined between 2006 and 2007. The average concentration of BEHP declined from approximately 3,600 ug/kg to 2,700 ug/kg, while the average concentration of HPAH declined from approximately 9,700 ug/kg to 7,800 ug/kg. The change in concentrations represent declines of approximately 20% to 25%.

Compliance samples located within the dredging recontamination area generally north of the bridge met the SQOs in 2007. BEHP concentrations ranged between 300 ug/kg and 790 ug/kg and HPAH concentrations ranged between 780 ug/kg and 1,800 ug/kg. The fines contents of these samples ranged between 3.9% and 8.3% indicating that the samples were composed primarily of capping material. As discussed earlier, the average

fines contents in early warning samples located south of the bridge was greater than 35% in 2007.

Compliance sample concentrations of BEHP and HPAH north of the SR509 bridge varied between 2006 and 2007. The average concentration of BEHP declined from approximately 730 ug/kg to 600 ug/kg (approximately 18%), while the average concentration of HPAH increased from approximately 955 ug/kg to 1,300 ug/kg (approximately 37%).

Sufficient data is not available to reliability assess long term trends in sediment contaminant concentrations. Variations in stormwater sediment volumes and concentrations discharged to the waterway coupled with sediment mixing and stabilization of the impacts of the 2004 dredging recontamination obscure trends that cannot be defined based on only two sample sets (2006 and 2007) collected after the dredging recontamination and capping occurred. Additional OMMP sampling rounds will be necessary to assess the longer term sediment quality trends in the Utilities' Work Area.

4.3 Early Warning Sample Quality Comparison to SQOs

The point of compliance for sediment quality in Thea Foss is the 0 to 10 cm sediment interval. Early warning samples collected from the 0 to 2cm interval provide an indication of the quality of the most recent sediment deposited at any given location and provide an indication of possible SQO exceedances at the POC in the future. The following constituents were detected above SQO concentrations in May 2007 early warning sediment samples.

Constituent	Locations	Exceedance Factor (EF)
Zinc	RC-02	1.3
Phenanthrene	RC-02, RC-13, RC-14	1.1 to 1.9
Fluoranthene	RC-01, RC-02, RC-13, RC-14	1.1 to 2.5
Pyrene	RC-02, RC-13	1.4 to 1.6
Benzo(a)anthracene	RC-02, RC-13	1.3 to 1.5
Chrysene	RC-02, RC-13	1.1 to 1.3
Benzofluoranthenes	RC-02, RC-13	1.9 to 2.2
Benzo(a)Pyrene	RC-02, RC-13	1.4 to 1.7
Indeno(1,2,3-cd)pyrene	RC-02, RC-13	1.3 to 1.7
Dibenzo(a,h)anthracene	RC-02, RC-13	1.0 to 1.7
Benzo(g,h,i)perylene	RC-02, RC-13	1.3 to 1.5
HPAH	RC-02, RC-13	1.5 to 1.8
BEHP	RC-01 to RC-14	1.2 to 10.8

Zinc, phenanthrene, individual HPAHs, sum of HPAHs and BEHP were detected at concentrations above the SQOs in one or more samples. Most of the exceedances occurred in samples collected near the head of the waterway (RC-02, RC-13 and RC-14). Similar to previous sampling rounds, BEHP exceeded it's SQO in every early warning sampling location in the Utilities' Work Area. Exceedance factors (sample concentration divided by the SQO) ranged between slightly above 1.0 to 10.8. The highest exceedance factor was for BEHP at sample location RC-01, located near the head of the waterway. The patterns of PAH (based on HPAH) and BEHP concentrations in early warning samples are shown on Figures 7 and 8.

4.4 Concentration Trends in Early Warning Samples

Figures 9 and 10 illustrate average concentrations in early warning samples collected within the Utilities Work Area (RC-01 to RC-14) and within the turning basin (RC-1 to RC-7) between 2004 to 2007. Data used to prepare the histograms is presented in Table 3. Interpretation of the data needs to consider the impacts of the dredging recontamination that occurred in 2004.

Over the past four years, the highest average concentrations of lead, mercury, LPAH, HPAH and PCBs in the Utilities Work Area were higher in 2005 after the dredging recontamination. Concentrations of these constituents declined in 2006. Average concentrations of zinc and BEHP were highest in 2007. Between 2006 and 2007, constituent concentrations increased within the Utilities' Work Area. Increases ranged between approximate 13% (HPAH) and 39% (zinc).

Constituent concentrations of lead, mercury, LPAH, HPAH and PCBs in samples from the turning basin were also highest in samples collected in 2005 while concentrations of zinc and BEHP were highest in 2007. Between 2006 and 2007, constituent concentrations generally increased between approximately 2.2% and 45%, except for average HPAH concentrations that declined approximately 12% to 13%. The greatest increases were for mercury (31%) and zinc (45%).

Overall, the average sediment concentrations indicate that constituent concentrations have increased between 2006 and 2007. The decrease in HPAH concentrations in the turning basin samples suggest that surface sediment concentrations continue to readjust to the impacts of the 2004 dredging recontamination.

4.5 Comparison of Accumulated Sediment Quality with Stormwater Sediment Quality

As noted in previous Utilities' OMMP reports (DOF 2006), stormwater sediment contains a typical suite of chemicals. These chemicals include petroleum hydrocarbons, metals and organic chemicals such as polycyclic aromatic hydrocarbons (PAHs) and phthalates. Pesticides and polychlorinated biphenyls (PCBs) are also commonly detected in stormwater sediments.

Since the mid- to late-1990's, Tacoma has implemented, with oversight by Ecology and EPA, a program to assess stormwater quality using in-line sediment-traps placed within portions of their stormwater conveyance system. Sediments collected by these traps are recovered and analyzed on an annual basis. Typically the traps are deployed in the fall (beginning of the wet season) and are recovered in the spring (near the end of the wet season). Several of the traps are placed immediately upstream of where stormwater discharges into the head of Thea Foss. Stormwater sediment quality data for outfalls that discharge to the head of Thea Foss are summarized for the period 2002 to 2006 in Table 4. Metals, petroleum hydrocarbons, PAHs, phthalates, and PCBs were detected in stormwater sediment collected by the sediment traps. These are the same constituents also detected in Thea Foss fine-grained bottom sediment present on top of the Utilities'' cap.

4.6 Sediment Quality Correlations and Trends – HPAHs and BEHP

Previous analyses (DOF 2006) documented a high correlation between HPAHs and BEHP in surface sediment samples collected within the Utilities' Work Area and a similarity in trends between the surface sediment and stormwater sediment discharged to the head of the waterway. HPAH and BEHP concentration data for early warning samples analyzed between 2004 and 2006 are plotted along with the results of the May 2007 analyses on Figure 11. Most of the 2007 sample results plot on the previously established trend using the 2004 to 2006 analytical results. Using the 2004 to 2007 data[i], a correlation of $R=0.83$ and $R^2=0.69$ are estimated.

Samples RC01 and RC13 collected in 2007 appear to vary from this established trend in that RC01 appears enriched in BEHP relative to HPAH and RC13 appears enriched with HPAH relative to BEHP. If these two samples are excluded from the analysis, a correlation of $R=0.94$ and $R^2=0.88$ are estimated.

The primary source of contamination for the early warning OMMP sediment samples is interpreted to be stormwater discharges to the Head of the Thea Foss Waterway. Figure 12 shows a plot of stormwater sediment-trap sediment concentrations installed near the outlets of outfalls that discharge to the head of Thea Foss. Data used to prepare the plots (2002 to 2006) are summarized in Table 4. Two concentration patterns are evident in the data. Sediment from the larger outfalls (237A and 237B) is enriched with HPAHs relative to BEHP as compared to the smaller outfalls (235 and 243).

Figure 12 also includes plots of the early warning sediment data collected between 2004 and 2007 to compare the relationship between HPAH and BEHP in early warning sediment samples (not significantly impacted by the dredging recontamination) and stormwater sediment collected by the sediment traps. Sample RC13(07) falls within the

[i] Samples collected in 2005 that were highly impacted from the dredging recontamination (RC8 to RC12) were excluded from this analysis.

concentration range for the larger outfalls while RC01 appears to fall within the range defined by the smaller outfall samples. However, the RC01(07) sample result may be indicative of variability in sediment quality being discharged by the larger outfalls. The sediment trap samples are composite samples obtained over a full wet season of discharge while the RC1 sample may represent a more discrete stormwater sediment sample representative of a shorter period of time.

As shown on Figure 12, the comparison indicates a similar relationship exists between HPAH and BEHP in most of the early warning sediment in the waterway and sediment being discharged from outfalls 237A and 237B. This relationship indicates the primary sources of BEHP and HPAHs to surface sediment are the Twin 96" Outfalls.

5.0 SUMMARY AND FINDINGS

- Remediation of the Utilities' Work Area was completed in February 2004 with final placement of capping material. OMMP sampling was completed in April 2004 (Year 0 – baseline), May 2005 (Year 1), May 2006 (Year 2) and May 2007 (Year 3). The Utilities' sampling in 2007 consisted of collecting and analyzing early warning "*top-down*" recontamination samples (0 to 2 cm). The City obtained and analyzed compliance samples (0 to 10 cm) from a number of locations throughout the Utilities' Work Area. Visual observations during low tides of the former SR509 Seep area were also made.

- BEHP exceeded its SQO (1,300 ug/kg) in the compliance samples obtained south of the SR509 bridge. PAHs also exceeded SQOs in a compliance sample obtained from location WC-02. The highest concentrations of BEHP and HPAHs in compliance samples were detected at location WC-02.

- Potential sediment recontamination sources identified near the Head of Thea Foss Waterway between February 2004 and May 2007 include stormwater (on-going) and dredging (2004) top-down sources and upward migration of contaminants contained by the Utilities' cap (bottom up source). Visual observations during low tides of the former SR509 Seep area indicates the impermeable cap is preventing the upward migration of tar that would cause visual sheens (Tetra Tech 2007). Cores obtained in May 2006 (cores were not obtained in 2007) indicated the Utilities' cap is functioning as intended.

- Contamination of the Utilities' Work Area (top of cap) began soon after the cap was installed. Fine grained sediment began to accumulate and concentrations of BEHP, PAHs and other contaminants began to increase. The source of this contamination appears to be stormwater discharges based on the following lines of evidence:

- Accumulation of fine grained sediment on top of the Utilities' cap that contains contaminants typical of stormwater discharges.

- High correlation and similar concentration trends between HPAHs and BEHP in early warning sediment samples between April 2004 and May 2007 indicate a similar source.

- Similarity of the HPAH and BEHP trend relationship in early warning sediment samples with the trend relationship of stormwater sediment samples collected near the end of the Twin 96" outfalls. These data indicate that the Twin 96" outfalls are the primary source of PAHs and BEHP to the Head of the Thea Foss Waterway.

6.0 REFERENCES

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7.0 CLOSING

The services described in this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, expressed or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations,

time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, or the use of segregated portions of this report.

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TABLE 1 - Summary of Utilities' Sediment Quality Data - May 2007 (Year 3)

Head Thea Foss Waterway
Tacoma, Washington

metals - mg/kg, dry
organics - µg/kg, dry

							TPH-Dx (mg/kg)		Pb	Hg	Zn
Field Sample I.D.	**Location**	Comments	Sample Date	Lab I.D.	% solids	% TOC	Diesel-range	Lube-range	7439-92-1	7439-97-6	7440-66-6
SQOs							na	na	450	0.59	410
Early Warning Samples											
Y3-RC01-S	RC/WC-01	0-2 cm	5/16/2007	079548-KZ56B	28	11.8	**540**	**3400**	**111**	**0.3**	**380**
Y3-RC02-S	RC/WC-02	0-2 cm	5/16/2007	079557-KZ56K	40	7.0	**790**	**5600**	**114**	**0.2**	**539**
Y3-RC03-S	RC/WC-03	0-2 cm	5/17/2007	079562-KZ56P	60	5.1	**230**	**1500**	**36**	**0.1**	**113**
Y3-RC04-S	RC/WC-04/R-02	0-2 cm	5/17/2007	079560-KZ56N	47	7.2	**500**	**3300**	**77**	**0.32**	**227**
Y3-RC05-S	RC/WC-05	0-2 cm	5/16/2007	079552-KZ56F	47	5.9	**540**	**3300**	**78**	**0.2**	**220**
Y3-RC06-S	RC/WC-06	0-2 cm	5/17/2007	079559-KZ56M	52	3.7	**420**	**2900**	**86**	**0.18**	**227**
Y3-RC07-S	RC/WC-07	0-2 cm	5/16/2007	079553-KZ56G	57	5.4	**310**	**2200**	**64**	**0.15**	**173**
Y3-RC08-S	RC/WC-08/R-03	0-2 cm; QC	5/16/2007	079554-KZ56H	52	3.4	**490**	**3100**	**70**	**0.18**	**184**
Y3-RC09-S	RC/WC-09	0-2 cm	5/16/2007	079556-KZ56J	48	3.1	**560**	**3600**	**86**	**0.2**	**221**
Y3-RC10-S	RC/WC-10	0-2 cm	5/16/2007	079551-KZ56E	75	5.3	**140**	**1000**	**33**	**0.08**	**102**
Y3-RC11-S	RC/WC-11/R-04	0-2 cm	5/16/2007	079547-KZ56A	53	6.1	**490**	**3000**	**73**	**0.19**	**195**
Y3-RC12-S	RC/WC-12	0-2 cm	5/17/2007	079558-KZ56L	65	4.9	**220**	**1300**	**39**	**0.14**	**109**
Y3-RC13-S	RC-13	0-2 cm	5/16/2007	079549-KZ56C	41	5.5	**560**	**3800**	**113**	**0.2**	**256**
Y3-RC14-S	RC-14	0-2 cm	5/16/2007	079550-KZ56D	53	7.3	**300**	**2200**	**70**	**0.1**	**209**
Y3-RC15-S	RC/WC-08/R-03	0-2 cm	5/16/2007	079555-KZ56I	53	5.5	**520**	**3100**	**76**	**0.2**	**194**
Y3-RB-01	field QC	Rinsate Blank	5/17/2007	079561-KZ56O	0.0		0.25 U	0.5 U	0.02 U	0.0001 U	0.01 U
Compliance Samples											
Y3-WC-01	RC/WC-01	0-10 cm	5/16/2007	WC-01-070516-G	60.8	4.55					
Y3-WC-02	RC/WC-02	0-10 cm	5/16/2007	WC-02-070516-G	35.6	6.86					
Y3-WC-03	RC/WC-03	0-10 cm	5/16/2007	WC-03-070516-G	60.4	2.54					
Y3-WC-04	RC/WC-04/R-02	0-10 cm	5/17/2007	WC-04-070517-G	56.1	3.3					
Y3-WC-05	RC/WC-05	0-10 cm	5/16/2007	WC-05-070516-G	52.4	5.03					
Y3-WC-06	RC/WC-06	0-10 cm	5/17/2007	WC-06-070517-G	56.9	6.58					
Y3-WC-07	RC/WC-07	0-10 cm	5/16/2007	WC-07-070516-G	58	4.65					
Y3-WC-08	RC/WC-08/R-03	0-10 cm	5/16/2007	WC-08-070516-G	55.6	2.71					
Y3-WC-09	RC/WC-09	0-10 cm	5/16/2007	WC-09-070516-G	55	4.3					
Y3-WC-10	RC/WC-10	0-10 cm	5/16/2007	WC-10-070516-G	86.6	0.861			**10**	0.04 U	**49**
Y3-WC-11	RC/WC-11/R-04	0-10 cm	5/16/2007	WC-11-070516-G	87.1	0.764			**12**	0.05 U	**53**
Y3-WC-12	RC/WC-12	0-10 cm	5/17/2007	WC-12-070517-G	77.1	1.24			**18**	0.05 U	**62**
Y3-S-15	S-15	0-10 cm	5/16/2007	S-15-070516-G	86	1.57			**10**	0.04 U	**55**
Y3-S-15	S-15	0-10 cm	5/16/2007	S-15-070516-G-D	85.8	0.977			**12**	0.05 U	**52**
Y3-S-17	S-17	0-10 cm	5/16/2007	S-17-070516-G	81.6	1.62			**15**	0.06 U	**58**
Y3-S-19	S-19	0-10 cm	5/16/2007	S-19-070516-G	88.4	0.848			**11**	0.04 U	**55**
Y3-S-24	S-24	0-10 cm	5/16/2007	S-24-070516-G	85.3	2.4			**23**	**0.05**	**69**
Y3-WC-13	WC-13	0-10 cm	5/16/2007	WC-13-070516-G	55.4	3.33					
Y3-WC-14	WC-14	0-10 cm	5/16/2007	WC-14-070516-G	57.1	2.84					
	FIELDQC	NA	5/17/2007	WC-05-RB					0.02 U	0.0001 U	0.01 U

TABLE 1 - Summary of Utilities' Sediment Quality Data - May 2007 (Year 3)

metals - mg/kg, dry
organics - µg/kg, dry

Field Sample I.D.	% gravel > 2000 µm	% v. coarse sand 1000-2000 µm	% coarse sand 500-1000 µm	% med. sand 250-500 µm	% fine sand 125-250 µm	% v. fine sand 62-125 µm	% silt 3.9-62.5 µm	% clay < 3.9 µm	% fines < 62.5 µm
SQOs									
Early Warning Samples									
Y3-RC01-S	32	16	10	7.3	5.5	5.1	14	10	24
Y3-RC02-S	2.4	5.4	9.3	15	20	13	26	11	36
Y3-RC03-S	0.1	3.2	8.4	21	23	13	22	9.7	32
Y3-RC04-S	0.7	0.8	5.3	14	16	11	36	17	53
Y3-RC05-S	0.7	3.1	5.3	12	16	12	34	17	51
Y3-RC06-S	4.6	2.5	5.5	18	16	8.8	36	9.3	45
Y3-RC07-S	3.7	2.6	9.6	26	18	6.8	23	11	34
Y3-RC08-S	1.5	1.9	7.7	21	18	8.8	30	12	42
Y3-RC09-S	0.6	1.3	6.6	18	16	8.3	35	15	49
Y3-RC10-S	20	11	16	21	9.4	3.7	13	5.9	19
Y3-RC11-S	9.7	6.5	13	12	5.2	4.2	36	14	50
Y3-RC12-S	30	11	13	13	5.0	3.0	17	7.5	25
Y3-RC13-S	4.6	6.3	7.7	10	17	14	27	13	40
Y3-RC14-S	14	7.0	11	14	16	15	16	7.8	24
Y3-RC15-S	0.8	1.5	8.0	21	18	8.9	30	12	42
Y3-RB-01									
Compliance Samples									
Y3-WC-01									
Y3-WC-02									
Y3-WC-03									
Y3-WC-04									
Y3-WC-05									
Y3-WC-06									
Y3-WC-07									
Y3-WC-08									
Y3-WC-09									
Y3-WC-10	61.1	11.9	9.6	8.8	3.6	1	2.4	1.4	3.9
Y3-WC-11	60.3	13.7	10.7	7.8	1.9	0.5	3.1	1.9	5.1
Y3-WC-12	58.9	11.8	10.5	8.1	2.7	1	4.6	2.4	7.1
Y3-S-15	57	13	10.5	10.5	3.1	0.6	3.5	2	5.3
Y3-S-15	53.6	11.5	10.8	12.7	4.5	0.9	3.8	2.4	6.1
Y3-S-17	48.2	13.5	12.6	11.2	4.8	1.4	5.2	3.2	8.3
Y3-S-19	61.2	14.7	10.8	6.3	1.8	0.6	2.7	1.7	4.5
Y3-S-24	65.9	9.2	6.9	6.4	3.3	1.4	4.8	2.1	6.9
Y3-WC-13									
Y3-WC-14									

TABLE 1 - Summary of Utilities' Sediment Quality Data - May 2007 (Year 3)

Head Thea Foss Waterway
Tacoma, Washington

metals - mg/kg, dry
organics - µg/kg, dry

	2-Methyl-naphthalene	Acenaphthene	Acenaphthylene	Anthracene	Fluorene	Naphthalene	Phenanthrene	LPAHs
Field Sample I.D.	91-57-6	83-32-9	208-96-8	120-12-7	86-73-7	91-20-3	85-01-8	
SQOs	670	500	1300	960	540	2100	1500	5200
Early Warning Samples								
Y3-RC01-S	150 U	150 U	150 U	**300**	**100 J**	**110 J**	**1500**	**2010**
Y3-RC02-S	170 U	**110 J**	170 U	**430**	**160 J**	**150 J**	**2500**	**3350**
Y3-RC03-S	**39 J**	**40 J**	76 U	**120**	76 U	**100**	**570**	**830**
Y3-RC04-S	110 U	**61 J**	110 U	**190**	**63 J**	**130**	**930**	**1374**
Y3-RC05-S	150 U	150 U	150 U	**140 J**	150 U	**110 J**	**680**	**930**
Y3-RC06-S	**60 J**	**59 J**	120 U	**180**	**62 J**	**160**	**910**	**1371**
Y3-RC07-S	**52 J**	**61 J**	96 U	**150**	**52 J**	**130**	**690**	**1083**
Y3-RC08-S	**76 J**	**87 J**	120 U	**200**	**74 J**	**200**	**890**	**1451**
Y3-RC09-S	130 U	130 U	130 U	**190**	130 U	**150**	**860**	**1200**
Y3-RC10-S	67 U	67 U	67 U	**60 J**	67 U	**44 J**	**310**	**414**
Y3-RC11-S	**48 J**	**60**	60 U	**150**	**52 J**	**120**	**630**	**1012**
Y3-RC12-S	**54 J**	**76**	72 U	**150**	**48 J**	**130**	**500**	**904**
Y3-RC13-S	**64 J**	**130**	120 U	**460**	**180**	**130**	**2800**	**3700**
Y3-RC14-S	120 U	**86 J**	120 U	**270**	**110 J**	**74 J**	**1600**	**2140**
Y3-RC15-S	**93 J**	**100 J**	110 U	**240**	**90 J**	**220**	**1000**	**1650**
Y3-RB-01	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Compliance Samples								
Y3-WC-01	77 U	77 U	77 U	**120**	**47 J**	**64 J**	**680**	**910 J**
Y3-WC-02	160 U	**94 J**	160 U	**320**	**120 J**	**93 J**	**2100**	**2700 J**
Y3-WC-03	69 U	69 U	69 U	**76**	69 U	**50 J**	**340**	**470 J**
Y3-WC-04	**34 J**	**47 J**	66 U	**99**	**34 J**	**91**	**440**	**750 J**
Y3-WC-05	**55 J**	**81 J**	92 U	**180**	**51 J**	**130**	**740**	**1200 J**
Y3-WC-06	85 U	**44 J**	85 U	**110**	85 U	**84 J**	**520**	**760 J**
Y3-WC-07	**47 J**	**74 J**	84 U	**170**	**50 J**	**120**	**700**	**1200 J**
Y3-WC-08	**60**	**94**	**31**	**160**	**57 J**	**160**	**530**	**1100 J**
Y3-WC-09	**45**	**73 J**	**36**	**150**	**47 J**	**130**	**450**	**930 J**
Y3-WC-10	20 U	20 U	20 U	**18 J**	20 U	**12 J**	**94**	**120 J**
Y3-WC-11	20 U	20 U	20 U	**14 J**	20 U	**11 J**	**67**	**92 J**
Y3-WC-12	**12 J**	**30**	20 U	**43**	**16 J**	**26**	**190**	**320 J**
Y3-S-15	20 U	20 U	20 U	**20**	20 U	**15 J**	**87**	**120 J**
Y3-S-15	20 U	20 U	20 U	**20 J**	20 U	**13 J**	**91**	**120 J**
Y3-S-17	20 U	**11 J**	20 U	**26**	20 U	**22**	**100**	**160 J**
Y3-S-19	20 U	**15 J**	20 U	**23**	**12 J**	**19 J**	**82**	**150 J**
Y3-S-24	20 U	**11 J**	20 U	**30**	**11 J**	**22**	**150**	**220 J**
Y3-WC-13	**88 J**	**140**	**69 J**	**250**	**82**	**220**	**710**	**1500 J**
Y3-WC-14	**44**	**63 J**	**30 J**	**120**	**52 J**	**110**	**400**	**820 J**
	1 U	1 U	1 U	1 U	1 U	1 U	1 U	

TABLE 1 - Summary of Utilities' Sediment Quality Data - May 2007 (Year 3)

Head Thea Foss Waterway
Tacoma, Washington

metals - mg/kg, dry
organics - µg/kg, dry

	Fluoranthene	Pyrene	Benzo(a)-anthracene	Chrysene	Benzo(b)-fluoranthene	Benzo(k)-fluoranthene	Benzofluor-anthenes	Benzo(a)-pyrene	Indeno(1,2,3-cd)pyrene	Dibenz(a,h)-anthracene	Benzo(ghi)-perylene	HPAHs
Field Sample I.D.	206-44-0	129-00-0	56-55-3	218-01-9	205-99-2	207-08-9		50-32-8	193-39-5	53-70-3	191-24-2	
SQOs	2500	3300	1600	2800	na	na	3600	1600	690	230	720	17000
Early Warning Samples												
Y3-RC01-S	**2800**	**2000**	**900**	**1600**	1500	1500	**3000**	**960**	**380**	**93 J**	**410**	**12143**
Y3-RC02-S	**5000**	**4700**	**2000**	**3100**	3300	3600	**6900**	**2300**	**870**	**390**	**900**	**26160**
Y3-RC03-S	**1400**	**1300**	**540**	**790**	920	960	**1880**	**620**	**260**	**61 J**	**270**	**7121**
Y3-RC04-S	**2300**	**2000**	**840**	**1300**	1300	1500	**2800**	**1000**	**410**	**82 J**	**420**	**11152**
Y3-RC05-S	**1800**	**1500**	**640**	**960**	1100	870	**1970**	**740**	**400**	**83 J**	**390**	**8483**
Y3-RC06-S	**2400**	**2100**	**860**	**1300**	1400	1700	**3100**	**990**	**440**	**84 J**	**460**	**11734**
Y3-RC07-S	**1600**	**1500**	**640**	**960**	980	990	**1970**	**770**	**380**	**77 J**	**400**	**8297**
Y3-RC08-S	**1900**	**1900**	**800**	**1200**	1400	1100	**2500**	**1000**	**600**	**270**	**650**	**10820**
Y3-RC09-S	**2300**	**1900**	**800**	**1300**	1200	1600	**2800**	**950**	**410**	**100 J**	**410**	**10970**
Y3-RC10-S	**720**	**660**	**280**	**450**	550	460	**1010**	**340**	**160**	**35 J**	**170**	**3825**
Y3-RC11-S	**1500**	**1400**	**610**	**1000**	1300	980	**2280**	**750**	**350**	**79**	**380**	**8349**
Y3-RC12-S	**1100**	**980**	**420**	**620**	820	560	**1380**	**510**	**190**	**48 J**	**190**	**5438**
Y3-RC13-S	**6200**	**5300**	**2400**	**3500**	3400	4400	**7800**	**2700**	**1200**	**240**	**1100**	**30440**
Y3-RC14-S	**3400**	**2600**	**1200**	**1800**	2000	2100	**4100**	**1400**	**560**	**130**	**540**	**15730**
Y3-RC15-S	**2400**	**2300**	**920**	**1400**	1700	1400	**3100**	**1100**	**420**	**93 J**	**440**	**12173**
Y3-RB-01	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Compliance Samples												
Y3-WC-01	**1500**	**1100**	**540**	**750**	**710**	**850**	**1600**	**580**	**220**	**53 J**	**210**	**6500 J**
Y3-WC-02	**4800**	**3300**	**1600**	**2200**	**2900**	**2000**	**4900**	**1700**	**600**	**230**	**570**	**20000**
Y3-WC-03	**900**	**770**	**330**	**480**	**540**	**600**	**1100**	**410**	**160**	**39 J**	**150**	**4400 J**
Y3-WC-04	**940**	**1000**	**420**	**600**	**730**	**690**	**1400**	**510**	**190**	**40 J**	**200**	**5300 J**
Y3-WC-05	**1900**	**1600**	**720**	**1000**	**1200**	**1100**	**2300**	**850**	**530**	**110 J**	**600**	**9600 J**
Y3-WC-06	**1400**	**1200**	**470**	**720**	**920**	**800**	**1700**	**590**	**210**	85 U	**220**	**6500**
Y3-WC-07	**1800**	**1400**	**660**	**940**	**1000**	**1200**	**2100**	**760**	**460**	**90 J**	**490**	**8700 J**
Y3-WC-08	**1100**	**1000**	**440**	**630**	**770**	**790**	**1600**	**600**	**260**	**86**	**280**	**6000**
Y3-WC-09	**1100**	**950**	**380**	**560**	**550**	**800**	**1400**	**500**	**230**	**48**	**240**	**5300**
Y3-WC-10	**210**	**180**	**82**	**130**	**100**	**160**	**260**	**98**	**72**	**24**	**80**	**1100**
Y3-WC-11	**170**	**160**	**70**	**110**	**78**	**150**	**230**	**82**	**54**	**12 J**	**64**	**950 J**
Y3-WC-12	**320**	**280**	**130**	**200**	**170**	**230**	**400**	**160**	**88**	**18 J**	**90**	**1700 J**
Y3-S-15	**200**	**160**	**73**	**120**	**120**	**130**	**250**	**94**	**55**	**14 J**	**57**	**1000 J**
Y3-S-15	**230**	**180**	**81**	**140**	**180**	**110**	**290**	**100**	**56**	**13 J**	**59**	**1100 J**
Y3-S-17	**220**	**210**	**95**	**150**	**130**	**190**	**320**	**120**	**59**	**16 J**	**60**	**1300 J**
Y3-S-19	**130**	**150**	**64**	**88**	**120**	**72**	**190**	**81**	**39**	20 U	**38**	**780**
Y3-S-24	**350**	**300**	**140**	**210**	**210**	**250**	**460**	**160**	**72**	**18 J**	**73**	**1800 J**
Y3-WC-13	**1400**	**1400**	**590**	**960**	**1000**	**1100**	**2100**	**840**	**320**	**69 J**	**340**	**8000 J**
Y3-WC-14	**980**	**910**	**380**	**520**	**670**	**720**	**1400**	**490**	**220**	**45**	**230**	**5200**
	1 U	1 U	1 U	1 U	1 U	1 U		1 U	1 U	1 U	1 U	

TABLE 1 - Summary of Utilities' Sediment Quality Data - May 2007 (Year 3)

Head Thea Foss Waterway
Tacoma, Washington

metals - mg/kg, dry
organics - µg/kg, dry

	Dibenzo-furan	*bis* (2-Ethylhexyl)-phthalate	Aroclor 1016	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Aroclor 1221	Aroclor 1232	Sum PCBs
Field Sample I.D.	132-64-9	117-81-7	12674-11-2	53469-21-9	12672-29-6	11097-69-1	11096-82-5	11104-28-2	11141-16-5	
SQOs	540	1300	na	na	na	na	na	na	na	300
Early Warning Samples										
Y3-RC01-S	150 U	**14,000**	9.9 U	9.9 U	30 U	**100**	**72**	9.9 U	9.9 U	**172**
Y3-RC02-S	**110 J**	**9500**	9.8 U	9.8 U	39 U	**78**	**55**	9.8 U	9.8 U	**133**
Y3-RC03-S	76 U	**2600**	9.7 U	9.7 U	15 U	**26 Jc**	**38**	9.7 U	9.7 U	**64**
Y3-RC04-S	110 U	**5100**	9.9 U	9.9 U	25 U	**67**	**73**	9.9 U	9.9 U	**140**
Y3-RC05-S	150 U	**4000**	9.7 U	9.7 U	29 U	**61**	**82**	9.7 U	9.7 U	**143**
Y3-RC06-S	120 U	**5600**	9.8 U	9.8 U	29 U	**54**	**72**	9.8 U	9.8 U	**126**
Y3-RC07-S	96 U	**3700**	9.9 U	9.9 U	25 U	**52**	**53**	9.9 U	9.9 U	**105**
Y3-RC08-S	120 U	**4300**	9.9 U	9.9 U	35 U	**56**	**80**	9.9 U	9.9 U	**136**
Y3-RC09-S	130 U	**6200**	9.8 U	9.8 U	29 U	**60**	**62**	9.8 U	9.8 U	**122**
Y3-RC10-S	67 U	**1600**	9.8 U	9.8 U	9.8 U	**20 Jc**	**20**	9.8 U	9.8 U	**40**
Y3-RC11-S	60 U	**6100**	9.9 U	9.9 U	25 U	**60**	**78**	9.9 U	9.9 U	**138**
Y3-RC12-S	72 U	**2200**	9.8 U	9.8 U	24 U	**32**	**40**	9.8 U	9.8 U	**72**
Y3-RC13-S	**120 J**	**7300**	9.8 U	9.8 U	30 U	**82**	**110**	9.8 U	9.8 U	**192**
Y3-RC14-S	**72 J**	**4200**	10 U	10 U	20 U	**60**	**62**	10 U	10 U	**122**
Y3-RC15-S	110 U	**5100**	9.8 U	9.8 U	**19 Jc**	**49**	**66**	9.8 U	9.8 U	**134**
Y3-RB-01	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	
Compliance Samples										
Y3-WC-01	77 U	**2300**								
Y3-WC-02	160 U	**4900**								
Y3-WC-03	69 U	**1800**								
Y3-WC-04	66 U	**2300**								
Y3-WC-05	92 U	**4000**								
Y3-WC-06	85 U	**2800**								
Y3-WC-07	84 U	**3600**								
Y3-WC-08	**24 J**	**2000**								
Y3-WC-09	**24 J**	**2200**								
Y3-WC-10	20 U	**410**	9.9 U	9.9 U	9.9 U	9.9 U	9.9 U	9.9 U	9.9 U	9.9 U
Y3-WC-11	20 U	**640**	9.7 U	9.7 U	9.7 U	9.7 U	9.7 U	9.7 U	9.7 U	9.7 U
Y3-WC-12	20 U	**640**	9.9 U	9.9 U	9.9 U	9.9 U	9.9 U	9.9 U	9.9 U	9.9 U
Y3-S-15	20 U	**500**	9.7 U	9.7 U	9.7 U	9.7 U	9.7 U	9.7 U	9.7 U	9.7 U
Y3-S-15	20 U	**590**	9.8 U	9.8 U	9.8 U	9.8 U	9.8 U	9.8 U	9.8 U	9.8 U
Y3-S-17	20 U	**620**	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Y3-S-19	20 U	**300**	9.8 U	9.8 U	9.8 U	9.8 U	9.8 U	9.8 U	9.8 U	9.8 U
Y3-S-24	20 U	**790**	9.8 U	9.8 U	9.8 U	9.8 U	9.8 U	9.8 U	**18**	**18**
Y3-WC-13	**34 J**	**2700**								
Y3-WC-14	**21 J**	**2100**								
	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	

TABLE 2 - Fine Grained Layer Thicknesses and "Fines" Contents of Samples

Head Thea Foss Waterway
Tacoma, Washington

Location	Apr-04			Nov./Dec-04			May -05		
	Fines Thickness (cm)	Sample Thickness (cm)(a)	% Fines (GS)(b)	Fines Thickness (cm)	Sample Thickness (cm)(a)	% Fines (GS)(b)	Fines Thickness (cm)	Sample Thickness (cm)	% Fines (GS)(b)
Early Warning Samples									
RC-1	(c)	2	12	1	2	6.3	1.5	2	30
RC-1B	-----	-----	-----	-----	-----	----	-----	-----	----
RC-2	(c)	2	36	8	8	44	9	2	51
RC-3	(c)	2	73	12	12	54	10	2	39
RC-4	(c)	2	34	9	9	46	13	2	68
RC-5	(c)	2	54	11	11	58	10	2	60
RC-6	(c)	2	26	5	5	53	4.5	2	55
RC-7	(c)	2	6.2	4	4	33	3	2	26
RC-8	(c)	2	5.2	5	5	47	4	2	62
RC-9	(c)	2	25	6	6	40	5.5	2	64
RC-10	(c)	2	20	3	3	52	5	2	65
RC-11	(c)	2	24	7	-----	-----	10.5	2	79
RC-12	(c)	2	1.9	3	3	67	5	2	72
RC-13	(c)	2	18	1	2	6.3	1	2	15
RC-14	(c)	2	34	1	2	13	1.5	2	20
RC-14B	-----	-----	-----	-----	-----	-----	1.5	2	18
S-16	-----	-----	-----	5	5	62	5	-----	-----
S-17	-----	-----	-----	2	2	48	6	-----	-----
S-18	-----	-----	-----	7	7	40	3	-----	-----
S-19	-----	-----	-----	4	4	60	8	-----	-----
S-20	-----	-----	-----	2	2	21	3.5	-----	-----
S-21	-----	-----	-----	7	7	69	-----	-----	-----
S-22	-----	-----	-----	8	8	48	6.5	-----	-----
S-23	-----	-----	-----	3	3	39	-----	-----	-----
S-24	-----	-----	-----	2	3	43	6	-----	-----
Compliance Samples									
WC-1	(c)	10	7.8	1	10	7.2	1.5	10	-----
WC-1B	-----	-----	-----	-----	-----	-----	-----	-----	-----
WC-2	(c)	10	24	8	10	-----	9	10	37
WC-3	(c)	10	43	12	10	-----	10	10	-----
WC-4	(c)	10	16	9	10	37	13	10	37
WC-5	(c)	10	31	11	10	61	10	10	48
WC-6	(c)	10	11	5	-----	-----	4.5	10	-----

TABLE 2 - Fine Grained Layer Thicknesses and "Fines" Contents of Samples

Head Thea Foss Waterway
Tacoma, Washington

Location	Apr-04			Nov./Dec-04			May -05		
	Fines Thickness (cm)	Sample Thickness (cm)(a)	% Fines (GS)(b)	Fines Thickness (cm)	Sample Thickness (cm)(a)	% Fines (GS)(b)	Fines Thickness (cm)	Sample Thickness (cm)	% Fines (GS)(b)
WC-7	(c)	10	2.5	4	10	17	3	10	7.2
WC-8	(c)	10	3.3	5	-----	-----	4	10	-----
WC-9	(c)	10	11	6	10	31	5.5	10	-----
WC-10	(c)	10	7.1	3	10	15	5	10	-----
WC-11	(c)	10	13	7	10	33	10.5	10	77
WC-12	(c)	10	2	3	10	25	5	10	-----
WC-13	(c)	10	5.7	-----	-----	-----	-----	-----	-----
WC-14	(c)	10	9.0	-----	-----	-----	-----	-----	-----
S-15	-----	-----	-----	12	10	52	11.5	10	58
S-16	-----	-----	-----	5	10	28	5	10	-----
S-17	-----	-----	-----	2	10	-----	6	10	43
S-18	-----	-----	-----	7	10	-----	3	10	-----
S-19	-----	-----	-----	4	10	25	8	10	-----
S-20	-----	-----	-----	2	10	-----	3.5	10	-----
S-21	-----	-----	-----	7	10	-----	-----	-----	-----
S-22	-----	-----	-----	8	10	-----	6.5	10	-----
S-23	-----	-----	-----	3	-----	-----	-----	-----	-----
S-24	-----	-----	-----	2	10	-----	6	10	25
S-25	-----	-----	-----	7	-----	-----	-----	-----	-----
S-26	-----	-----	-----	2	-----	-----	-----	-----	-----
S-27	-----	-----	-----	5	-----	-----	-----	-----	-----
S-28	-----	-----	-----	2	-----	-----	-----	-----	-----
S-29	-----	-----	-----	4	10	-----	5	10	-----
S-30	-----	-----	-----	1	-----	-----	3	10	-----

Notes: (a) - In Nov./Dec. 2004, "RC" designated samples consisted of the full thickness of the fine grained sediment that had accumulated on the Utilities' Cap, except where accumulations were less than 2 cm. Where less than 2 cm of fine grained sediment was present, a 0 to 2 cm thick sample was obtained that also included some of the underlying capping material.

(b) - Based on grain size analysis (GS), less than 62.5 micron (um) in size

(c) - A variable thickness of a fine sandy silt material was observed to have accumulated since the final capping material was placed. This fine-grained material ranged from a thin coating up to approximately 1 cm thick and comprised a larger percentage of the 0 to 2 cm samples as compared to the 0 to 10 cm samples.

TABLE 2 - Fine Grained Layer Thicknesses and "Fines" Contents of Samples

Location	May -06			May -07		
	Fines Thickness (cm)	Sample Thickness (cm)	% Fines (GS)(b)	Fines Thickness (cm)	Sample Thickness (cm)	% Fines (GS)(b)
Early Warning Samples						
RC-1	-----	2	27	-----	2	24
RC-1B	19	-----	-----	-----	-----	-----
RC-2	16	2	52	13+	2	36
RC-3	11	2	46	13	2	32
RC-4	9 to 17	2	46	13	2	53
RC-5	12	2	51	14	2	51
RC-6	1 to 10	2	30	12	2	45
RC-7	6	2	41	12+	2	34
RC-8	7	2	47	7	2	42
RC-9	7	2	58	9	2	49
RC-10	0.5	2	7.5	1	2	19
RC-11	1	2	8.7	3	2	50
RC-12	1	2	11	3	2	25
RC-13	2	2	36	-----	2	40
RC-14	2	2	23	-----	2	24
RC-14B	1	2	25	-----	-----	-----
S-16	-----	-----	-----	-----	-----	-----
S-17	0.5	-----	-----	2	-----	-----
S-18	-----	-----	-----	-----	-----	-----
S-19	2	-----	-----	4	-----	-----
S-20	-----	-----	-----	-----	-----	-----
S-21	-----	-----	-----	-----	-----	-----
S-22	-----	-----	-----	-----	-----	-----
S-23	-----	-----	-----	-----	-----	-----
S-24	0.5	-----	-----	1	-----	-----
Compliance Samples						
WC-1	-----	10	35	-----	-----	-----
WC-1B	19	-----	-----	-----	-----	-----
WC-2	16	10	57	13+	-----	-----
WC-3	11	10	40	13	-----	-----
WC-4	9 to 17	10	36	13	-----	-----
WC-5	12	10	51	14	-----	-----
WC-6	1 to 10	10	26	12	-----	-----

TABLE 2 - Fine Grained Layer Thicknesses and "Fines" Contents of Samples

Location	May -06			May -07		
	Fines Thickness (cm)	Sample Thickness (cm)	% Fines (GS)(b)	Fines Thickness (cm)	Sample Thickness (cm)	% Fines (GS)(b)
WC-7	6	10	21	11+	-----	-----
WC-8	7	10	38	7	-----	-----
WC-9	7	10	40	9	-----	-----
WC-10	0.5	10	4.7	1	-----	-----
WC-11	1	10	8.1	3	-----	-----
WC-12	1	10	5	3	-----	-----
WC-13	7	10	35	-----	-----	-----
WC-14	7	10	52	13+	-----	-----
S-15	2	10	9.3	3	10	-----
S-16	-----	-----	-----	-----	-----	-----
S-17	0.5	10	5.5	2	10	-----
S-18	-----	-----	-----	-----	-----	-----
S-19	2	10	10	4	10	-----
S-20	-----	-----	-----	-----	-----	-----
S-21	-----	-----	-----	-----	-----	-----
S-22	-----	-----	-----	-----	-----	-----
S-23	-----	-----	-----	-----	-----	-----
S-24	0.5	10	4.2	1	10	
S-25	-----	-----	-----	-----	-----	-----
S-26	-----	-----	-----	-----	-----	-----
S-27	-----	-----	-----	-----	-----	-----
S-28	-----	-----	-----	-----	-----	-----
S-29	-----	-----	-----	-----	-----	-----
S-30	-----	-----	-----	-----	-----	-----

Notes: (a) - In Nov./Dec. 2004, "RC" designated samples consisted of the full thickness of the fine grained sediment that had accumulated on the Utilities' Cap, except where accumulations were less than 2 cm. Where less than 2 cm of fine grained sediment was present, a 0 to 2 cm thick sample was obtained that also included some of the underlying capping material.

(b) - Based on grain size analysis (GS), less than 62.5 micron (um) in size

(c) - A variable thickness of a fine sandy silt material was observed to have accumulated since the final capping material was placed. This fine-grained material ranged from a thin coating up to approximately 1 cm thick and comprised a larger percentage of the 0 to 2 cm samples as compared to the 0 to 10 cm samples.

TABLE 3 - Summary of Average Early Warning Sediment Concentrations

Head Thea Foss Waterway
Tacoma, Washington

Location	Lead				Mercury				Zinc				LPAH				HPAH			
	2004	2005	2006	2007	2004	2005	2006	2007	2004	2005	2006	2007	2004	2005	2006	2007	2004	2005	2006	2007
Util. Work Area																				
RC-1	25	104	90	111	<0.06	0.2	0.1	0.3	74	289	287	380	160	2340	1930	2010	2667	18570	17890	12143
RC-2	20	122	97	114	<0.10	0.3	0.2	0.2	71	261	254	539	197	2844	2550	3350	1033	17390	21710	26160
RC-3	44	55	62	36	0.1	0.21	0.16	0.1	115	123	166	113	586	1740	1180	830	2279	8603	12190	7121
RC-4	19	140	44	77	0.08	0.5	0.2	0.32	70	254	108	227	191	4730	2050	1374	868	19830	15680	11152
RC-5	19	108	76	78	0.09	0.3	0.19	0.2	70	187	189	220	74	5110	910	930	259	19780	10290	8483
RC-6	18	114	47	86	<0.08	0.3	0.11	0.18	56	216	121	227	164	3070	740	1371	1050	13610	8280	11734
RC-7	6	70	70	64	<0.05	0.22	0.15	0.15	41	141	169	173	26	2382	1350	1083	270	9818	11160	8297
RC-8	5	145	73	70	<0.06	0.5	0.22	0.18	33	215	150	184	28	4640	1974	1451	213	17310	13800	10820
RC-9	15	144	76	86	<0.07	0.5	0.28	0.2	53.3	211	158	221	130	5030	1790	1200	577	20490	13220	10970
RC-10	11	159	15	33	<0.06	0.6	<0.04	0.08	44	203	52	102	159	9570	79	414	392	25330	917	3825
RC-11	35	178	13	73	0.13	0.84	<0.06	0.19	83	231	56.9	195	338	9860	110	1012	881	25090	1471	8349
RC-12	4	186	19	39	<0.05	0.8	<0.05	0.14	44	217	59.9	109	<20	18510	396	904	22	39650	2906	5438
RC-13	42	38	73	113	0.07	0.08	0.12	0.2	99	118	208	109	303	686	1130	3700	4180	5760	12940	30440
RC-14	54	58	67	70	0.1	0.13	0.13	0.1	167	203	219	256	658	996	830	2140	7360	8686	8890	15730
Average	**23**	**116**	**59**	**75**	**0.08**	**0.39**	**0.14**	**0.18**	**73**	**205**	**157**	**218**	**217**	**5108**	**1216**	**1555**	**1575**	**17851**	**10810**	**12190**

Location	Lead				Mercury				Zinc				LPAH				HPAH			
	2004	2005	2006	2007	2004	2005	2006	2007	2004	2005	2006	2007	2004	2005	2006	2007	2004	2005	2006	2007
Turning Basin																				
RC-1	25	104	90	111	<0.06	0.2	0.1	0.3	74	289	287	380	160	2340	1930	2010	2667	18570	17890	12143
RC-2	20	122	97	114	<0.10	0.3	0.2	0.2	71	261	254	539	197	2844	2550	3350	1033	17390	21710	26160
RC-3	44	55	62	36	0.1	0.21	0.16	0.1	115	123	166	113	586	1740	1180	830	2279	8603	12190	7121
RC-4	19	140	44	77	0.08	0.5	0.2	0.32	70	254	108	227	191	4730	2050	1374	868	19830	15680	11152
RC-5	19	108	76	78	0.09	0.3	0.19	0.2	70	187	189	220	74	5110	910	930	259	19780	10290	8483
RC-6	18	114	47	86	<0.08	0.3	0.11	0.18	56	216	121	227	164	3070	740	1371	1050	13610	8280	11734
RC-7	6	70	70	64	<0.05	0.22	0.15	0.15	41	141	169	173	26	2382	1350	1083	270	9818	11160	8297
Average	**22**	**102**	**69**	**81**	**<0.08**	**0.29**	**0.16**	**0.21**	**71**	**210**	**185**	**268**	**200**	**3174**	**1530**	**1564**	**1204**	**15372**	**13886**	**12156**

TABLE 3 - Summary of Average Early Warning Sediment Concentrations

Location	BEHP				PCBs			
	2004	2005	2006	2007	2004	2005	2006	2007
Util. Work Area								
RC-1	1300	8200	8300	14000	5.7	200	95	172
RC-2	470	7300	8700	9500	6.3	300	169	133
RC-3	1100	3200	5100	2600	7.2	178	134	64
RC-4	360	6700	5900	5100	5.7	172	108	140
RC-5	110	5600	5400	4000	4.3	273	142	143
RC-6	500	4400	3900	5600	9.2	192	113	126
RC-7	180	4400	5400	3700	nd	120	97	105
RC-8	110	3500	5400	4300	nd	188	112	136
RC-9	230	3500	4700	6200	6.5	219	226	122
RC-10	80	3600	420	1600	nd	272	28	40
RC-11	280	3500	1100	6100	11	381	9.8	138
RC-12	60	3800	1300	2200	nd	275	43	72
RC-13	1400	2100	3700	7300	nd	80	98	192
RC-14	3000	3600	3600	4200	nd	110	62	122
Average	**656**	**4529**	**4494**	**5457**	**7**	**211**	**103**	**122**

Location	BEHP				PCBs			
	2004	2005	2006	2007	2004	2005	2006	2007
Turning Basin								
RC-1	1300	8200	8300	14000	5.7	200	95	172
RC-2	470	7300	8700	9500	6.3	300	169	133
RC-3	1100	3200	5100	2600	7.2	178	134	64
RC-4	360	6700	5900	5100	5.7	172	108	140
RC-5	110	5600	5400	4000	4.3	273	142	143
RC-6	500	4400	3900	5600	9.2	192	113	126
RC-7	180	4400	5400	3700	nd	120	97	105
Average	**574**	**5686**	**6100**	**6357**	**6**	**205**	**123**	**126**

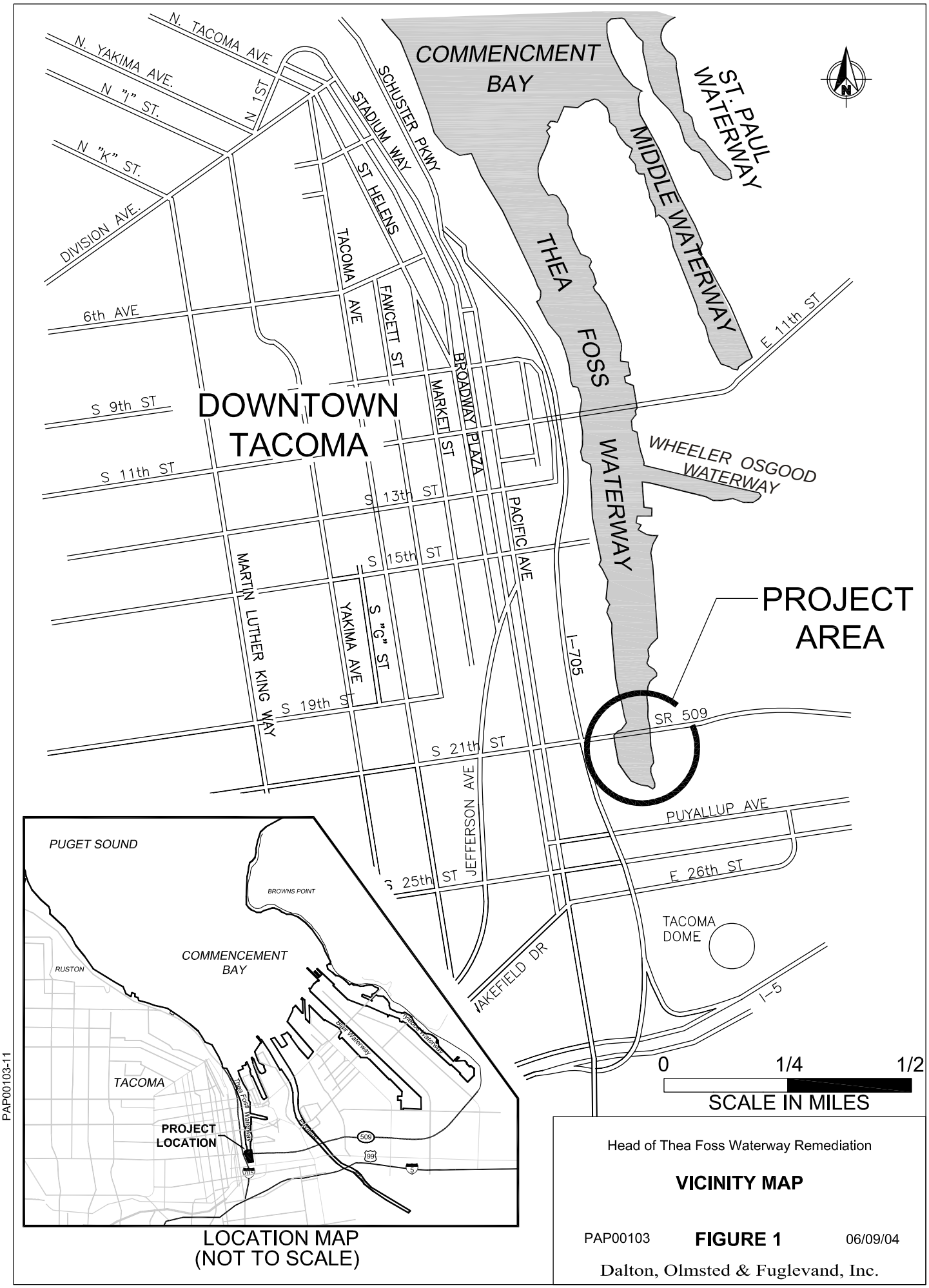
TABLE 4 - Sediment Trap Concentrations - 2002 to 2006

Head of Thea Foss Waterway
Tacoma, WA

	Lead	Mercury	Zinc	Diesel	Heavy Oil	LPAH	HPAH	BEHP	4,4'-DDD	4,4'-DDE	4,4'-DDT	T-PCBs
Units	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(ug/kg)**	**(ug/kg)**	**(ug/kg)**	**(ug/kg)**	**(ug/kg)**	**(ug/kg)**	**(ug/kg)**
SQO	450	0.59	410	None	None	5200	17000	1300	16	9	34	300
237A-FD2												
3/26/2002	78.9	0.04	220 J	160	2100	2263	17850	4600	6.3 U	6.3 U	8.5	84
4/28/2003	114 J	0.11 J	365 J	130	3700	5920	40020	22000	4 UJ	4 U	28.6 J	62
4/8/2004	114	0.07 J	307	97	2000	5840	35220	11000	8 UJ	8 UJ	11 J	110
4/19/2005	74.5	0.06 J	290	72	2400	5750	36000	14000	9.5 U	9.5 U	9.5 U	101
4/6/2006	81.5	0.05	267	69	2600	4080	28530	8800	3.3 U	3.3 U	3.3 U	197
237B-FD1												
3/26/2002	56.7	0.05	185 J	37 J	1400	823	4193	3000	1.4 B	1.3 B	4.2 B	30
4/28/2003	129 J	0.16 J	277 J	72	3000	4509	28310	17000	4 UJ	4 U	12.9 J	8 U
4/8/2004	72.3	0.10 J	233	60	1800	3349	20100	8500	8 UJ	8 UJ	9.3 J	75 U
4/19/2005	35.7	0.04 UJ	123	25 U	750	1960	6090	3600	8.2 U	8.2 U	8.2 U	35
4/6/2006	50.8	0.04 J	211	25 U	1400	860	8160	5100	3.2 UJ	3.2 UJ	3.2 UJ	88 B
235-FD6												
3/26/2002	144	0.08	348	110	3100	1158	6550	9700	5.8 U	5.8 U	14	79
4/28/2003	202	0.08	332	130 UJ	2300	2200	11030	22000	6.3 UJ	6.3 U	6.3 U	40.6
4/8/2004	96.4	0.06 J	296	92	1700	1322	5588	10000	7.9 UJ	7.9 UJ	7.9 UJ	65 U
4/19/2005	94.9	0.05 J	219	86	1600	1400	4680	15000	10 U	10 U	10 U	23
5/5/2006	183	0.05 J	323	99	3300	3650	14070	1600	3.2 UJ	3.2 UJ	3.2 UJ	79 B
243-FD23												
3/26/2002	388	0.60	742	670	3800	1529	7440	16000	-----	-----	-----	-----
4/28/2003	-----	-----	-----	190	7200	4830	15720	41000	34 U	34 U	34 U	220
4/8/2004	430	0.97 J	649	220	4700	2037	10020	18000	8 UJ	8 UJ	9.6 J	206
4/19/2005	-----	-----	-----	240	6600	3140	8500	37000	-----	-----	-----	-----
4/6/2007	620	0.96	790	210	6100	2390	11900	29000	12 UJ	12 UJ	12 UJ	160 U
Range (detections)												
High	620	0.972	790	670	7200	5920	40020	41000	1.4 B	1.3 B	34	220
Low	35.7	0.036	123	25	750	823	4193	1600	1.4 B	1.3 B	3.2	8
Average	165	0.15	343	140	3078	2951	15999	14845	-----	-----	11	93
Geomean	121	0.08	306	102	2632	2476	12567	11028	-----	-----	9	69

Notes: Source - Table E-15 in Stormwater Monitoring, August 2001-2006 Report, Thea Foss and Wheeler-Osgood Waterways, Prepared by City of Tacoma, December 2006.

U - Not detected at indicated value
J - Estimated concentration
C - Analyte detected in laboratory blank
----- - Not reported
SQO - Commencement Bay Sediment Quality Objective



LOCATION MAP
(NOT TO SCALE)

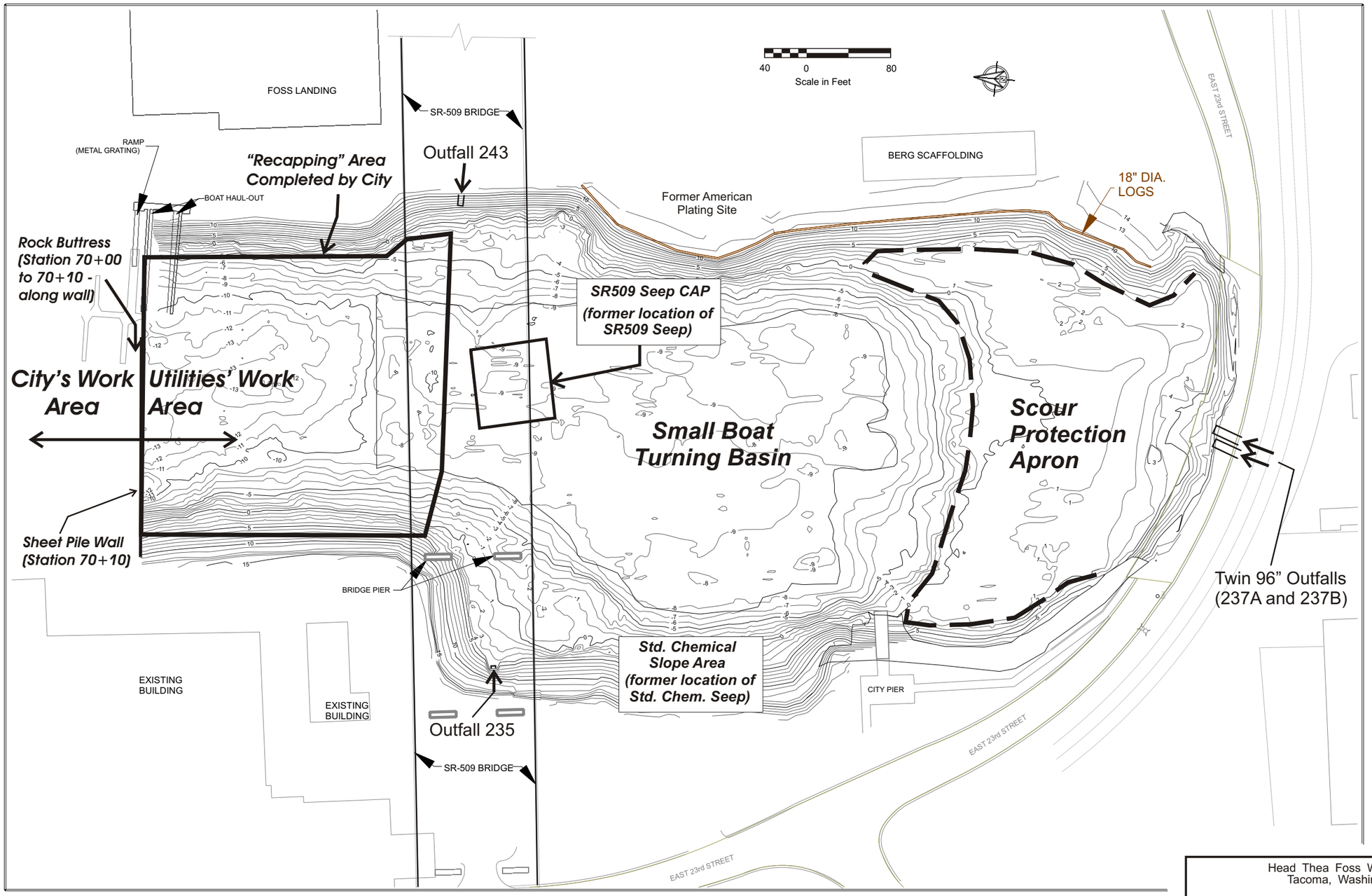
PAP00103-11

Head of Thea Foss Waterway Remediation

VICINITY MAP

PAP00103 **FIGURE 1** 06/09/04

Dalton, Olmsted & Fuglevand, Inc.



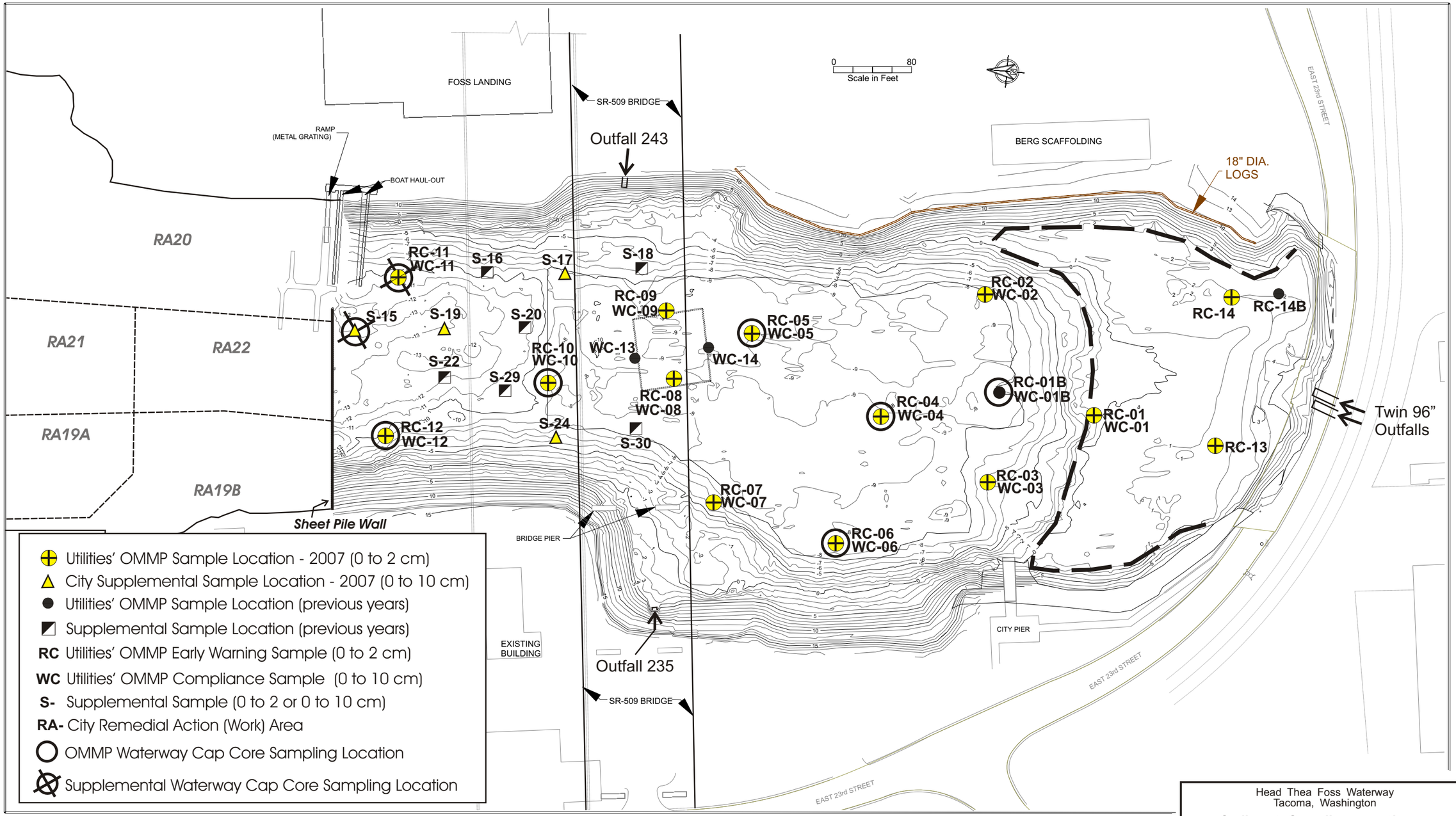
Ref: Head of waterway b 2006.cdr

Head Thea Foss Waterway
Tacoma, Washington

Remedial Features
Utilities' Work Area

PAP-001-04 **FIGURE 2** Sept. 2006

Dalton, Olmsted & Fuglevand, Inc.

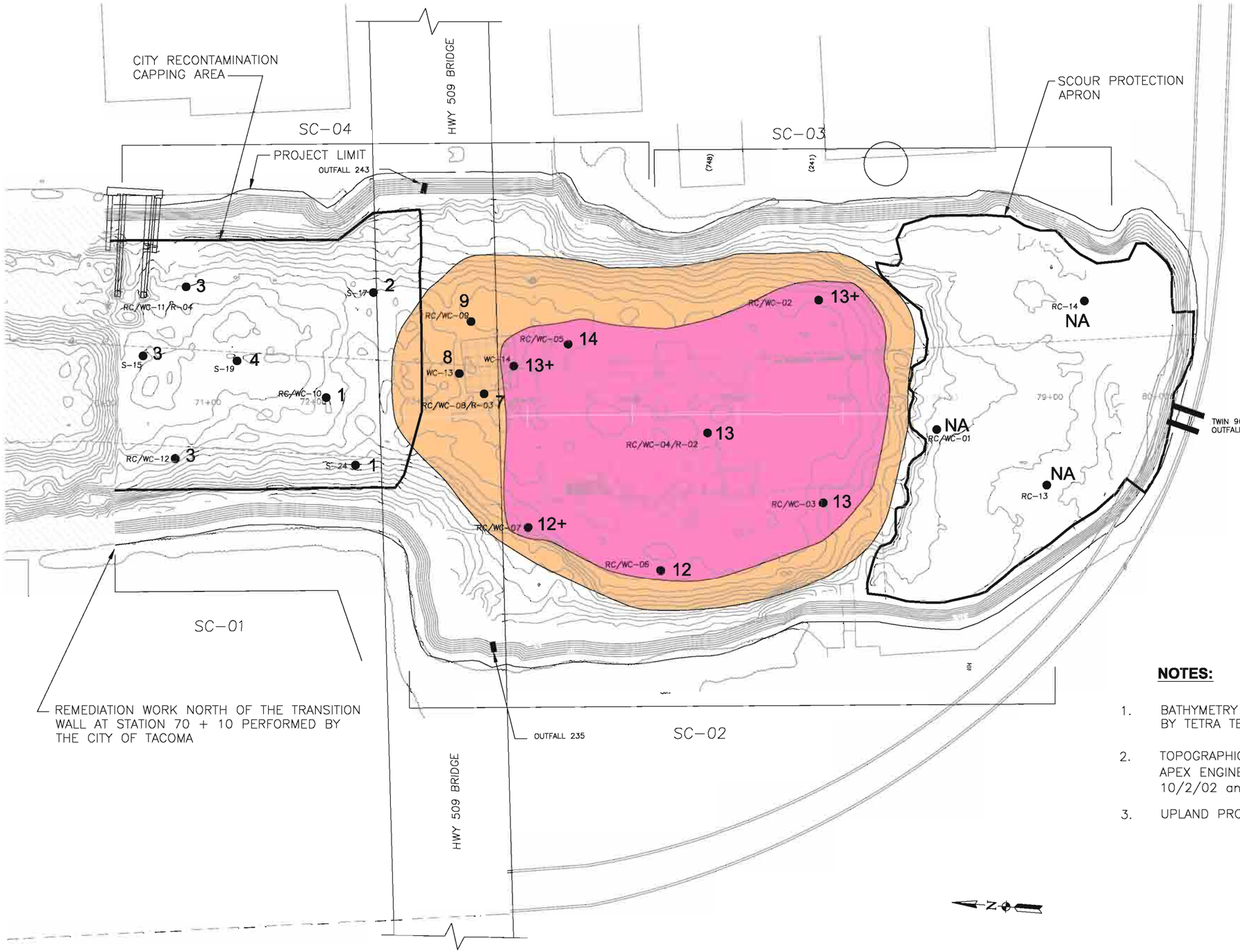


Head Thea Foss Waterway
Tacoma, Washington

Sediment Sampling Locations
Utilities Work Area
April 2004 to May 2007

PAP-001-04 **FIGURE 3** July 2007
Dalton, Olmsted & Fuglevand, Inc.

Ref: Sur Spl Loc Map 2007.cdr



LEGEND:

- MAJOR CONTOUR LINES
- CITY OF TACOMA WORK AREA
- IMPERMEABLE CAP
- FINE-GRAINED SEDIMENT ACCUMULATION >10 CM
- FINE-GRAINED SEDIMENT ACCUMULATION >5 CM
- 13 RC/WC-03 = THICKNESS OF SEDIMENT ACCUMULATION IN CM
- NA = NOT AVAILABLE

NOTES:

1. BATHYMETRY SURVEY UP TO ELEVATION +5 MLLW COMPLETED BY TETRA TECH EC ON MAY 10, 2006
2. TOPOGRAPHIC DATA SHOWN ABOVE +5 MLLW WAS PROVIDED BY APEX ENGINEERING LLC, DATED 2/7/02, 3/8/02, 5/16/02, 10/2/02 and 10/12/02.
3. UPLAND PROJECT LIMIT IS +12 FEET MLLW.

GRAPHIC SCALE
50' 0 25' 50' 100'
(IN FEET)

Thea Foss Waterway

Head of The Thea Foss Waterway
Post-Construction Monitoring

TETRA TECH EC, INC.

Figure 4
Thickness (cm) of Fine-grained Material

May 2007

P:\2562_THEA FOSS\THEA FOSS\OMMP\YEAR 3 MAY 07\CAD\FOSSFIGURE-MAY 07 REVISED\FOSSFIGURE 4 .DWG
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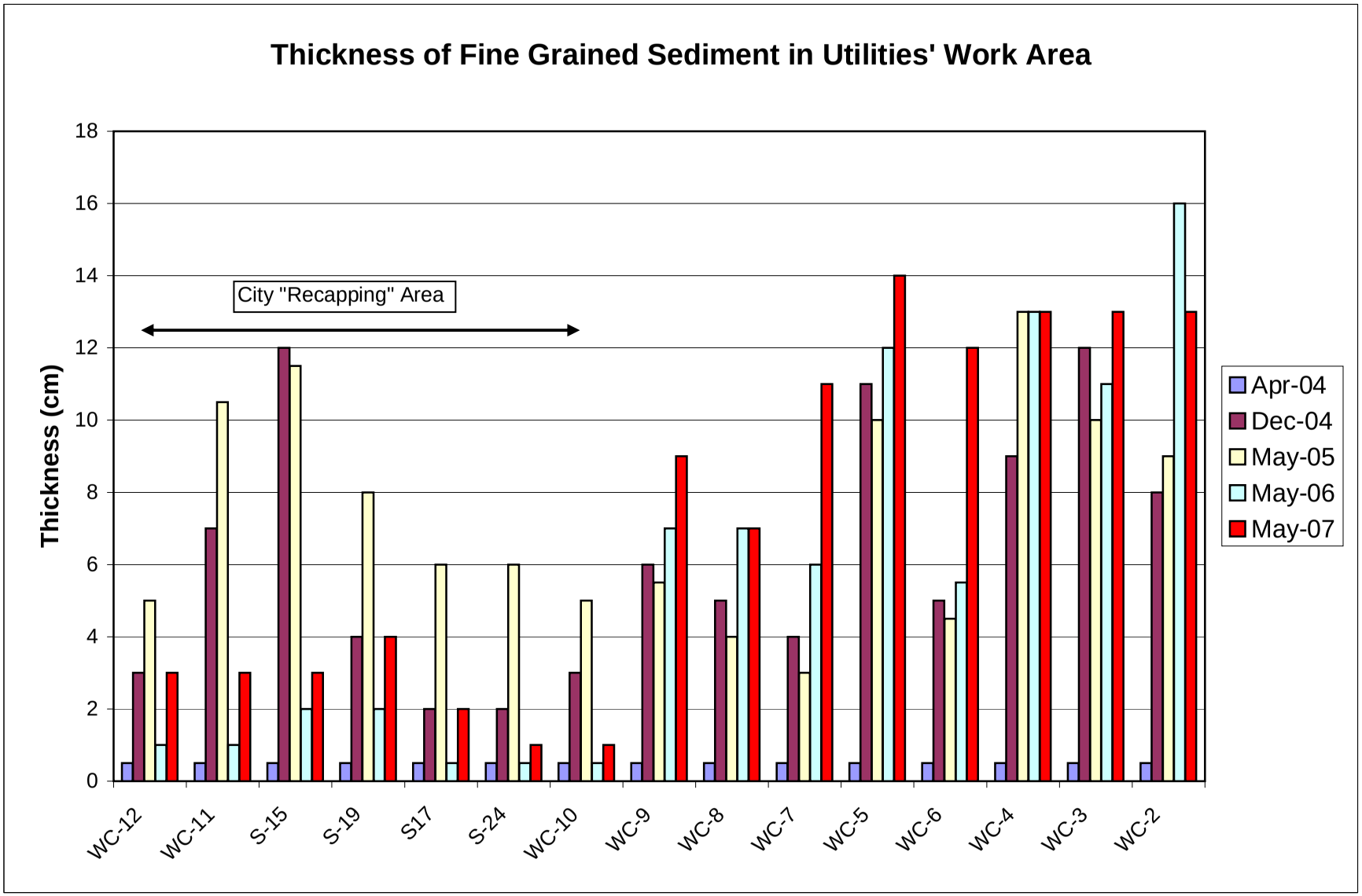

FIGURE 5
Thickness of Fine Grained Sediment

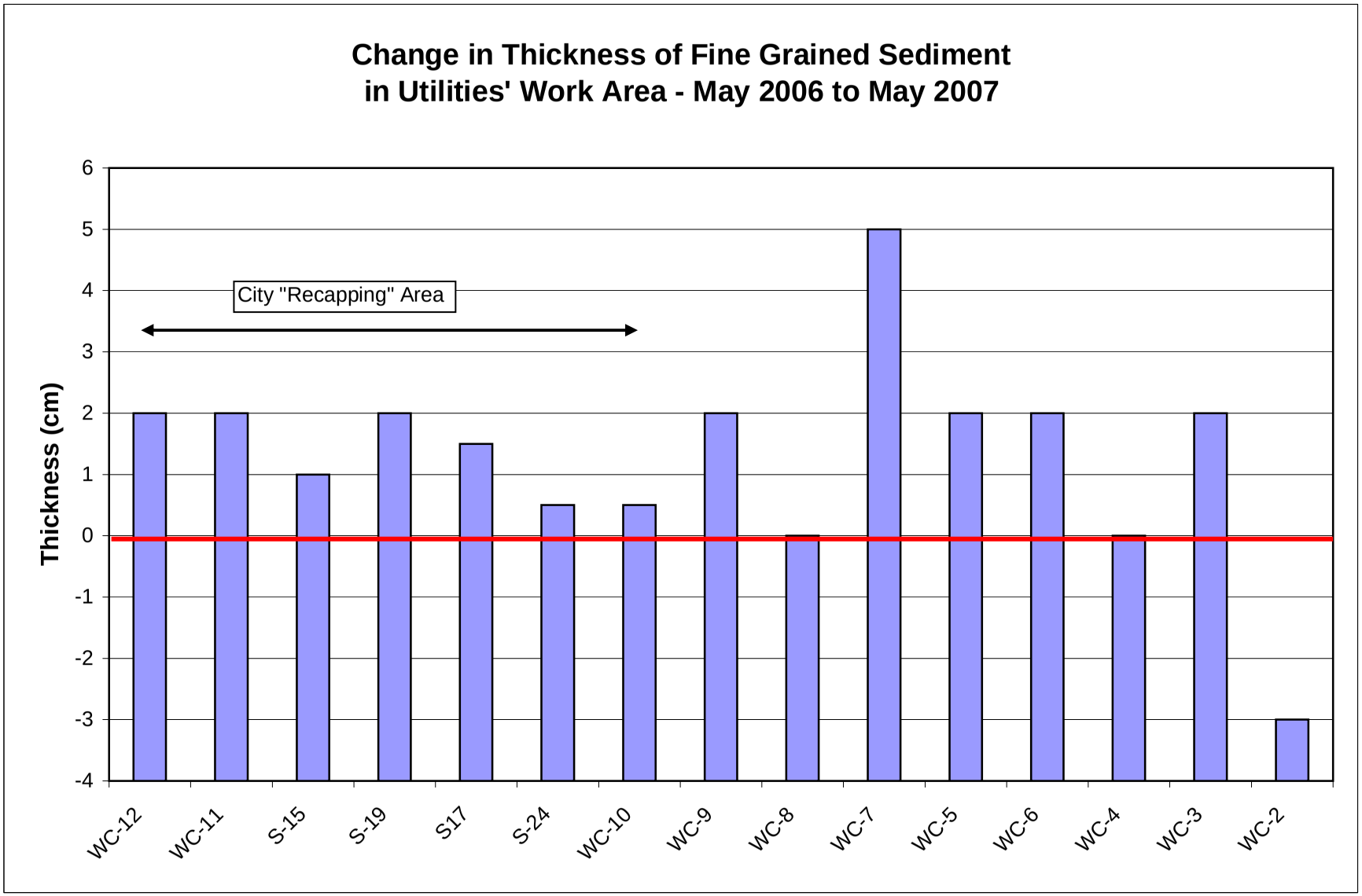

FIGURE 6
Change in Thickness of Fine Grained Sediment 2006 to 2007

Dalton, Olmsted Fuglevand, Inc.

(Fines Thickness - 5-07-Change 06 07)

LEGEND:

- MAJOR CONTOUR LINES
- CITY OF TACOMA WORK AREA
- IMPERMEABLE CAP
- [HPAH] > 17,000 µg/kg — HPAH SQO = 17,000 µg/kg
- [HPAH] > 10,000 to 17,000 µg/kg
- HPAH = High molecular weight Polycyclic Aromatic Hydrocarbons
- 7100 J = HPAH CONCENTRATION IN µg/kg (RC/WC-03)
- NA = NOT AVAILABLE
- J = ESTIMATED VALUE

NOTES:

1. BATHYMETRY SURVEY UP TO ELEVATION +5 MLLW COMPLETED BY TETRA TECH EC ON MAY 10, 2006
2. TOPOGRAPHIC DATA SHOWN ABOVE +5 MLLW WAS PROVIDED BY APEX ENGINEERING LLC, DATED 2/7/02, 3/8/02, 5/16/02, 10/2/02 and 10/12/02.
3. UPLAND PROJECT LIMIT IS +12 FEET MLLW.

GRAPHIC SCALE
50' 0 25' 50' 100'
(IN FEET)

Thea Foss Waterway

Head of The Thea Foss Waterway
Post-Construction Monitoring

TETRA TECH EC, INC.

Figure 7
HPAH Concentration
0-2 cm Sediment
May 2007

P:\2562_THEA FOSS\THEA FOSS\OMMP\YEAR 3 MAY 07\CAD\FOSSFIGURE-MAY 07 REVISED\FOSSFIGURE 7.DWG
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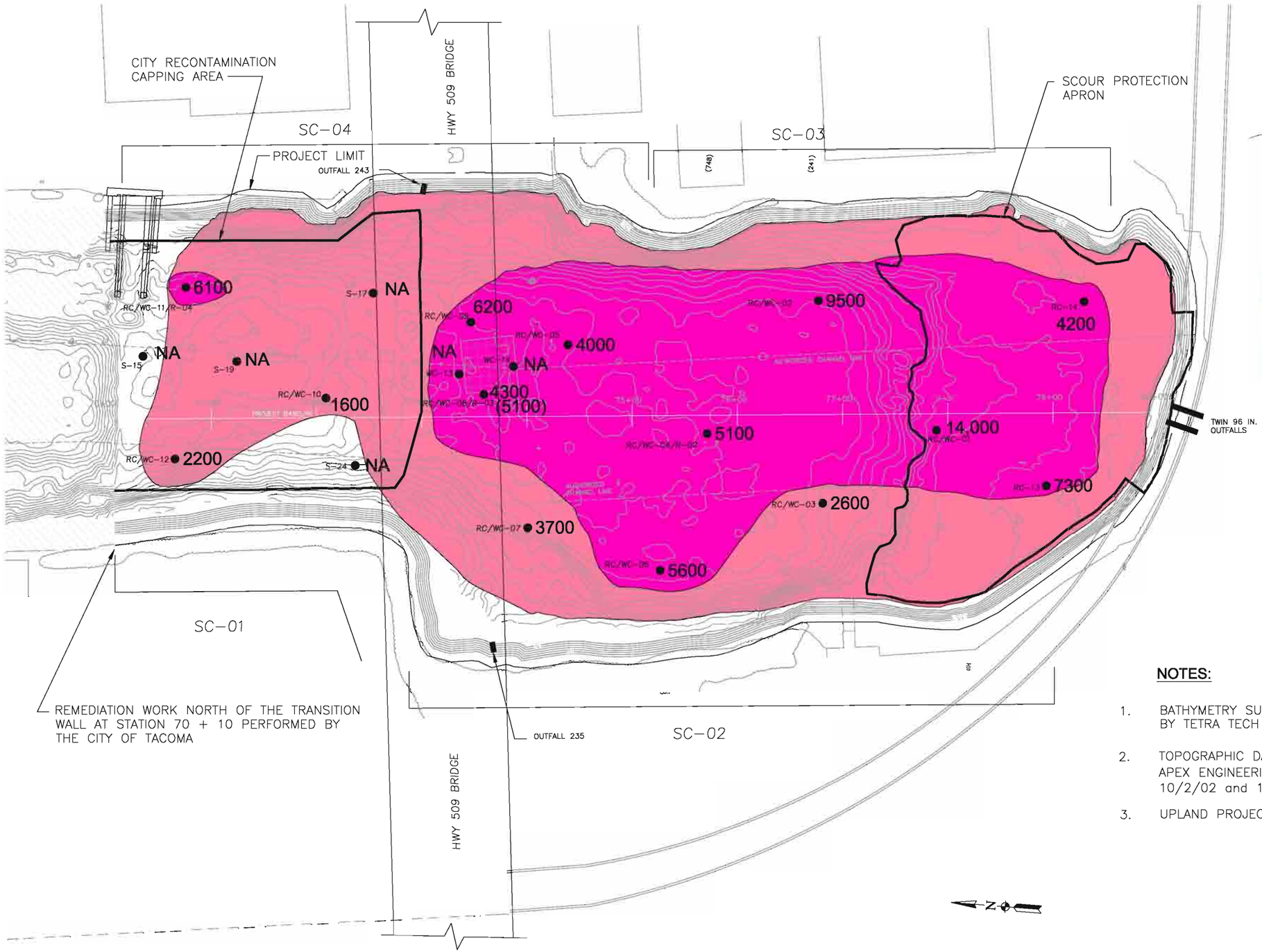

LEGEND:

- MAJOR CONTOUR LINES
- CITY OF TACOMA WORK AREA
- IMPERMEABLE CAP
- [BEHP] > 3,900 µg/kg
- BEHP SQO = 1,300 µg/kg
- [BEHP] > 1,300 to 3,900 µg/kg
- BEHP = BIS (2-Ethylhexyl) phthalate
- 2600 = BEHP CONCENTRATION IN µg/kg
- RC/WC-03
- NA = NOT AVAILABLE

NOTES:

1. BATHYMETRY SURVEY UP TO ELEVATION +5 MLLW COMPLETED BY TETRA TECH EC ON MAY 10, 2006
2. TOPOGRAPHIC DATA SHOWN ABOVE +5 MLLW WAS PROVIDED BY APEX ENGINEERING LLC, DATED 2/7/02, 3/8/02, 5/16/02, 10/2/02 and 10/12/02.
3. UPLAND PROJECT LIMIT IS +12 FEET MLLW.

GRAPHIC SCALE
50' 0 25' 50' 100'
(IN FEET)

Thea Foss Waterway

Head of The Thea Foss Waterway
Post-Construction Monitoring

TETRA TECH EC, INC.

Figure 8
BEHP Concentration
0-2 cm Sediment
May 2007

P:\2562_THEA FOSS\THEA FOSS\OMMP\YEAR 3 MAY 07\CAD\FOSSFIGURE-MAY 07 REVISED\FOSSFIGURE 8.DWG
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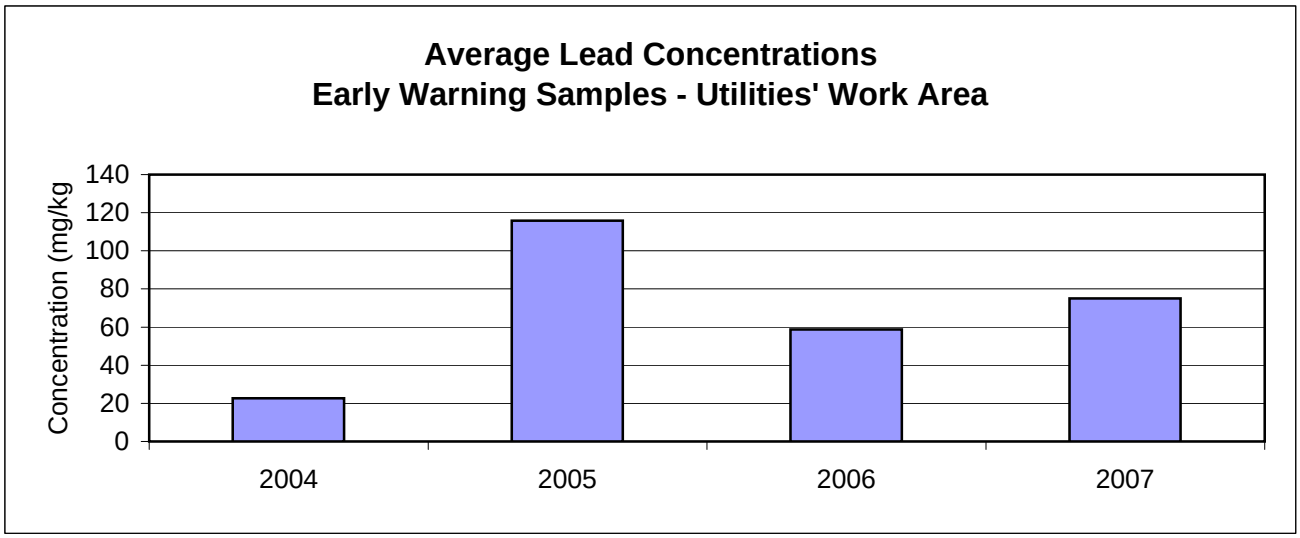
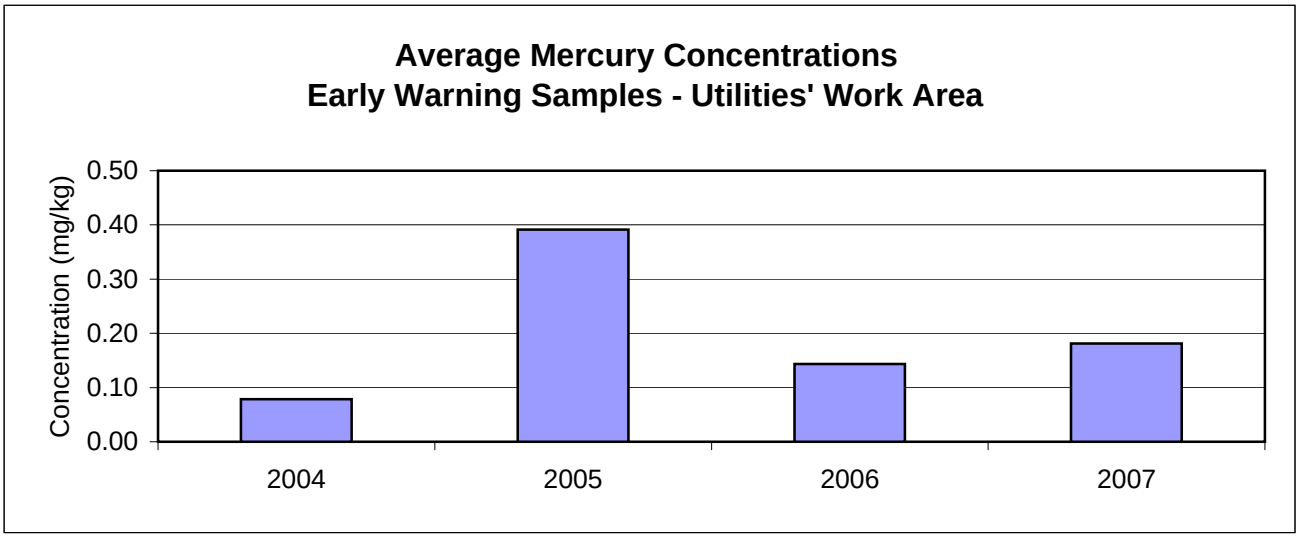




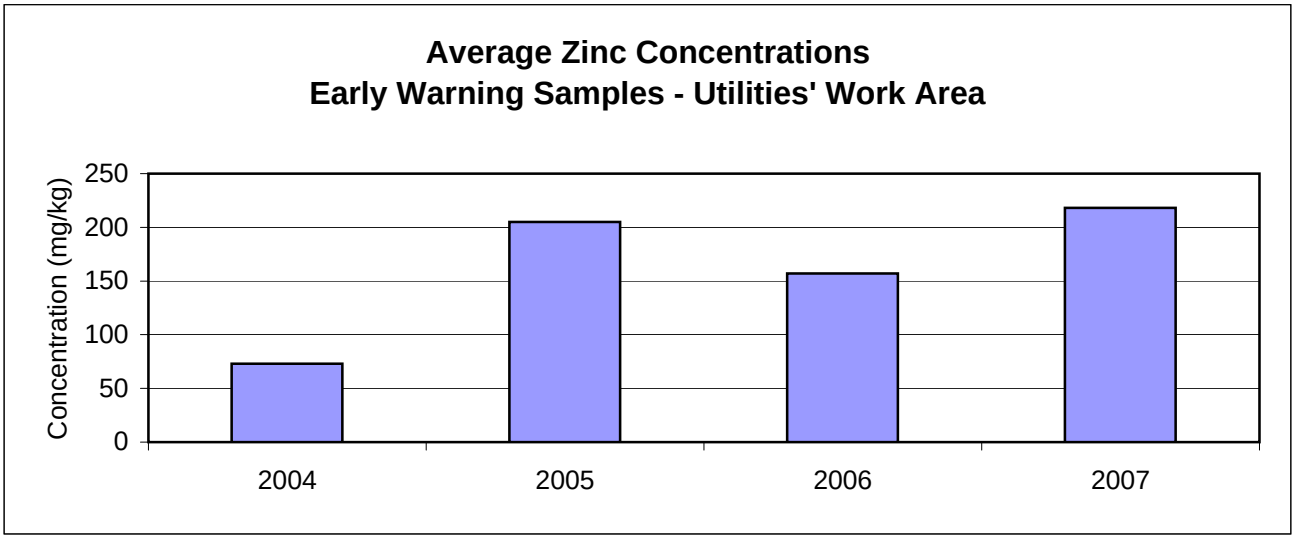
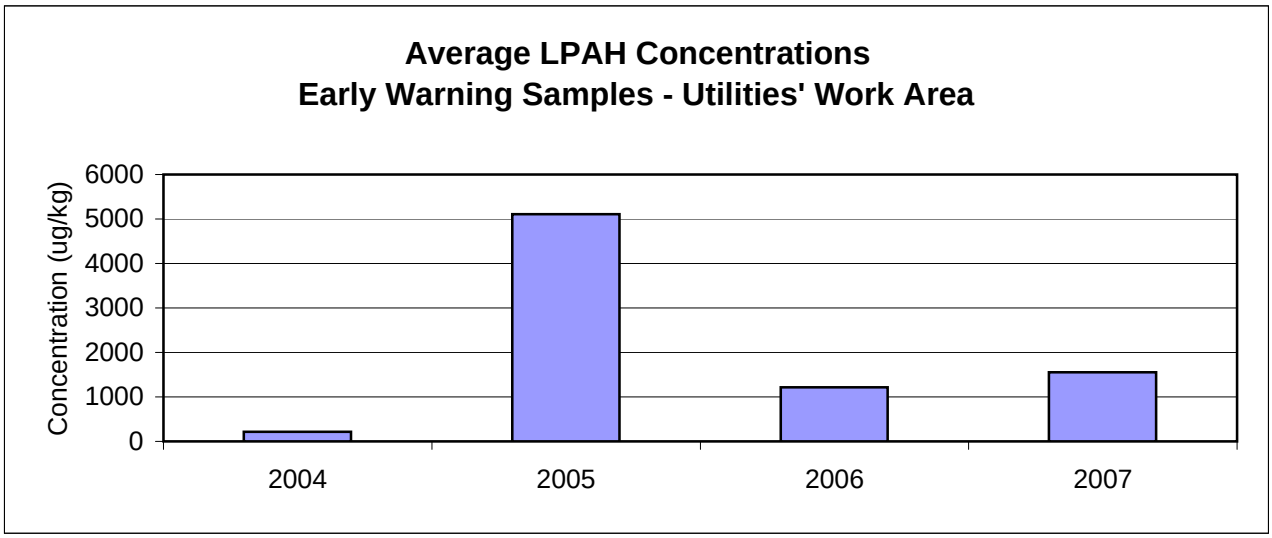
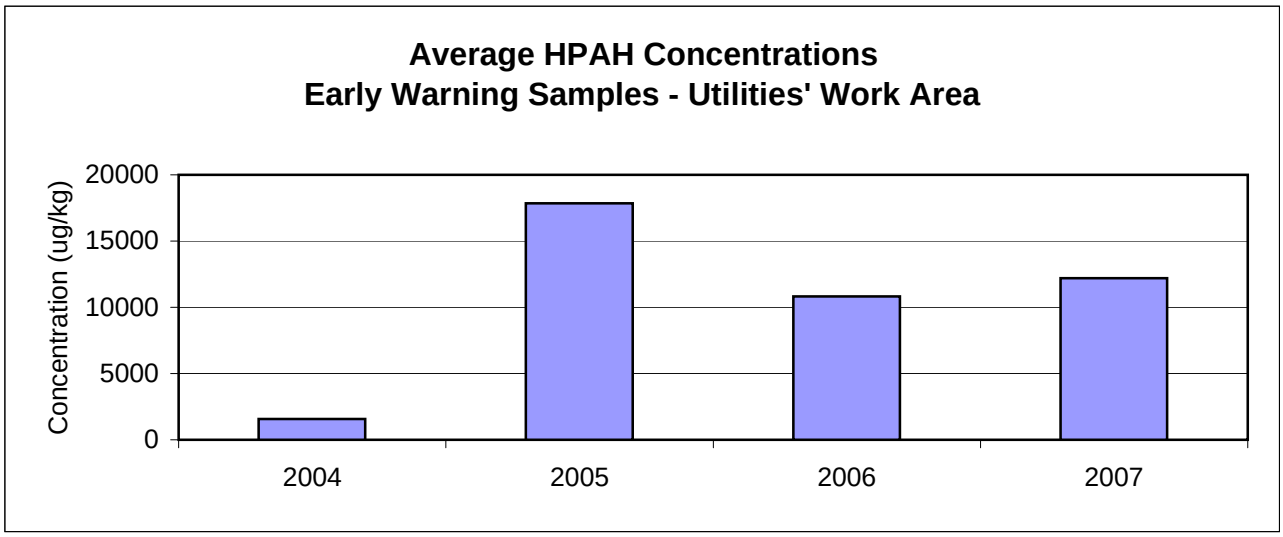


FIGURE 9
Average Concentrations
Utilities' Work Area





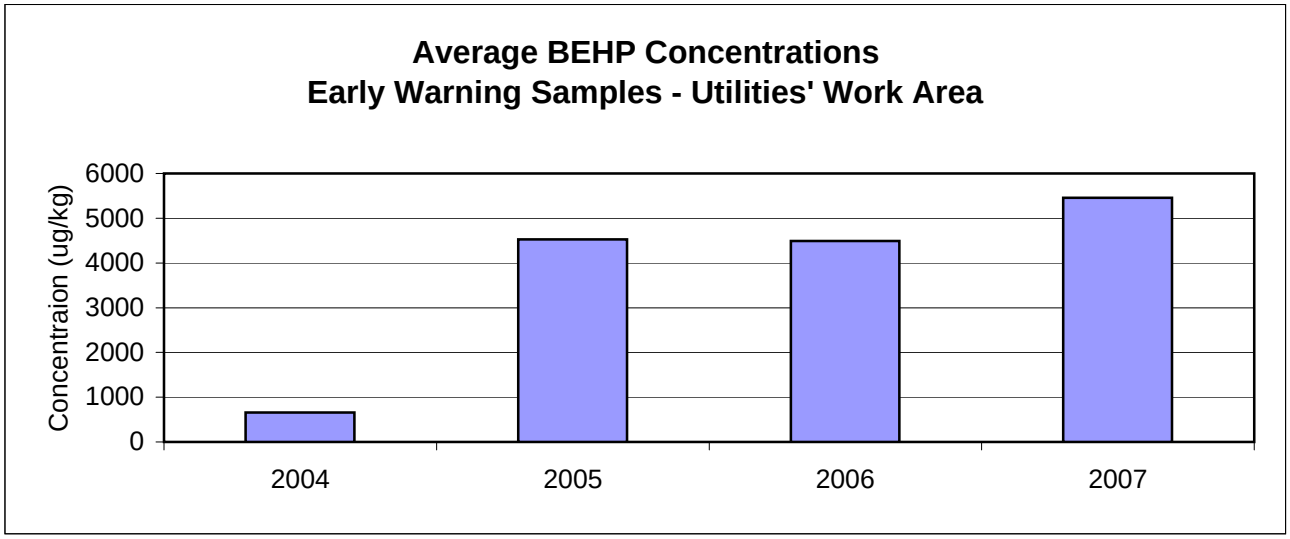


FIGURE 9
Average Concentrations
Utilities' Work Area

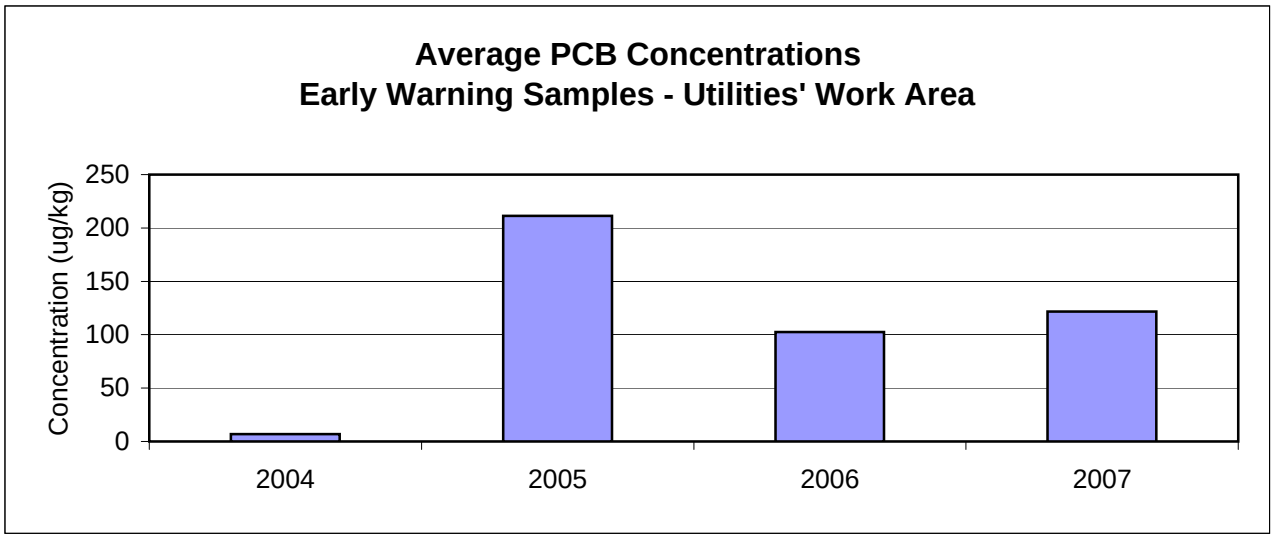
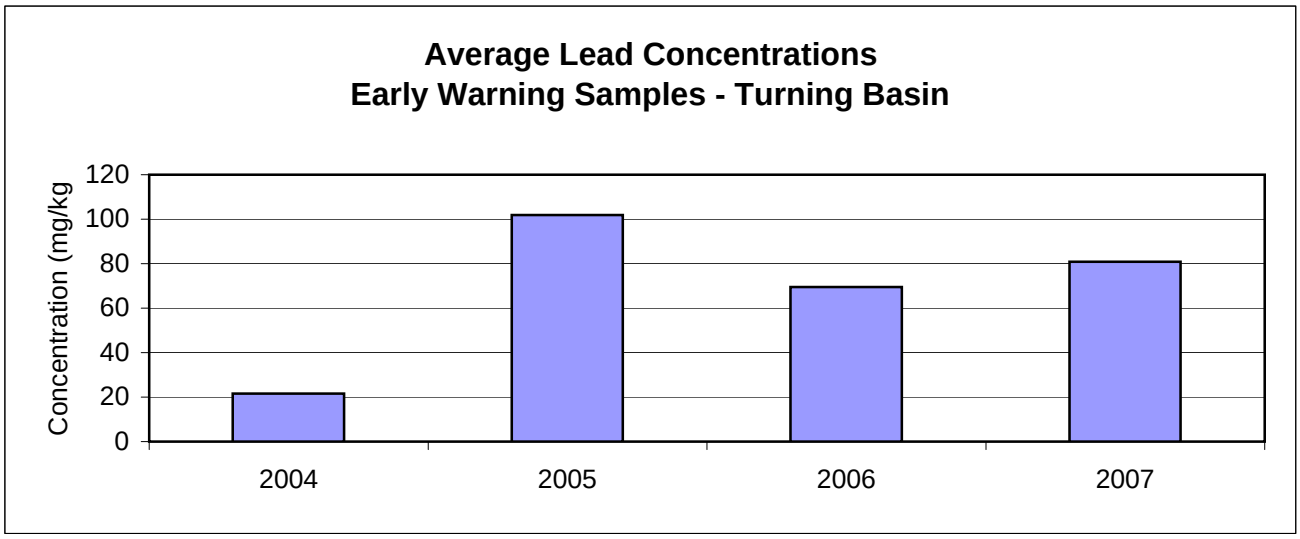
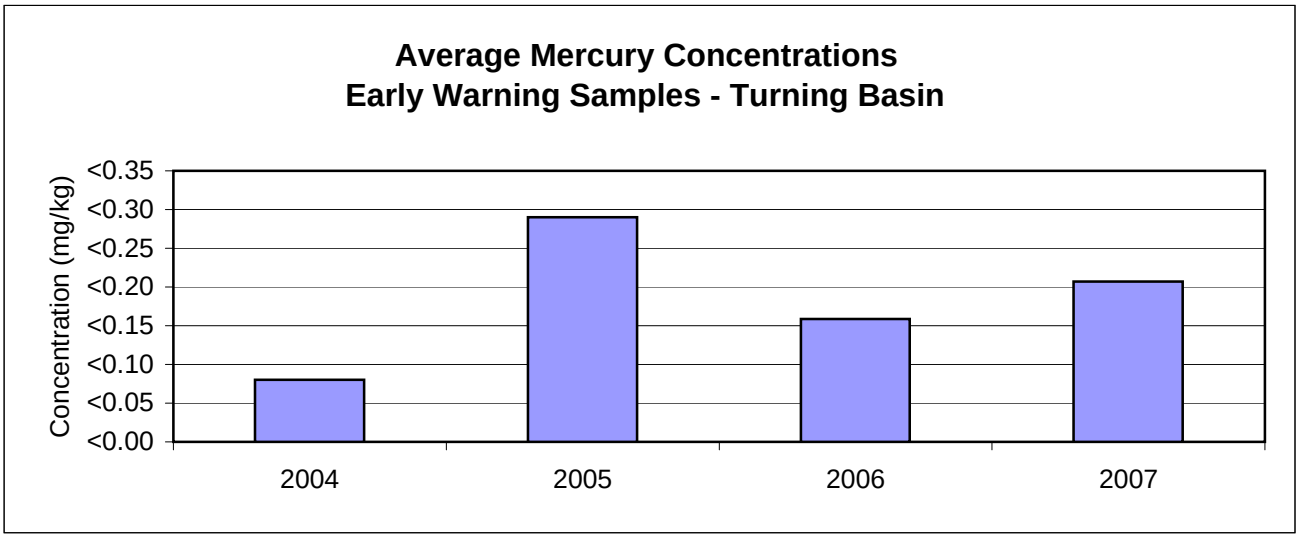


FIGURE 9
Average Concentrations
Utilities' Work Area





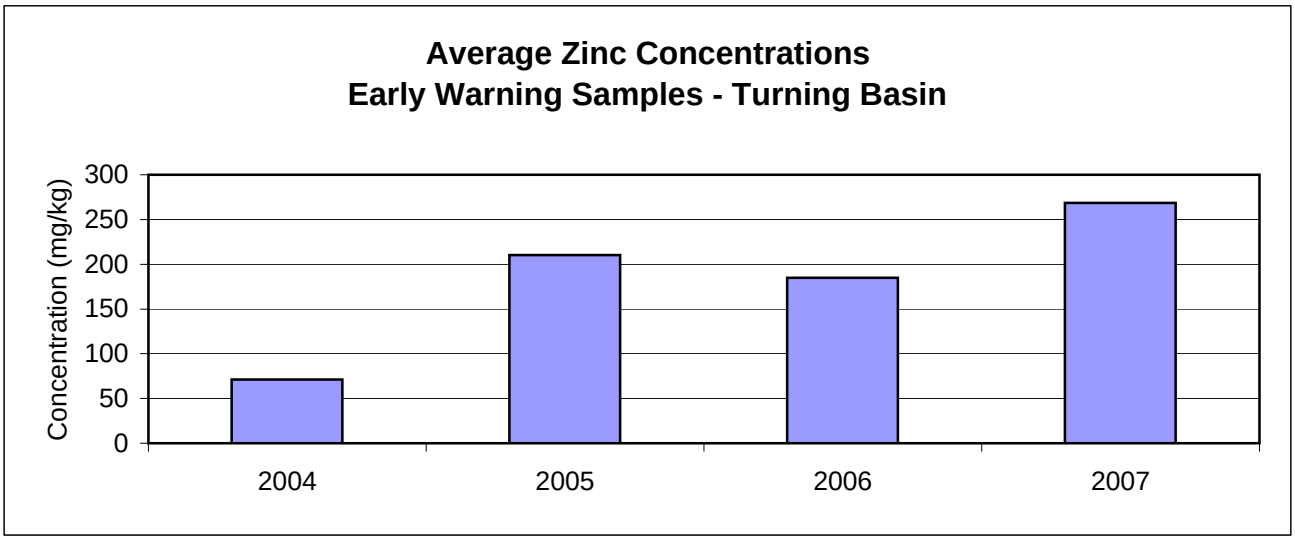
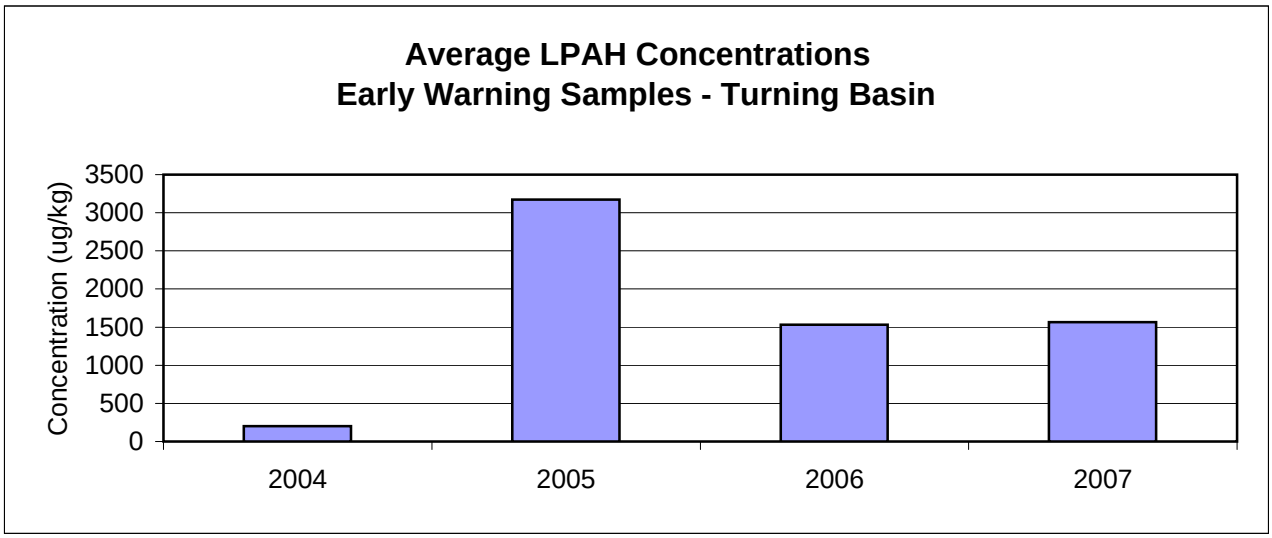
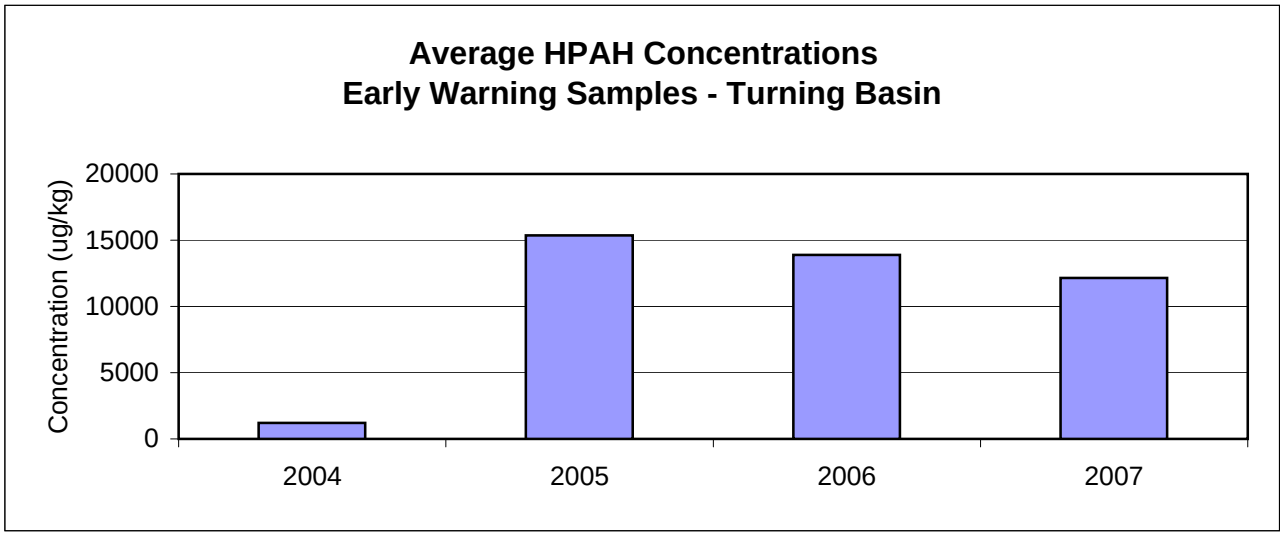


FIGURE 10
Average Concentrations
Turning Basin





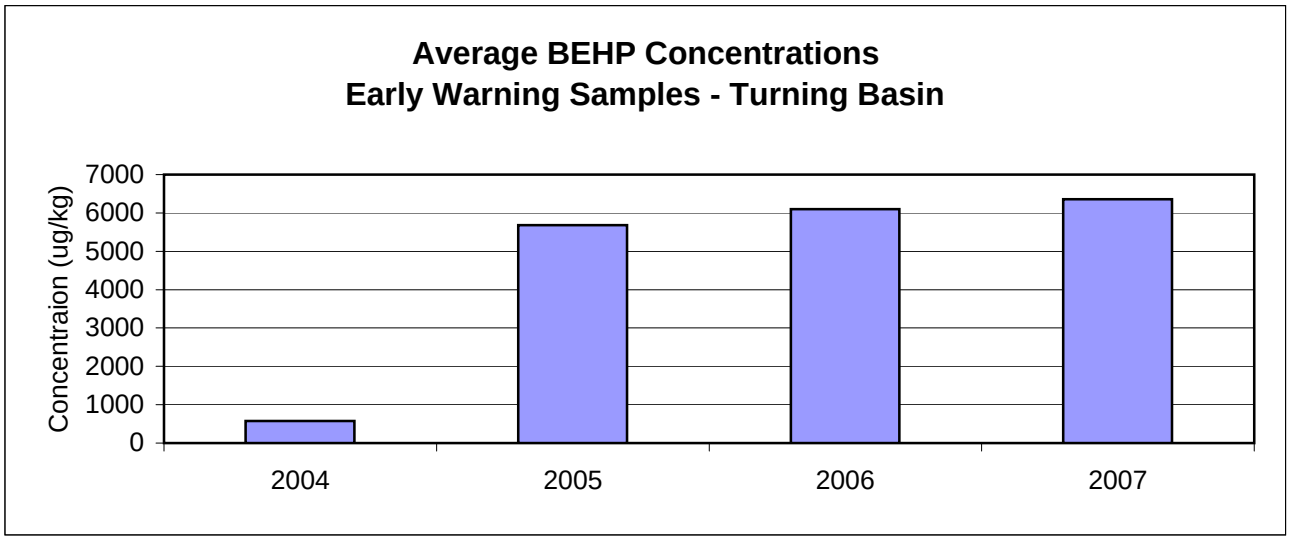


FIGURE 10
Average Concentrations
Turning Basin

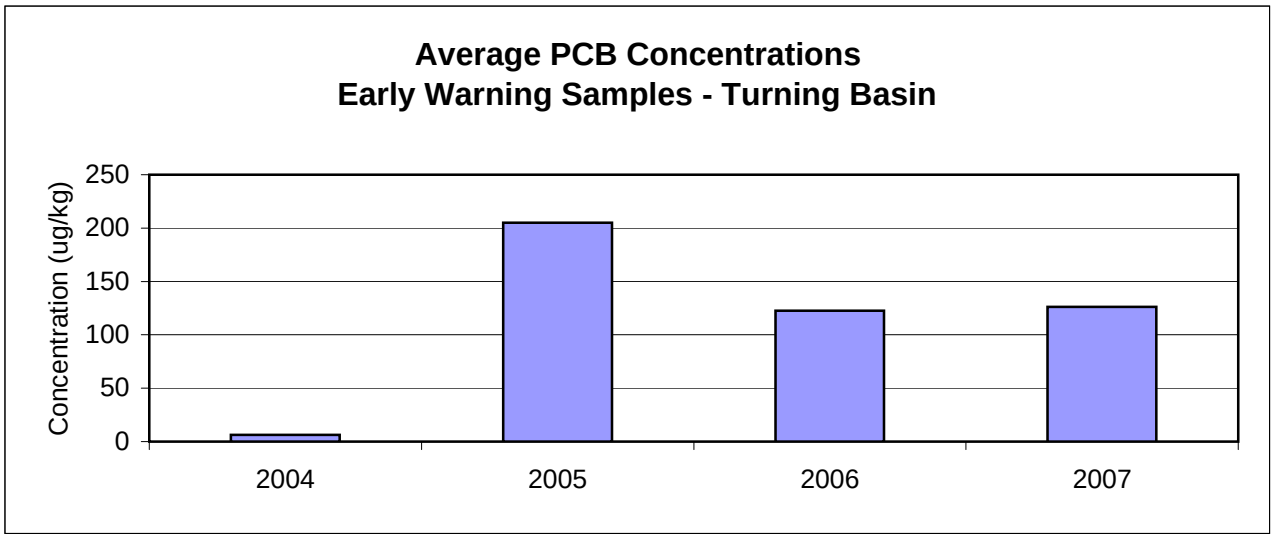
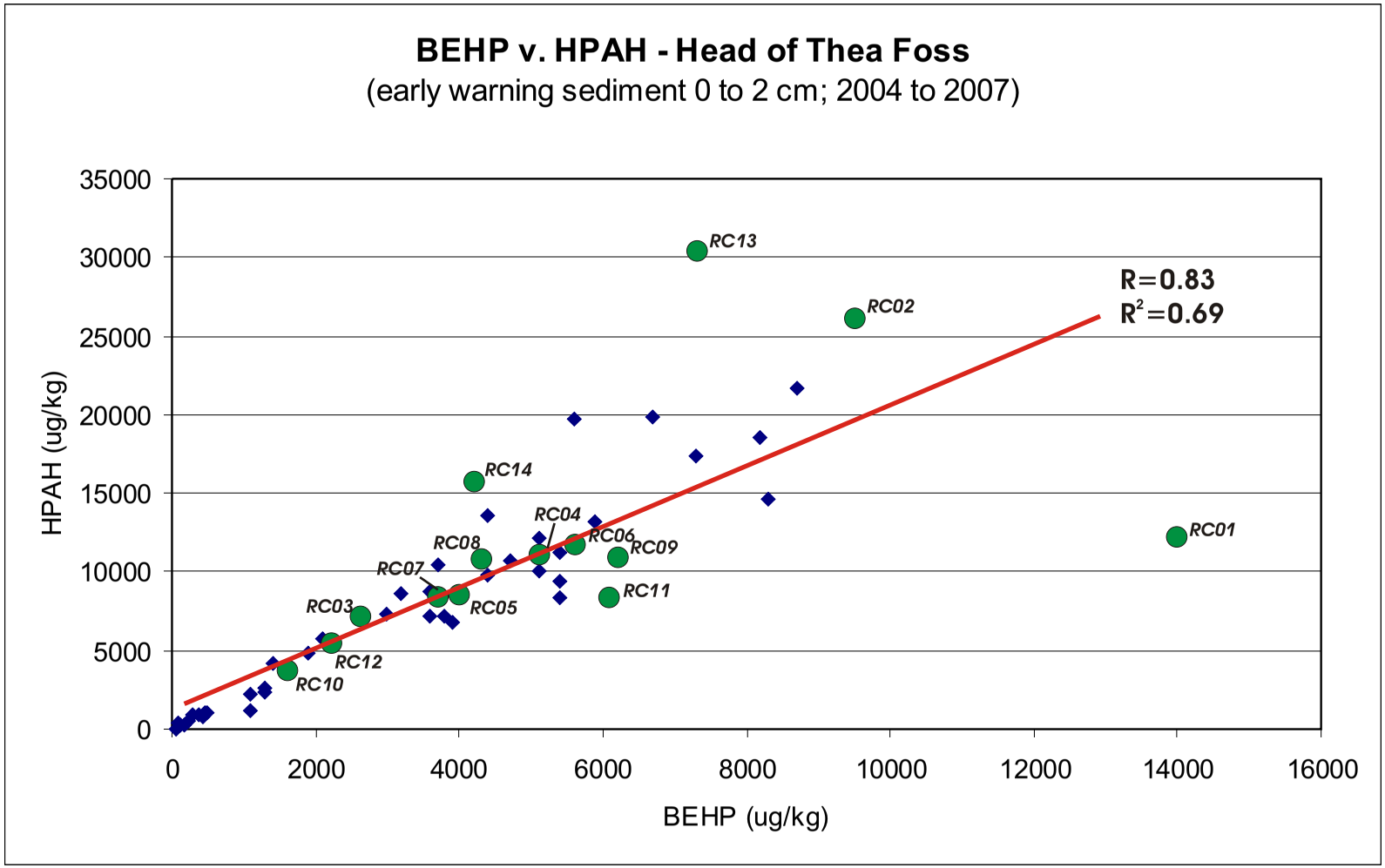


FIGURE 10
Average Concentrations
Turning Basin



May 2007 Sample

2004 to 2006 Samples

Ref: Early Warning Sediment 04 to 07.cdr

Head of Thea Foss Waterway
Tacoma, Washington

HPAH vs. BEHP Sediment Conc.
2004 to 2007 Early Warning Samples

PAP-001-04 **FIGURE 11** July 2007

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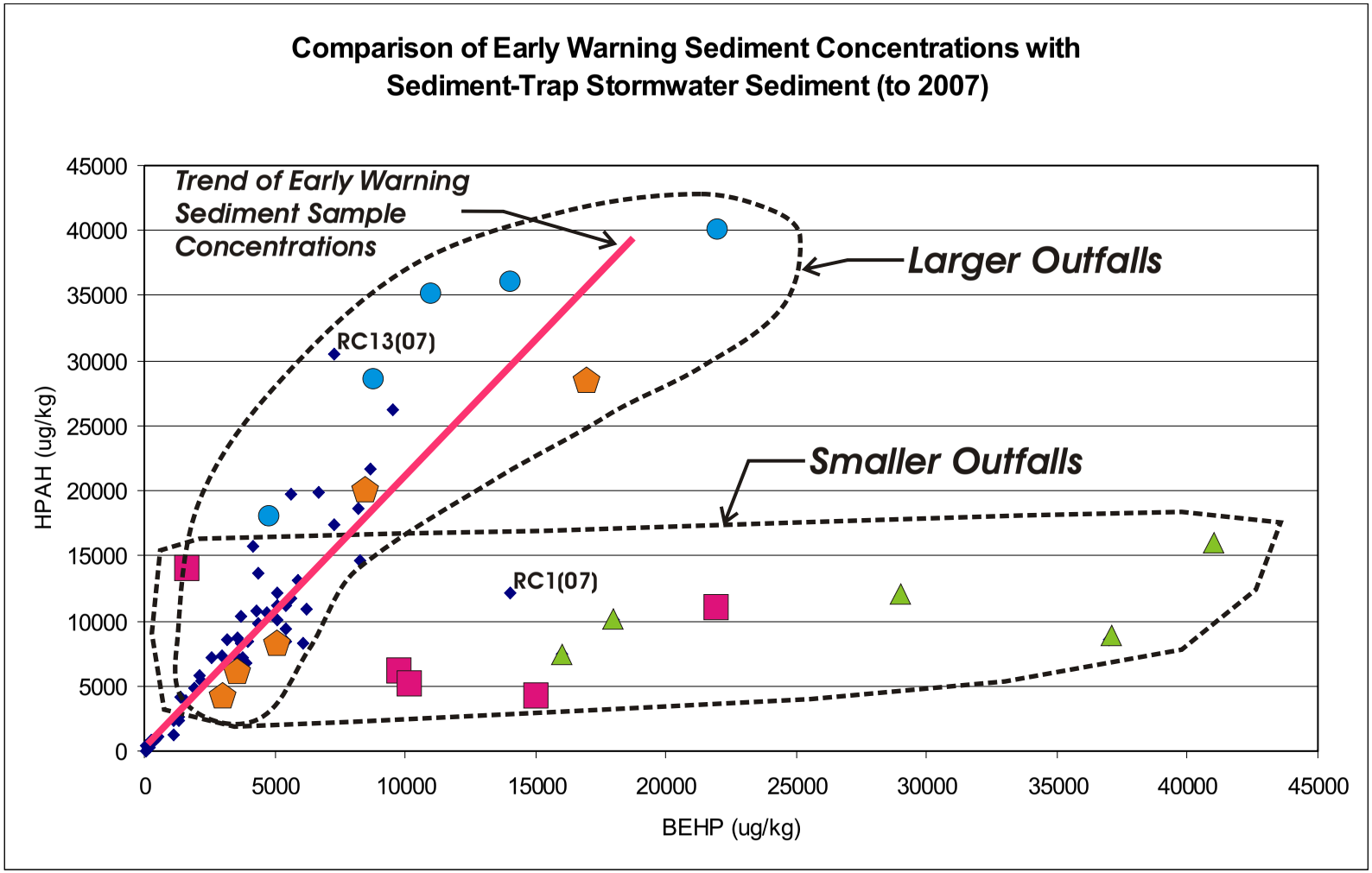

Outfalls

- 237A (FD2)
- 235 (FD6)
- 237B (FD1)
- 243 (FD23)
- Early Warning Sediment Sample

Ref: Comparison Sed w Sed Trap Thea Foss 07.cdr

Head of Thea Foss Waterway
Tacoma, Washington

Comparison of HPAH and BEHP Sediment Conc. With Stormwater Sediment-Trap Conc.

PAP-001-04 **FIGURE 12** July 2007

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