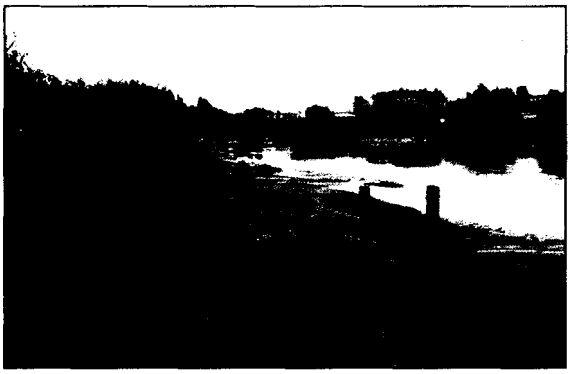
Norfolk CSO Sediment Remediation Project
Five-Year Monitoring Program

Final Monitoring Report - Year Five, April 2004



Elliott Bay/Duwamish Restoration Program

Prepared for the
Elliott Bay/Duwamish Restoration Program Panel
by the
King County Department of Natural Resources

Panel Publication 38

June 2005

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Prepared for the
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by
Scott Mickelson
King County Department of Natural Resources and Parks

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Elliott Bay/Duwamish Restoration Program
NOAA Damage Assessment and Restoration Center Northwest
7600 Sand Point Way NE
Seattle, WA 98115-0070

(206) 526-4338
(FAX) (206) 526-4321

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Individuals and organizations needing further information about the Elliott Bay/Duwamish Restoration Program should contact the Administrative Director at the following address and telephone number:

Dr. Robert C. Clark, Jr., Administrative Director
Elliott Bay/Duwamish Restoration Program
NOAA Damage Assessment and Restoration Center Northwest
7600 Sand Point Way NE
Seattle, WA 98115–0070
(206) 526-4338 FAX: (206) 526-4321

The Panel of Managers holds regularly scheduled meetings that are open to the public. Technical Working Group and committee meetings are scheduled on an as-needed basis, and are also open to the public. Meetings are generally held at the National Oceanic and Atmospheric Administration, National Marine Fisheries Service - Regional Directorate Conference Room, Building 1, 7600 Sand Point Way NE, Seattle. The Panel recommends that you contact the Administrative Director at the above phone number to confirm meeting schedules and locations. The panel also holds periodic special evening and weekend public information meetings and workshops.

General Schedule for Panel and Committee Meeting Dates

Panel: quarterly, first Thursday of January, April, July, October, 9:30 A.M. - 12:30 P.M.
Habitat Development Technical Working Group: scheduled as needed.
Sediment Remediation Technical Working Group: scheduled as needed.
Public Participation Committee: scheduled as needed.
Budget Committee: scheduled as needed.

Environmental Review of Specific Projects

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

This information is available in accessible formats on request at
(206) 296-0600 (voice) and 1-800-833-6388 (TTY/TDD users only).

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1 INTRODUCTION

This report presents results for the final sampling event of the five-year monitoring program at the Norfolk combined sewer overflow (CSO) sediment remediation site, along with a discussion of the monitoring program as a whole. The purpose of the five-year program was to monitor sediment placed as backfill material at the site for potential recontamination from CSO and other discharges. The final sampling event was conducted in April 2004 and represents the seventh time the site has been sampled after completion of remedial activities in March 1999, as well as the conclusion of the five-year monitoring program. The objective of the final sampling event was to collect data on the chemical characteristics of the backfill material five years after placement and compare those data to baseline and previous monitoring years' chemical conditions. Included in this report are a project background, descriptions of sampling and analytical methodologies, analytical results, a quality assurance review of the analytical data, and a final overview and discussion of the entire five-year monitoring program. Figures and tables referenced in this report are located at the end of the narrative.

1.1 Project Background

Sediment remediation at the Norfolk CSO site was undertaken to partially fulfill requirements of a 1991 Consent Decree, which defined the terms of a natural resources damage agreement between King County and the City of Seattle and federal, state, and tribal natural resources trustees. The Norfolk CSO site was chosen by the Elliott Bay/Duwamish Restoration Program (EB/DRP) Panel as one of four sites prioritized for potential sediment remediation.

A site characterization and cleanup study was performed in 1994 and 1995, and the cleanup study report was issued in 1996 (EB/DRP, 1996). Chemicals of concern at the site included mercury, 1,4-dichlorobenzene, bis(2-ethylhexyl) phthalate, and polychlorinated biphenyls (PCBs), all present at concentrations exceeding State of Washington Sediment Management Standards (SMS) sediment chemical criteria values that define cleanup screening levels. PCB "hot spot" concentrations at the site also exceeded Toxic Substances Control Act (TSCA) limits for hazardous waste disposal.

Site remediation began in early February 1999 and was completed by late March 1999. Remedial activities consisted of dredging and disposal of contaminated sediment and backfilling the dredged area to original grade with clean sediment from the Duwamish River Turning Basin. Contaminated sediments were removed from the site by mechanical dredge and dewatered on shore in a containment area initially designed to segregate batches about 50 cubic yards (cy) in size and later reconfigured to handle larger batches.

Sediment samples were collected daily from each 50-cy batch and analyzed for PCBs to determine the appropriate disposal destination. Sediments with a PCB concentration greater than 45 parts per million (ppm) were transported to a Subtitle C landfill in Arlington, Oregon for disposal. Sediments with a PCB concentration less than 45 ppm were transported to a Subtitle D landfill in Bremerton, Washington for disposal. A total of 5,190 cy of sediment was removed during the remediation, of which approximately 1,900 cy were transported to the Subtitle C landfill as hazardous waste. Sediment was generally removed to a depth of

three feet. Remediation in the PCB hot spot areas, however, required removal of sediment up to a depth of nine feet. Confirmational testing, subsequent to dredging activities, indicated that, in some of the deepest-dredged areas, sediments were left in place that contained PCB concentrations greater than SMS chemical criteria. Discussions with project oversight personnel from the EB/DRP Panel and State of Washington Department of Ecology (Ecology) determined that, at a depth of nine feet below original grade, these PCB-contaminated sediments could be left in place.

Clean backfill sediment was obtained from the Duwamish River Turning Basin during normal maintenance dredging operations by the Army Corps of Engineers (ACOE). Data collected by the Corps prior to maintenance dredging indicated that this material was suitable for use as backfill material (ACOE unpublished data, 1998). A sample was also collected from the Turning Basin sediment after it was placed on a barge and just prior to backfilling activities. Analytical results from this sample confirmed the suitability of the sediment as backfill material (King County unpublished data, 1999). No organic chemicals were detected in the sample and metals were detected at levels indicative of natural, area-wide crustal sediment concentrations. Approximately 6,700 cy of Turning Basin sediment were used to backfill the dredged area at the Norfolk CSO sediment remediation site. A site closure report was issued in August 1999 (EBDRP, 1999).

The site hydraulic permit, issued by the Washington State Department of Fish and Wildlife prior to remediation, requires that the site be monitored for a period of five years following remedial activities to evaluate possible recontamination of the backfill sediment as a result of continuing CSO or storm water discharges. To comply with this permit, a five-year monitoring plan was prepared that included sampling and analysis of surficial sediments from four stations in the backfilled area. Resulting analytical data allowed King County to evaluate the chemical characteristics of the sediment and assess possible recontamination over time. Monitoring activities were performed in accordance with a sampling and analysis plan addendum (King County, 1999).

1.2 Site Description

The Norfolk CSO sediment remediation site is located in the Duwamish River, upstream of the Turning Basin, at approximately river kilometer 10 in the City of Tukwila (Figure 1). The site is located upstream of the river reach maintained for commercial navigation and, as such, has maintained its natural channel as well as some riparian habitat (EBDRP, 1996). The shoreline is characterized by a steeply-sloping, erosional bank maintained with large concrete riprap. The bank joins a gently-sloping, intertidal mud shoreline that is completely exposed during extreme low tides.

The Norfolk CSO outfall originates at King County's Norfolk Street Regulator Station near South 102nd Street and East Marginal Way in Tukwila (EBDRP, 1996). The outfall structure has a flap gate over the 84-inch discharge pipe and a concrete splash plate that is exposed during normal low tides. The remediation site is located adjacent to the outfall structure and is characterized by exposed, intertidal mud habitat as well as subtidal riverbed. The intertidal zone has been channelized, both by the discharge of the Norfolk CSO and by a storm drain that drains a Boeing Company parking lot adjacent to the CSO outfall.

2 SAMPLE COLLECTION

This section describes sampling activities conducted in April 2004. All sampling activities were conducted following guidance suggested in the Puget Sound Protocols (PSEP, 1997a and 1998).

2.1 Sample Locations and Station Positioning

Four sediment sampling locations were established for annual monitoring and were assigned corresponding state plane coordinates (NAD83) specific to each station. These four sampling locations were selected prior to the October 1999 six-month sampling event (King County, 2000) and were designed to assess potential recontamination at the site and evaluate the chemical characteristics of the backfill material at the following locations:

- within the Norfolk CSO channel, prior to its confluence with the Boeing storm drain (SD) channel (station NFK501);
- on the delta after the confluence of the Norfolk CSO and Boeing SD channels (station NFK502);
- within the Boeing SD channel prior to its confluence with the Norfolk CSO channel (station NFK503); and
- upriver of both the Norfolk CSO and Boeing SD channels (station NFK504).

Station locations were selected to monitor sediment quality in those areas with the greatest potential for recontamination; one station in the Norfolk CSO channel, one station in the Boeing SD channel, and one station on the delta formed after the confluence of the CSO and SD channels. The upriver station was selected to provide background or reference data.

The prescribed station coordinates are presented in Table 1 and station locations are shown in Figure 2.

Sediment grab samples were collected from the King County research vessel *Chinook*, which is equipped with a differential global positioning system (DGPS). The DGPS is a satellite-based navigation system that operates using a receiver to calculate ground position by triangulating data transmitted by a constellation of satellites operated by the Department of Defense (DOD). The ship-board "differential" receiver receives both the DOD signal and signals originating from base stations operated by various agencies including the Coast Guard and King County. System software applies a differential correction and calculates a precise, real-time navigational position.

Representative samples were collected at each station by compositing sediment from multiple grabs into single samples for both the 0 to 2 centimeter (cm) and 0 to 10 cm depth strata. Coordinates, shown in Table 1, were recorded using DGPS for each individual sediment grab as the sampler contacted the river bottom.

2.2 Sample Collection and Handling

Four 0 to 2 cm and four 0 to 10 cm depth stratum sediment samples were collected April 5, 2004 from the routine monitoring stations at the Norfolk CSO sediment remediation site. Water depth at the four sampling stations ranged from 1 to 2 meters (~ 3.3 to 6.6 feet) on a

slack to ebbing tide between +1 and +4 feet (referenced to mean lower low water). Samples were collected using a stainless steel, modified, 0.1 m^2 van Veen grab sampler deployed from the *Chinook*. Samples at station NFK501 were composited from three separate deployments of the grab sampler and samples at stations NFK502, NFK503, and NFK504 were composited from two deployments. Between 14 and 17 cm of sediment was recovered in each grab, allowing collection of a sample aliquot from the top 10 cm without sampling sediment that had touched the sides or bottom of the grab sampler.

Sediment aliquots from the 0 to 2 cm depth stratum were collected from one side of each grab using a 200 cm^3 stainless-steel "cookie cutter." Sediment aliquots from the 0 to 10 cm depth stratum were collected from the other side of each grab using a stainless-steel spoon. Each of the aliquots was placed into separate stainless-steel bowls, covered with foil, and placed into an ice-filled cooler between grab deployments. After collecting aliquots from two or three grabs per station, the sediment sample was thoroughly homogenized and then split out into pre-labeled containers. Sample containers were supplied by the King County Environmental Laboratory and were pre-cleaned according to analytical specifications.

Two sets of sample compositing equipment were dedicated to each station, precluding the need for decontamination of this field gear. The Van Veen grab sampler was decontaminated between stations by scrubbing with a brush and river water followed by a thorough *in situ* rinsing.

Samples were stored in ice-filled coolers from the time of collection until delivery to the King County Environmental Laboratory. Samples were delivered under chain-of-custody and were maintained as such throughout the analytical process. Samples were stored frozen (-18°C) until analysis with the exception of samples for particle size distribution (PSD) analysis. PSD samples were stored refrigerated at approximately 4°C. All analyses were conducted by the King County Environmental Laboratory.

3 SAMPLE ANALYSIS

Eight estuarine sediment samples collected April 25, 2004 were submitted for analysis of conventional, metal, and organic parameters. This section describes the types of analysis performed, as well as analytical methodologies used and the associated quality assurance/quality control (QA/QC) procedures followed. Analyses were selected to allow comparison of sediment data to the SMS sediment chemical criteria found in Tables 1 and 3 of Chapter 173-204 WAC (Ecology, 1995).

3.1 Conventionals

Conventional analyses included percent solids, total organic carbon (TOC), and PSD. Percent solids and TOC analyses were performed to provide data necessary to normalize sediment data to dry weight and organic carbon, respectively. TOC analysis also allows evaluation of possible organic enrichment at the site over time. Percent solids analysis was performed following SM 2540-G, gravimetric determination, and TOC analysis was performed following EPA Method 9060, high-temperature combustion with infrared spectroscopy. PSD analysis allows evaluation of the gross physical characteristics of the backfill material and any changes imparted by sedimentation or scouring. PSD analysis was performed according to method ASTM D422, a combination of sieve and hydrometer analyses.

3.2 Metals

Metal analyses included 12 priority pollutant metals, as well as the crustal metals aluminum, iron, and manganese. Metal analysis allows assessment of potential recontamination at the site over time. SMS provides regulatory chemical criteria for eight of the metals included in this suite of analytes; arsenic, cadmium, chromium, copper, lead, mercury, silver, and zinc. With the exception of mercury, all metal analyses were performed following EPA Method 3050A/6010B; strong-acid digestion with inductively coupled plasma optical emission spectroscopy (ICP-OES). Mercury was analyzed according to EPA Method 245.5, cold vapor atomic absorption spectroscopy (CVAA).

3.3 Organics

Organic analyses included base/neutral/acid extractable semivolatile compounds (BNAs) and PCBs. Organic analysis also allows assessment of potential recontamination at the site over time, especially by PCBs and phthalates. BNA analysis was performed following EPA Method 3550B/8270C (SW-846 [EPA, 1995]), using gas chromatography with mass spectroscopy (GC/MS). PCBs were analyzed by EPA Method 8081A/8082 (SW-846), using gas chromatography with electron capture detection (GC/ECD). The suite of analytes included all organic compounds regulated under SMS.

3.4 Quality Assurance/Quality Control (QA/QC)

All analyses were performed following guidance recommended under the Puget Sound Protocols (PSEP 1986, 1997b, and 1997c) including associated QA/QC practices. Laboratory QA/QC practices produced data of sufficient quality to pass QA1 review. Analytical data were reviewed following QA1 guidelines (Ecology, 1989) and were flagged with data qualifiers where appropriate. A comprehensive report of analytical data, including qualifier flags is included as Appendix A. The QA1 review narrative is included as Appendix B.

4 ANALYTICAL RESULTS

This section discusses analytical results and compares the data to sediment criteria specified under SMS (Ecology, 1995). Tables 2 through 10 referenced in this section summarize pertinent analytical data. Complete analytical data are located in Appendix A. Metals and organics data have been compared to both Sediment Quality Standards (SQS) and Cleanup Screening Levels (CSL) in Tables 4 through 7. Analytical data for this sampling event have also been compared to previous sampling events in Tables 8a-d and 9a-d.

4.1 Particle Size Distribution (PSD)

PSD results are summarized in Table 2. The ratio of percent fine material (silt and clay) to percent coarse material (sand and gravel) was highest at the Boeing SD channel station (NFK503) in the 0 to 10 cm sample (55.5:40.0%) and was lowest at the combined channel delta station (NFK502) in the 0 to 2 cm sample (4.5:96.5%).

Percent fine material decreased significantly between 2003 and 2004, from 29 to 7.6%, in the 0 to 10 cm sample collected at the Norfolk CSO channel station (Table 8a). Percent fine material increased significantly, from 4.5 to 47.4%, in the 0 to 2 cm sample collected at the upriver reference station, which had a previous dramatic decrease from 2002 to 2003 (Table 9d).

4.2 Conventionals

Conventional analytical results are summarized in Table 3 and include percent solids, used to calculate dry-weight sediment concentrations of metal and organic data and TOC, used to normalize certain organic parameters to organic carbon content. Percent solids results range from 48.2 to 87.2%.

TOC concentrations in the 0 to 2 cm depth stratum samples range from 2,280 to 24,100 milligrams per kilogram, normalized to dry weight (mg/Kg DW), or approximately 0.2 to 2.4%. TOC concentrations in the 0 to 10 cm depth stratum samples range from 1,650 to 25,900 mg/Kg DW, or approximately 0.2 to 2.6%. TOC concentrations in both depth strata at all four stations remained fairly consistent between the 2003 and 2004 monitoring events, with two exceptions:

- the TOC concentration detected in the 0 to 10 cm sample from the Norfolk CSO channel station (NFK501) decreased from 2.2 to 0.3%; and
- the TOC concentration detected in the 0 to 2 cm sample from the upriver reference station (NFK504) increased from 0.2 to 1.9%.

4.3 Metals

Metals analytical results are summarized in Table 4. Metals data have been normalized to dry weight for comparison to SMS chemical criteria. Silver was detected for the first time during the Norfolk five-year monitoring program, at concentrations ranging from 0.46 to 0.98 mg/Kg DW, in all eight samples. The MDL values for silver range from 0.23 to 0.41 mg/Kg DW. The quality assurance review indicates that silver results may be biased high,

based on quality control analysis of a standard reference material (Appendix B). Silver results are all less than 7% of the SQS criterion of 6.1 mg/Kg DW. Reported concentrations of arsenic, cadmium, chromium, copper, lead, mercury, and zinc are all well below their respective SQS criteria. Reported concentrations of all metals (Appendix A) are at levels indicative of natural, area-wide crustal concentrations (Dexter et al, 1981).

The elevated lead concentration reported in the 0 to 2 cm sample collected in 2003 at the Norfolk CSO channel station (NFK501) (King County, 2003) was not seen during the 2004 monitoring event. Lead concentrations reported for the 2004 monitoring event at the Norfolk CSO channel station are 13 and 4.1 mg/Kg DW, respectively, in the 0 to 2 and 0 to 10 cm samples.

4.4 Organics

Organic analytical results are summarized in Tables 5, 6, and 7. Data for ionic organic compounds have been normalized to dry weight for comparison to SMS chemical criteria and are presented in Table 5.

Data for non-ionic organic compounds, normalized to organic carbon, are presented in Table 6 for comparison to SQS and CSL chemical criteria. Normalization to organic carbon can produce biased results, however, when the organic carbon content of the sample is very low (Ecology, 1992). When the organic carbon content of a sample is near 0.1 or 0.2% (1,000 to 2,000 mg/Kg DW), even background concentrations of certain organic compounds can exceed the SQS or CSL. Low organic carbon concentrations, ranging from 1,650 to 3,130 mg/Kg DW (0.17 to 0.31%) were reported for both the 0 to 2 and 0 to 10 cm samples collected from the combined channel delta station (NFK502) and the 0 to 10 cm samples collected from the Norfolk CSO channel and upriver reference stations (NFK501 and NFK504). Although organic carbon-normalized data for these samples are presented in Table 6 for comparative purposes, Table 6 should be considered an appropriate summary of analytical results only for the 0 to 2 and 0 to 10 cm samples from the Boeing SD channel station (NFK503) and the 0 to 2 cm samples from the Norfolk CSO channel (NFK503) and upriver reference (NFK504) stations.

For sediment with a TOC content less than 0.5% (5,000 mg/Kg dry weight), Ecology recommends comparing dry weight-normalized, non-ionic organic data to Puget Sound lowest apparent effects thresholds (LAET) and second lowest apparent lowest effects thresholds (2LAET) (EPA, 1988), which are considered to be equivalent to the SQS and CSL criteria, respectively. This comparison allows a more appropriate evaluation of sediment quality relative to organic compounds (Ecology, 1992). Table 7 presents dry weight-normalized data and should be considered the appropriate data summary only for both the 0 to 2 and 0 to 10 cm samples from the combined channel delta station and the 0 to 10 cm samples from the Norfolk CSO channel and upriver reference stations. Data for the other samples are again presented in Table 7 for comparative purposes only.

The quality assurance narrative (Appendix B) states that analytical results for two organic compounds were impacted by laboratory contamination, indicated by detectable concentrations in the quality control laboratory method blank. Table 10 compares sample analytical results for benzoic acid and bis(2-ethylhexyl) phthalate, on which various data

analyses have been performed to evaluate the impact of laboratory contamination. Table 10 compares analytical results for these two compounds using the following five methods of evaluating sample results to account for method blank contamination:

- sample concentration reported with no adjustment for the method blank concentration;
- sample concentration reported with the method blank concentration subtracted from the dry weight sample result – after normalization to dry weight;
- sample concentration reported with the method blank concentration subtracted from the wet weight sample result – prior to normalization to dry weight (because the method blank is anhydrous sodium sulfate, it is considered to be 100% solids and the wet weight and dry weight values for any compound are the same);
- sample concentration reported with its associated dry weight MDL raised to five times the method blank concentration; and
- sample concentration reported with its associated dry weight MDL raised to ten times the method blank concentration.

4.4.1 Ionic Organic Compounds

Benzoic acid was detected in seven of eight samples at concentrations ranging from 47 to 292 micrograms per kilogram normalized to dry weight (µg/Kg DW). This compound, however, was also detected in the associated quality control laboratory method blank at a concentration of 43 µg/Kg DW. Table 10 compares benzoic acid results using various methods of evaluating analytical data compromised by laboratory contamination. Section 4.4.4 provides a summary of this analysis.

The Environmental Protection Agency (EPA) recommends considering sample results that are less than five times the concentration reported for the laboratory method blank as "undetected" for compounds such as benzoic acid (EPA, 1999). If the MDL for benzoic acid is raised to five times the method blank concentration, a value of 215 µg/Kg DW, seven of eight sample results are "less than the MDL." The benzoic acid concentration of 292 µg/Kg DW in the 0 to 2 cm sample from the Norfolk CSO channel station (NFK501) should be considered valid as reported. This benzoic acid concentration is less than 45% of the SQS/CSL of 650 µg/Kg DW.

The remaining ionic organic compounds were not detected in any sample and dry weight-normalized MDLs for all ionic organic compounds are below SQS/CSL chemical criteria for all samples.

4.4.2 Non-Ionic Organic Compounds Compared to SQS/CSL Criteria – NFK501 (0 to 2 cm), NFK503 (0 to 2 and 0 to 10 cm), and NFK504 (0 to 2 cm)

Organic carbon concentrations ranging from 1.89 to 2.59% were reported for both the 0 to 2 and 0 to 10 cm samples from the Boeing SD channel station (NFK503) and the 0 to 2 cm samples collected from the Norfolk CSO channel and upriver reference stations (NFK501 and NFK504, respectively). This section discusses organic analytical results for these four samples only since the data can appropriately be normalized to organic carbon for comparison with SQS and CSL chemical criteria. Analytical results for the other four

samples will be discussed in Section 4.4.3 because the low organic carbon concentrations justify comparison of dry weight-normalized data to LAET and 2LAET values.

4.4.2.1 Low-Molecular Weight Polynuclear Aromatic Hydrocarbons (LPAHs)
Anthracene and phenanthrene were detected in both the 0 to 2 and 0 to 10 cm samples from the Boeing SD channel station and in the 0 to 2 cm sample from the Norfolk CSO channel station. Anthracene concentrations in these three samples ranges from 0.44 to 0.73 mg/Kg OC, all less than 0.5% of the SQS criterion of 220 mg/Kg OC. Phenanthrene concentrations range from 2.23 to 4.94 mg/Kg OC, all less than 5% of the SQS criterion of 100 mg/Kg OC. Total LPAH concentrations for these three samples are all less than 2% of the SQS criterion of 370 mg/Kg OC.

LPAH concentrations are significantly higher in the 0 to 2 cm sample from the upriver reference station. Anthracene was detected at a concentration of 5.16 mg/Kg OC, however, this concentration is still less than 3% of the SQS criterion. Phenanthrene was detected at a concentration of 152 mg/Kg OC, which exceeds the SQS criterion of 100 mg/Kg OC and is approximately 32% of the CSL criterion of 480 mg/Kg OC. Acenaphthene, naphthalene, and 2-methylnaphthalene were also detected in this sample at concentrations of 5.90, 1.6, and 2.4 mg/Kg OC, respectively, representing 37, 2, and 6% of their respective SQS criteria. The total LPAH concentration of 170 mg/Kg OC in this sample is 46% of the SQS criterion of 370 mg/Kg OC.

Organic carbon-normalized MDLs are below SQS criteria for all LPAHs in each of these samples.

4.4.2.2 High-Molecular Weight Polynuclear Aromatic Hydrocarbons (HPAHs)
Eight of nine HPAHs were detected in both the 0 to 2 and 0 to 10 cm samples from the Boeing SD channel station and the 0 to 2 cm sample at the Norfolk CSO channel station. Dibenzo(a,h)anthracene was not detected in these three samples. All reported HPAH concentrations were less than their respective SQS chemical criteria and the range of total HPAH concentrations, from 27 to 49.1 mg/Kg OC, is less than 6% of the SQS criterion of 960 mg/Kg OC. No individual HPAH concentration for these three samples is greater than 11% of its associated SQS criterion.

All nine HPAHs were detected in the 0 to 2 cm sample collected from the upriver reference station and at significantly higher concentrations than the other three samples. The fluoranthene concentration of 276 mg/Kg OC in this sample exceeds the SQS criterion of 160 mg/Kg OC and is 23% of the CSL criterion of 1,200 mg/Kg OC. Other HPAH concentrations were all less than their respective SQS criteria with reported values representing 8 to 31% of the SQS. The total HPAH concentration of 530 mg/Kg OC is approximately 55% of the SQS criterion.

4.4.2.3 Chlorobenzenes
Chlorobenzenes were not detected in any of these four samples and all organic carbon-normalized chlorobenzene MDLs are below SQS criteria.

4.4.2.4 Phthalates

Benzyl butyl phthalate was detected at concentrations ranging from 1.08 to 1.64 mg/Kg OC in all four samples. The highest concentration is approximately 33% of the SQS criterion of 4.9 mg/Kg OC. Benzyl butyl phthalate analysis was not affected by laboratory contamination.

Bis(2-ethylhexyl) phthalate was also detected in all four samples at concentrations ranging from 11.9 to 25.7 mg/Kg OC. The highest concentration is approximately 55% of the SQS criterion of 47 mg/Kg OC. Bis(2-ethylhexyl) phthalate was detected in the quality control laboratory method blank, however, the reported concentrations of this compound in all four samples is greater than 10 times the method blank concentration. The high sample to method blank concentration ratio indicates that bis(2-ethylhexyl) phthalate results for these four samples are not greatly impacted by laboratory contamination and may be used as reported. Refer to Section 4.4.4, Table 10, and Appendix B for information regarding these method blank contamination issues.

The other phthalates were not detected in any of these four samples and all organic carbon-normalized phthalate MDLs are below SQS criteria.

4.4.2.5 Miscellaneous Compounds

Dibenzofuran was detected at a concentration of 6.01 mg/Kg OC in the sample collected from the 0 to 2 cm depth stratum at the upriver reference station (NFK504); the first time this organic compounded has been detected at the Norfolk monitoring site. This reported dibenzofuran concentration is 40% of the SQS criterion of 15 mg/Kg OC. Dibenzofuran was not detected in the other three samples and hexachlorobutadiene and N-nitrosodiphenylamine were not detected in any of the four samples. Organic carbon-normalized MDLs for these three compounds are below SQS criteria for all four samples.

4.4.2.6 PCBs

PCBs (as total Aroclors®) were detected at concentrations ranging from 4.46 to 18.3 mg/Kg OC in all four samples. Total PCB concentrations (comprised of Aroclors 1248 and 1254) are distributed as follows:

- Norfolk CSO Channel NFK501 (0 to 2 cm) – the total PCB concentration of 7.82 mg/Kg OC is approximately 65% of the SQS criterion of 12 mg/Kg OC.
- Boeing SD Channel NFK503 (0 to 2 cm) – the total PCB concentration of 5.19 mg/Kg OC is approximately 43% of the SQS criterion.
- Boeing SD Channel NFK503 (0 to 10 cm) – the total PCB concentration of 18.3 mg/Kg OC exceeds the SQS and is approximately 28% of the CSL criterion of 65 mg/Kg OC.
- Upriver Reference NFK504 (0 to 2 cm) – the total PCB concentration of 4.46 mg/Kg OC is approximately 37% of the SQS criterion.

4.4.3 Non-Ionic Organic Compounds Compared to LAET/2LAET Values – NFK501 (0 to 10 cm), NFK502 (0 to 2 and 0 to 10 cm), and NFK504 (0 to 10 cm)

The low organic carbon content (0.17 to 0.31%) of both the 0 to 2 and 0 to 10 cm samples from the combined channel delta station (NFK502) and the 0 to 10 cm samples from the Norfolk CSO channel and upriver reference stations (NFK501 and NFK504) makes it

inappropriate to organic carbon-normalize the non-ionic organic data. Table 7 compares dry weight-normalized data for these four samples to LAET and 2LAET values. Dry weight-normalized data for the other samples are presented in this table for comparative purposes only.

4.4.3.1 Low-Molecular Weight Polynuclear Aromatic Hydrocarbons (LPAHs)
LPAHs were not detected in either the 0 to 2 or 0 to 20 cm sample collected from the combined channel delta station. Phenanthrene was the only LPAH detected in the 0 to 10 cm samples collected from the Norfolk CSO channel and upriver reference stations, at concentrations of 9.1 and 10 μg/Kg DW, respectively, or approximately 0.6% of the LAET value of 1,500 μg/Kg DW. Dry weight-normalized MDLs for all LPAHs are LAET values.

4.4.3.2 High-Molecular Weight Polynuclear Aromatic Hydrocarbons (HPAHs)
Benzo(a)anthracene, benzo(a)pyrene, total benzofluoranthenes, and pyrene were detected in all four samples. Chrysene and fluoranthene were also detected in the 0 to 2 cm sample from the combined channel delta station and the 0 to 10 cm samples from the Norfolk CSO channel and upriver reference stations. Total HPAH concentrations range from 21 to 110 μg/Kg DW with the highest concentration representing less than 1% of the LAET value of 12,000 μg/Kg DW. Dry weight-normalized MDLs for all HPAHs are below LAET values.

4.4.3.3 Chlorobenzenes
Chlorobenzenes were not detected in any of these four samples and all dry weight-normalized chlorobenzene MDLs are below LAET values.

4.4.3.4 Phthalates
Benzyl butyl phthalate was detected at a concentration of 10 μg/Kg DW in the 0 to 10 cm sample collected from the upriver reference station. This concentration is approximately 16% of the LAET value of 63 μg/Kg DW. Benzyl butyl phthalate was not detected in the other three samples.

Bis(2-ethylhexyl) phthalate was detected in all four samples at concentrations ranging from 19.3 to 46.7 μg/Kg DW, all less than 4% of the LAET value of 1,300 μg/Kg DW. All four of the reported bis(2-ethylhexyl) phthalate sample concentrations, however, are less than 10 times the associated method blank concentration of 7.0 μg/Kg DW and, therefore, should be considered as "less than the MDL" at a new MDL of 70 μg/Kg DW. All dry weight-normalized phthalate MDLs, including bis(2-ethylhexyl) phthalate, are below LAET values.

4.4.3.5 Miscellaneous Compounds
Dibenzofuran, hexachlorobutadiene, and N-nitrosodiphenylamine were not detected in any of these four samples and dry weight-normalized MDLs for these three compounds are below LAET values.

4.4.3.6 PCBs
PCBs were not detected in either the 0 to 2 or 0 to 10 cm sample collected from the combined channel delta station or in the 0 to 10 cm sample collected from the upriver reference station. Dry weight-normalized MDLs for all PCB Aroclors are below the LAET value of 130 μg/Kg DW.

PCBs (Aroclors 1248 and 1254) were detected in the 0 to 10 cm sample collected from Norfolk CSO channel station. The total PCB concentration in this sample of 473 µg/Kg DW exceeds the LAET and is 47% of the 2LAET value of 1,000 µg/Kg DW. This 2004 total PCB concentration is significantly higher than the total PCB concentration of 89.8 µg/Kg DW detected in 2003 (Table 8a).

4.4.4 Evaluation of Laboratory Contamination on Sample Results

The quality assurance review for this sampling event (Appendix B) indicates that laboratory contamination impacted sample results for two compounds; benzoic acid and bis(2-ethylhexyl) phthalate. Detectable concentrations of these compounds were reported in the quality control laboratory method blank. Table 10 summarizes the evaluation of impacts these method blank results have had on sample results.

4.4.4.1 Benzoic Acid

Benzoic acid was detected in the method blank at a concentration of 43 µg/Kg. It was detected in seven of eight samples at concentrations ranging from 47 to 292 µg/Kg DW. Table 10 shows the effects on sample data of both "blank correction" and "MDL adjustment." The method blank concentration of 43 µg/Kg is the "concentration at the instrument" or "wet weight." Since the method blank matrix is anhydrous sodium sulfate, it is considered to have a total solids value of 100%, thus making wet and dry weight concentrations equivalent in the method blank. Table 10 shows the effect of subtracting the method blank concentration from the sample concentration both before and after normalization to dry weight. The benzoic acid results for two of seven detected samples is adjusted to less than the MDL. Benzoic acid results for an additional four samples is lowered by greater than 50%.

Environmental Protection Agency (EPA) data validation guidance (EPA, 2001) recommends adjusting the MDL for any sample in which the detected concentration is less than five times the method blank concentration when laboratory contamination is the result of a compound such as benzoic acid. Raising the MDL to 215 µg/Kg DW (five times the concentration detected in the method blank) results is seven of eight sample results being qualified as "less than the MDL". A new MDL of 215 µg/Kg DW is still well below the benzoic SQS of 650 µg/Kg DW. The remaining sample result of 292 µg/Kg DW (NFK501, 0 to 2 cm) should be considered valid as reported.

4.4.4.2 Bis(2-ethylhexyl) Phthalate

Bis(2-ethylhexyl) phthalate was detected in the method blank at a concentration of 7.0 µg/Kg. It was detected in all eight samples collected during this sampling event at concentrations ranging from 19.3 to 626 µg/Kg DW.

Subtracting the method blank concentration from either dry weight-normalized or wet weight bis(2-ethylhexyl) phthalate sample results does not significantly lower reported concentrations for four of eight samples; the 0 to 2 cm samples at the Norfolk CSO channel and upriver reference stations and both the 0 to 2 and 0 to 10 cm samples from the Boeing

SD channel station. Bis(2-ethylhexyl) phthalate results for the remaining four samples are lowered by 19 to 43 %.

EPA data validation guidance recommends adjusting the MDL for samples in which the detected concentration is less than ten times the method blank concentration for common laboratory contaminants such as phthalates when a detectable phthalate result is reported for a method blank (EPA, 2001). Raising the MDL to 70 µg/Kg DW qualifies results as "less than the MDL" for both the 0 to 2 and 0 to 10 cm samples collected from the combined channel delta station and the 0 to 10 cm depth stratum samples at the Norfolk CSO channel and upriver reference stations. The new dry weight-normalized MDL of 70 µg/Kg DW is below the LAET value of 1,300 µg/Kg DW. The resulting organic carbon-normalized MDLs (22 to 42 mg/Kg OC) also are below the SQS criterion of 47 mg/Kg OC. Bis(2-ethylhexyl) phthalate sample results from both depth strata in the Boeing SD channel and the 0 to 2 cm depth stratum at the Norfolk CSO channel and upriver reference stations are all significantly greater than ten times the method blank concentration. An additional method of adjusting phthalate MDLs, in which the MDL is raised to the value of the detected sample concentration, is discussed further in Section 6.2.2

Based on this evaluation, bis(2-ethylhexyl) phthalate sample results from the combined channel delta station (NFK502) and the 0 to 10 cm depth stratum samples from the Norfolk CSO channel and upriver reference stations (NFK501 and NFK504) have been compromised by laboratory contamination and should be considered as "less than the MDL." Bis(2-ethylhexyl) phthalate sample results from the Boeing SD channel station (NFK503) and the 0 to 2 cm depth stratum samples at the Norfolk CSO channel and upriver reference stations may be considered valid as reported with little impact to the sample results from laboratory contamination.

5 FUTURE MONITORING

The sampling and analysis performed in April 2004 represents the final event of the Norfolk CSO five-year monitoring program and completes the monitoring required under the cleanup action plan. Further monitoring at the site under this program is not planned at this time.

6 SUMMARY AND DISCUSSION

This section will provide a summary of both the April 2004 monitoring event as well as the critical issues from the entire five-year monitoring program.

6.1 Summary of the Year-Five, April 2004 Monitoring Event

Eight estuarine sediment samples were collected in April 2004 from the Norfolk CSO sediment remediation site, five years after completion of remedial activities. Samples were collected from the surface of backfill material placed at the site and analytical results were compared to baseline chemical conditions of the backfill material to evaluate possible recontamination. Samples were collected from two depth strata at each of four stations: one sample collected from the 0 to 2 cm depth stratum to evaluate chemical concentrations in recently deposited sediment; and one sample collected from the 0 to 10 cm depth stratum to evaluate sediment chemical concentrations over the entire biologically-active zone. Analytes included sediment conventionals along with metal and organic parameters regulated under SMS criteria.

6.1.1 Summary of Primary Issues by Chemical Class

This section summarizes the April 2004 results for the primary chemicals of concern at the Norfolk site; metals, PAHs, phthalates, and PCBs.

6.1.1.1 Metals

Metals concentrations throughout the backfill material at the Norfolk sediment remediation site continue to be detected at concentrations close to regional background levels (Dexter et al, 1981). The lead concentration of 222 mg/Kg DW detected in the sample collected from the 0 to 2 cm depth stratum at the Norfolk CSO channel station (NFK501) in April 2003 appears to have been an anomaly. The lead concentrations detected in both depth strata at NFK501 in April 2004 were 13 and 4.1 mg/Kg DW. Concentrations of some metals appear to be increasing slightly at the Norfolk CSO channel station (NFK501) and Boeing SD channel station (NFK503). These increasing metals concentrations appear to correspond with increasing levels of fine material and organic carbon that have accumulated over the past few monitoring years at both stations (Tables 8a, 9a, 8c, 9c). All metals concentrations are well below associated SQS chemical criteria in samples collected during the April 2004 sampling event.

6.1.1.2 PAHs

Total LPAH concentrations were all less than 2% of the SQS and total HPAH concentrations were all less than 5% of the SQS at three of four stations; NFK501, NFK502, and NFK503. Both LPAH and HPAH concentrations reported in the 0 to 2 cm sample collected from the upriver reference station (NFK504), however, were significantly elevated over previous years (Tables 8d and 9d). Two compounds, phenanthrene and fluoranthene, exceeded their SQS chemical criteria, however, the reported total LPAH and total HPAH concentrations were both well below the SQS criteria. A corresponding increase in PAH concentrations was not seen in the 0 to 10 cm sample at NFK504, indicating that the elevated PAH concentrations are present in recently deposited sediment.

6.1.1.3 Phthalates

Assessment of phthalate sediment concentrations continues to be difficult due to laboratory contamination, indicated by positive phthalate results in laboratory QC method blanks. Bis(2-ethylhexyl) phthalate was the only phthalate compound detected in the method blank associated with the April 2004 monitoring event, at a relatively low concentration of 7.0 µg/Kg DW. This positive method blank result, as a result, did not significantly impact interpretation of bis(2-ethylhexyl) phthalate sample results. Quantifiable concentrations of bis(2-ethylhexyl) phthalate were detected in four of eight samples (from NFK501, NFK503, and NFK504) at concentrations ranging from 11.9 to 25.8 mg/Kg OC. The highest concentration was detected in the 0 to 2 cm sample collected from NFK501, however, this reported result is less than 55% of the SQS criterion of 47 mg/Kg OC. All other phthalate results were well below associated SQS criteria or LAET values.

6.1.1.4 PCBs

Samples collected from three of four stations during the April 2004 sampling event have detected total PCB concentrations. PCBs were not detected in either sample collected from the combined channel delta station (NFK502). A total PCB concentration of 4.46 mg/Kg OC was reported in the 0 to 2 cm sample collected from the upriver reference station (NFK504), which is approximately 37% of the SQS criterion of 12 mg/Kg OC. PCBs were not detected in the 0 to 10 cm sample at NFK504. PCBs were detected in both the 0 to 2 cm and 0 to 10 cm samples collected from the Norfolk CSO channel and Boeing SD channel stations (NFK501 and NFK503, respectively). Total PCB concentrations reported for the 0 to 2 cm samples at both NFK501 (7.82 mg/Kg OC) and NFK503 (5.19mg/Kg OC) were below the SQS. Total PCB concentrations detected in the 0 to 10 cm samples at both of these stations, however, exceeded the SQS or LAET. The total PCB concentration of 473 µg/Kg DW reported for NFK501 (0.31% TOC) exceeds the LAET and is approximately 47% of the 2LAET of 1,000 µg/Kg DW. The total PCB concentration of 18.3 mg/Kg OC reported for NFK503 (2.41% TOC) exceeds the SQS and is approximately 28% of the CSL. PCB concentrations for both of these stations in the April 2003 monitoring event were below the SQS and/or LAET.

6.1.2 Summary of Primary Issues by Monitoring Station

This section summarizes the primary issues of concern by monitoring station based on results of the April 2004 and other monitoring events.

6.1.2.1 Norfolk CSO Channel Station (NFK501)

Total PCB concentrations are once again elevated at NFK501. The detected concentration of 473 µg/Kg DW reported for the 0 to 10 cm sample (0.31% TOC) exceeds the LAET and is approximately 47% of the 2LAET value of 1,000 µg/Kg DW. The total PCB concentration of 7.82 mg/Kg OC reported for the 0 to 2 cm sample (2.00% TOC), however, is below the SQS criterion of 12 mg/Kg OC. While elevated PCB concentrations had been reported for NFK501 during past monitoring events, the total PCB concentrations of 4.28 mg/Kg OC (0 to 2 cm) and 4.06 mg/Kg OC (0 to 10 cm) reported for the April 2003 monitoring event indicated at that time that sediment quality had improved to a level that met SMS chemical criteria (King County, 2003).

6.1.2.2 Combined Channel Delta Station (NFK502)
There are no chemicals of concern at the combined channel delta station at the end of the five-year monitoring period (Tables 8b and 9b). PCBs have not been detected in the 0 to 2 cm depth stratum for the last three monitoring rounds. PCBs were detected once in the 0 to 10 cm depth stratum in the last three monitoring rounds. Total PCBs were detected at a concentration of 21.0 µg/Kg DW in the 0 to 10 cm sample collected in 2003, which is less than 20% of the LAET. PCBs were not detected during the 2004 monitoring event, at a detection limit of 2.5 to 5.0 µg/Kg DW. Percent fines and TOC have remained consistently low at this station, indicating that this area of the cap is not prone to sediment deposition.

6.1.2.3 Boeing SD Channel Station (NFK503)
Total PCB concentrations are also once again elevated at NFK503. The detected concentration of 18.3 mg/Kg OC reported for the 0 to 10 cm sample exceeds the SQS and is approximately 28% of the CSL criterion of 65 mg/Kg OC. The total PCB concentration of 5.19 mg/Kg OC reported for the 0 to 2 cm sample, however, is well below the SQS of 12 mg/Kg OC. While very elevated PCB concentrations had been reported for NFK503 during past monitoring events, the total PCB concentrations of 4.13 mg/Kg OC (0 to 2 cm) and 7.93 mg/Kg OC (0 to 10 cm) reported for the April 2003 monitoring event indicated at that time that sediment quality had improved to a level that met SMS chemical criteria.

6.1.2.4 Upriver Reference Station (NFK504)
Both LPAH and HPAH concentrations increased significantly over those detected during the April 2003 monitoring event in the 0 to 2 cm sample collected from NFK504. While a corresponding higher TOC concentration (1.89%) was also reported at this station, the elevated PAH concentrations are much higher than reported in previous years, in samples with similar TOC results (Table 9d). Reported concentrations of phenanthrene (152 mg/Kg OC) and fluoranthene (276 mg/Kg OC) exceeded the SQS criteria (100 and 160 mg/Kg OC, respectively). Both total LPAH and total HPAH concentrations, however, were about half of the SQS criteria. Elevated concentrations of PAH compounds were not seen in the 0 to 10 cm sample at NFK504. Dibenzofuran was also detected in the 0 to 2 cm sample at a concentration of 6.01 mg/Kg OC, which is 40% of the SQS criterion of 15 mg/Kg OC. This is the first time this compound has been detected at the Norfolk monitoring site. Carbazole (not regulated under SMS) was detected at a higher concentration than in past monitoring events (Appendix A). The increased PAH concentrations, along with the first-time detection of dibenzofuran and increased carbazole concentration indicate the deposition in the last year of sediment possibly contaminated by creosote.

6.2 Summary of the Five-Year Monitoring Program

Sediment quality at the Norfolk CSO site has been monitored since April 1999, one month after placement of the remedial sediment cap. The five-year monitoring program was undertaken to meet a requirement of the site hydraulic permit, issued by the Washington State Department of Fish and Wildlife prior to remediation. The permit required that the site be monitored for a period of five years following remedial activities to evaluate possible recontamination of the sediment as a result of continuing CSO or storm water discharges. The two groups of chemicals of primary interest during the monitoring program were PCBs, detected at very elevated concentrations during remedial activities, and phthalates, due to predicted rapid recontamination by storm water and CSO discharges.

Monitoring stations were established at the following four locations:

- NFK501 – the Norfolk CSO channel prior to its confluence with the Boeing SD channel;
- NFK502 – a delta formed at the terminus of the combined Norfolk CSO and Boeing SD channels;
- NFK503 – the Boeing SD channel prior to its confluence with the Norfolk CSO channel; and
- NFK504 – an upriver reference station, still located on the sediment cap.

Sediment samples were collected from these four stations in April 1999 to establish a baseline, against which subsequent sediment data could be compared. A subsequent survey, performed in June 1999, found that the CSO and SD channels had altered their courses slightly after placement cap and stations NFK501, NFK502, and NFK503 were relocated to their present sampling points prior to the October 1999 monitoring event (King County 2000a). The October 1999 monitoring event was performed to evaluate site conditions six months' after placement of the sediment cap. Subsequent monitoring events were performed on an annual basis from April 2000 to April 2004.

A supplemental sampling event was conducted by King County to assess elevated PCB concentrations detected during the October 1999 scheduled monitoring event (King County 2000b). Very elevated PCB concentrations were detected inshore of the Norfolk sediment cap during the supplemental sampling event and were attributed to the Boeing parking lot SD outfall. Both The Boeing Company and Ecology completed additional sediment characterizations to further investigate the possible sources and transport of PCBs at the site and Boeing completed a sediment remediation of the inshore area in September 2003.

This section discusses and summarizes four main issues of interest over the five-year monitoring program:

- the spatial distribution of sample-collection points at the four monitoring stations over the course of the monitoring program;
- evaluating trends in phthalate concentrations to assess the predicted recontamination of the sediment cap;
- the distribution of PCBs at the site; and
- chemicals of concern at the end of the five-year monitoring program.

6.2.1 Distribution of Sample-Collection Points

Figure 3 shows the distribution of sample-collection points over the 5-year monitoring period, based on recorded DGPS coordinates collected with each grab sample, which are plotted on a 2002 USGS aerial photo. Grab sampling locations at the combined channel delta station (NFK502) and upriver reference station (NFK504) have been tightly distributed, with all sample-collection points at both stations within approximately 10 feet of each other. The distribution of sample-collection points at the Norfolk CSO channel station (NFK501) and Boeing SD channel station (NFK503) has been somewhat more widely distributed, due to the shallow depths and tidal dependence of the sampling locations. All sample-collection points at NFK501 have been located within 30 feet of each other and, at NFK503, within 20 feet of each other. All sample-collection points from these two stations have been located within their respective channels.

6.2.2 Potential Recontamination by Phthalates

One of the primary reasons for requiring the five-year monitoring program was concern about potential rapid recontamination of the cap by phthalate compounds present in storm water and remaining CSO from the Norfolk outfall. During preparation of the Norfolk cleanup study report (King County, 1996), simplified recontamination modeling indicated that phthalates in Norfolk CSO discharges could recontaminate the surface of the clean backfill material. Evaluating trends in phthalate concentrations at the site has become more complicated due to frequent laboratory contamination by these ubiquitous compounds. Laboratory phthalate contamination has been apparent for several of the sampling events, indicated by positive phthalate results in laboratory QC method blanks.

Table 11 summarizes phthalate analytical results for the five-year monitoring program using the most widely-accepted method of assessing data impacted by laboratory contamination. Samples with detected phthalate concentrations that have been qualified with a "B" flag, indicating laboratory contamination, have been qualified as "undetected" when the sample concentration is less than 10 times the concentration detected in the associated method blank. The qualified sample result has been reported as "less than the method detection limit" (<MDL) and the new, numeric MDL has been raised to a value equal to the detected sample concentration, as recommended in data validation guidelines (EPA, 2001).

Two phthalate compounds, diethyl phthalate and dimethyl phthalate have never been detected during the five-year monitoring program. Dry weight-normalized MDLs for these two compounds have always been below LAET values. When appropriate, organic carbon-normalized MDLs have also always been below SQS criteria.

Di-N-octyl phthalate was detected once, in a sample collected from the 0 to 2 cm depth stratum at the Norfolk CSO channel station (NFK501) during the April 2003 monitoring event. The dry weight-normalized di-N-octyl phthalate concentration of 146 μg/Kg DW was well below the LAET of 420 μg/Kg DW and the organic carbon-normalized concentration of 4.98 mg/Kg OC was also well below the SQS criterion of 58 mg/Kg OC.

Di-N-butyl phthalate was not detected in samples collected during the October 1999, April 2000, and April 2004 monitoring events. Di-N-butyl phthalate was detected in samples collected during the April 2001 and April 2003 monitoring events, however, a positive result for this compound in the laboratory QC method blank caused all sample results to be reported as "<MDL." Adjusted numeric MDLs for all samples were below both the LAET value and SQS criterion when appropriately normalized to either dry weight or organic carbon. Detected di-n-butyl phthalate concentrations were reported in six of eight samples collected during the April 2002 monitoring event. Dry weight-normalized concentrations ranged from 9.5 to 21.3 μg/Kg DW and organic carbon-normalized concentrations ranged from 0.39 to 1.1 mg/Kg OC, both of which were well below the LAET value of 1,400 μg/Kg DW and the SQS criterion of 220 mg/Kg OC, respectively.

Benzyl butyl phthalate was not detected in any sample collected during the first two monitoring events, October 1999 and April 2000. Benzyl butyl phthalate was detected in six of eight samples collected during the April 2001 monitoring event at concentrations ranging from 22.1 to 57.5 μg/Kg DW. When appropriately normalized to organic carbon, the benzyl

butyl phthalate concentration of 6.63 mg/Kg OC in the 0 to 2 cm sample collected from the Norfolk CSO channel station and the concentration of 5.03 mg/Kg OC in the 0 to 10 cm sample collected from the combined channel delta station both exceeded the SQS criterion of 4.9 mg/Kg OC. The other four detected sample results for benzyl butyl phthalate were all less than the SQS. Laboratory contamination caused all benzyl butyl phthalate results to be reported as "<MDL" for both the April 2002 and April 2003 monitoring events. All of the adjusted numeric MDLs, when appropriately normalized to organic carbon, were below the SQS criterion. Benzyl butyl phthalate was detected in five of eight samples collected during the April 2004 monitoring event at dry weight-normalized concentrations ranging from 10 to32.9 μg/Kg DW. Four of these five sample results could appropriately be normalized to organic carbon and the resulting concentrations, ranging from 1.08 to 1.65 mg/Kg OC, were all below the SQS. The dry weight-normalized result for the one sample that was not appropriate to normalize to organic carbon was below the LAET.

Bis(2-ethylhexyl) phthalate has been detected in the laboratory QC method blanks associated with every monitoring event. Adjusted MDLs have ranged from 19 to 410 μg/Kg DW, all well below the LAET of 1,300 μg/Kg DW. One adjusted, organic carbon-normalized MDL of 52 mg/Kg OC has exceeded the SQS of 49 mg/Kg OC. In spite of the continued laboratory contamination problem with this compound, usable bis(2-ethylhexyl) phthalate data have been reported for the last four monitoring rounds, April 2001 to April 2004. All reported dry weight-normalized bis(2-ethylhexyl) phthalate concentrations, ranging from 192 to 1,130 μg/Kg DW, have been below the LAET. When it has been appropriate to normalize these results to organic carbon, one reported concentration exceeded the SQS. The bis(2-ethylhexyl) phthalate concentration of 63.1 mg/Kg OC in the 0 to 2 cm sample collected in 2002 from the upriver reference station (NFK504) exceeded the SQS and was 80% of the CSL. The concentration has declined to below the SQS at this station, however, to 11.9 mg/Kg OC in the sample collected during the April 2004 monitoring round. This declining trend in bis(2-ethylhexyl) phthalate concentrations has been evident at all four stations over the last two monitoring rounds. The highest reported bis(2-ethylhexyl) phthalate concentration from the April 2004 monitoring event was 25.8 mg/Kg OC in the 0 to 2 cm sample collected from the Norfolk CSO channel station. This concentration is less than 55% of the SQS.

Based on this evaluation, it appears that the previously predicted recontamination by phthalates to a level greater than the SQS is not occurring at the Norfolk CSO sediment remediation site.

6.2.3 Distribution of PCBs

Figure 4 shows plots of dry-weight normalized PCB concentrations over time at all four Norfolk monitoring stations. PCB concentrations have been presented on a dry-weight normalized basis to allow ease of comparison, both between stations and over time. The plots compare the concentrations to both the LAET (130 μg/Kg DW) and the 2LAET (1,000 μg/Kg DW) as a measure of sediment quality. An "exceedence" of the LAET or 2LAET, however, does not necessarily constitute an exceedence of SMS criteria if the PCB concentration should be correctly normalized to organic carbon (an organic carbon content greater than 0.5% DW). The plots have been notated with an asterisk for those values that

appear to exceed the LAET but, when correctly normalized to organic carbon, do not exceed the SQS criterion of 12 mg/Kg OC.

PCBs were first detected at the Norfolk CSO sediment remediation site in samples collected during the October 1999 monitoring event, six months after completion of remedial activities. PCBs were detected in both depth strata at three of the four stations (NFK501, NFK502, and NFK503) and in the 0 to 2 cm depth stratum at the upriver reference station (NFK504). The highest total PCB concentrations from this monitoring round were detected in both the 0 to 2 and 0 to 10 cm samples collected from the Boeing SD channel station (NFK503). Total PCB concentrations at station NFK503 exceeded both the SQS criterion (0 to 2 cm sample) and the LAET value (0 to 10 cm sample) when appropriately normalized to organic carbon or dry weight, respectively (King County, 2000a).

Because an apparent gradient in PCB concentrations existed, from lowest at station NFK502 (combined channel delta), then NFK501 (Norfolk CSO channel), to highest at NFK503 (Boeing SD channel), a supplemental sediment sampling event was conducted in February 2000 to assess PCB concentrations inshore of the remedial sediment cap. Results of this sampling showed very elevated PCB concentrations proximal to the Boeing SD outfall and indicated that this inshore area was a likely source of PCB recontamination on the Norfolk sediment cap. Total PCB concentrations in the three samples collected closest to the Boeing SD outfall were all greater than six times the CSL (King County, 2000b). Ecology conducted a sediment characterization inshore of the Norfolk remedial cap in June 2002. Results from their study verified King County's earlier sampling event in the vicinity of the Boeing SD outfall, showing elevated total PCB concentrations at the outfall (Ecology, unpublished data 2002).

The highest PCB concentrations were also detected in samples collected from the Boeing SD channel station during the April 2001 monitoring event. Total PCB concentrations in these two samples were 130 and 190% of the 2LAET. PCB concentrations reported for all stations began to decrease in the April 2002 and April 2003 monitoring events. Total PCB concentrations at all four monitoring stations were below the SQS or LAET for the April 2003 monitoring event (King County 2003).

The Boeing Company conducted a sediment remediation inshore of the cap in September 2003, during which approximately 60 cy of PCB-contaminated sediment were removed. Results from the King County's April 2004 sampling event, however, showed an increase in PCB concentrations at two stations. Total PCB concentrations were again elevated above the SQS or LAET in the 0 to 10 cm depth stratum at the Norfolk CSO channel and Boeing SD channel stations (NFK501 and NFK503). These results indicate that there may still be some residual PCB concentrations at the Norfolk remediation site.

6.2.4 Chemicals of Concern at the End of the Five-Year Monitoring Program

The following chemicals are still present at the Norfolk CSO sediment remediation site at the end of the five-year monitoring program in concentrations that exceed SMS chemical criteria or LAET values.

- **PAHs** – Two PAH compounds were detected in the 0 to 2 cm sample from the upriver reference station (1.89% TOC) at concentrations that exceed SQS criteria.
  1. The fluoranthene concentration of 276 mg/Kg OC exceeds the SQS criterion of 160 mg/Kg OC but is less than 25% of the CSL criterion of 1,200 mg/Kg OC.
  2. The phenanthrene concentration of 152 mg/Kg OC exceeds the SQS criterion of 100 mg/Kg OC but is less than 35% of the CSL criterion of 480 mg/Kg OC.
- **PCBs** – Total PCBs, comprised solely of Aroclors 1248 and 1254, were detected at two stations at concentrations that exceed either the SQS criterion or LAET .
  1. The total PCB concentration of 18.3 mg/Kg OC detected in the 0 to 10 cm sample from the Boeing SD channel station (2.59% TOC) exceeds the SQS criterion of 12 mg/Kg OC but is less than 30% of the CSL criterion of 65 mg/Kg OC.
  2. The total PCB concentration of 473 μg/Kg DW detected in the 0 to 10 cm sample from the Norfolk CSO channel station (0.31% TOC) exceeds the LAET of 130 μg/Kg DW but is less than 50% of the 2LAET of 1,000 μg/Kg DW.

There have been period exceedences of SMS criteria on the Norfolk sediment cap. These exceedences, however, have been sporadic in nature and do not appear to show a consistent upward trend. Surface recontamination of the sediment cap from discharges of the Norfolk CSO, to levels approaching SQS chemical criteria, does not appear to have occurred over the five-year monitoring period. There appear to be some residual PCB concentrations at the site that are greater than the SQS criterion or LAET.

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FIGURES

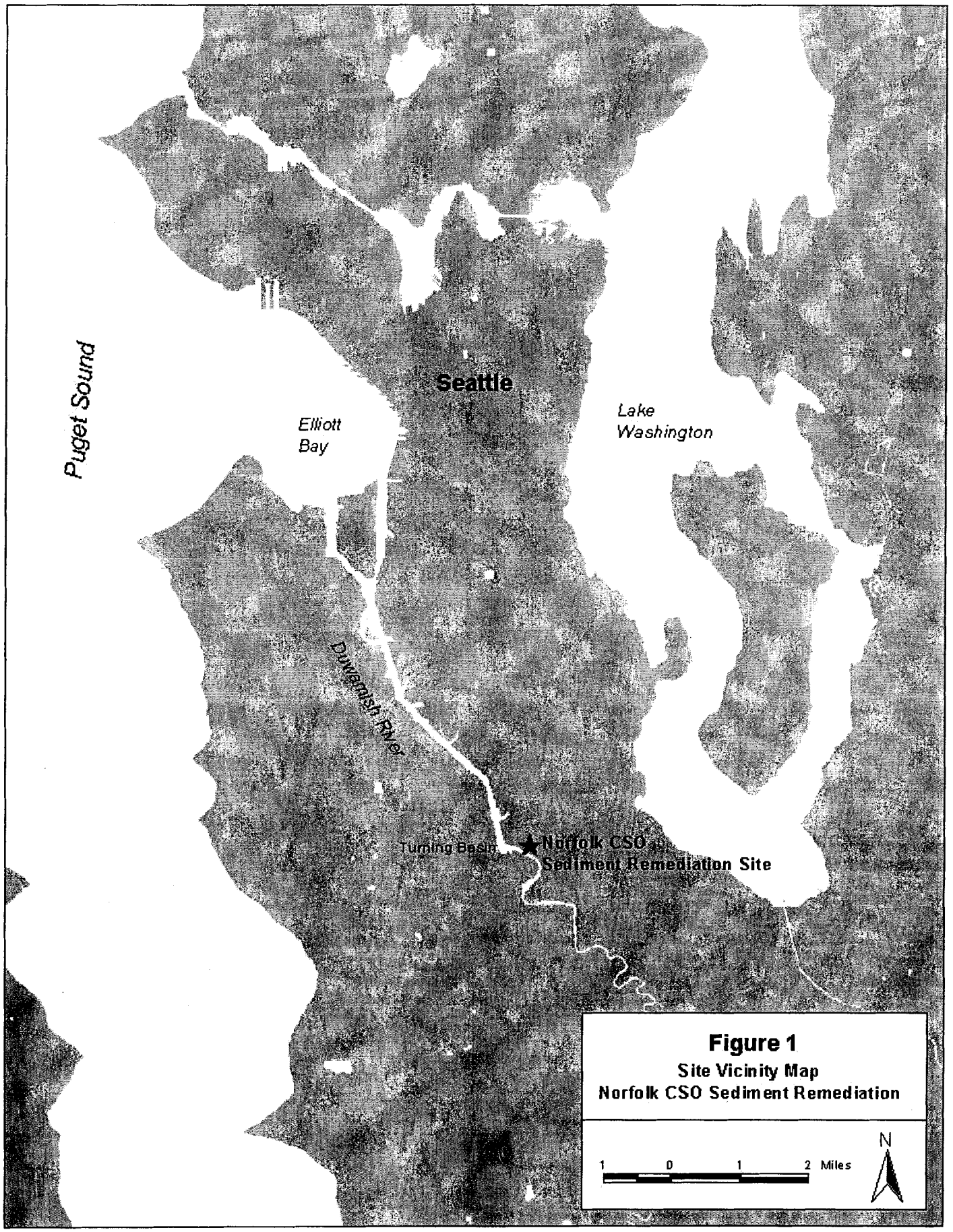


Figure 1
Site Vicinity Map
Norfolk CSO Sediment Remediation

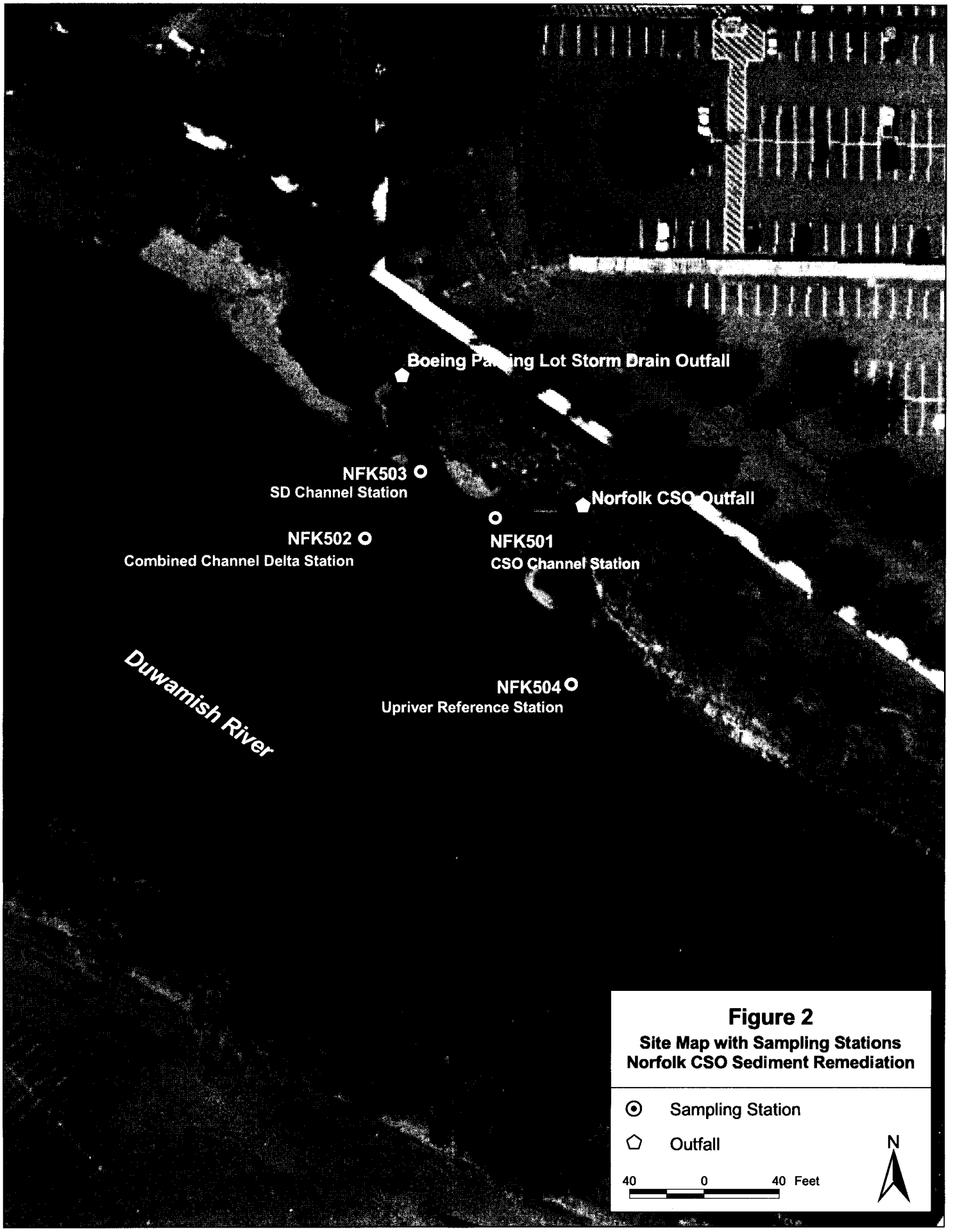


Figure 2
Site Map with Sampling Stations
Norfolk CSO Sediment Remediation

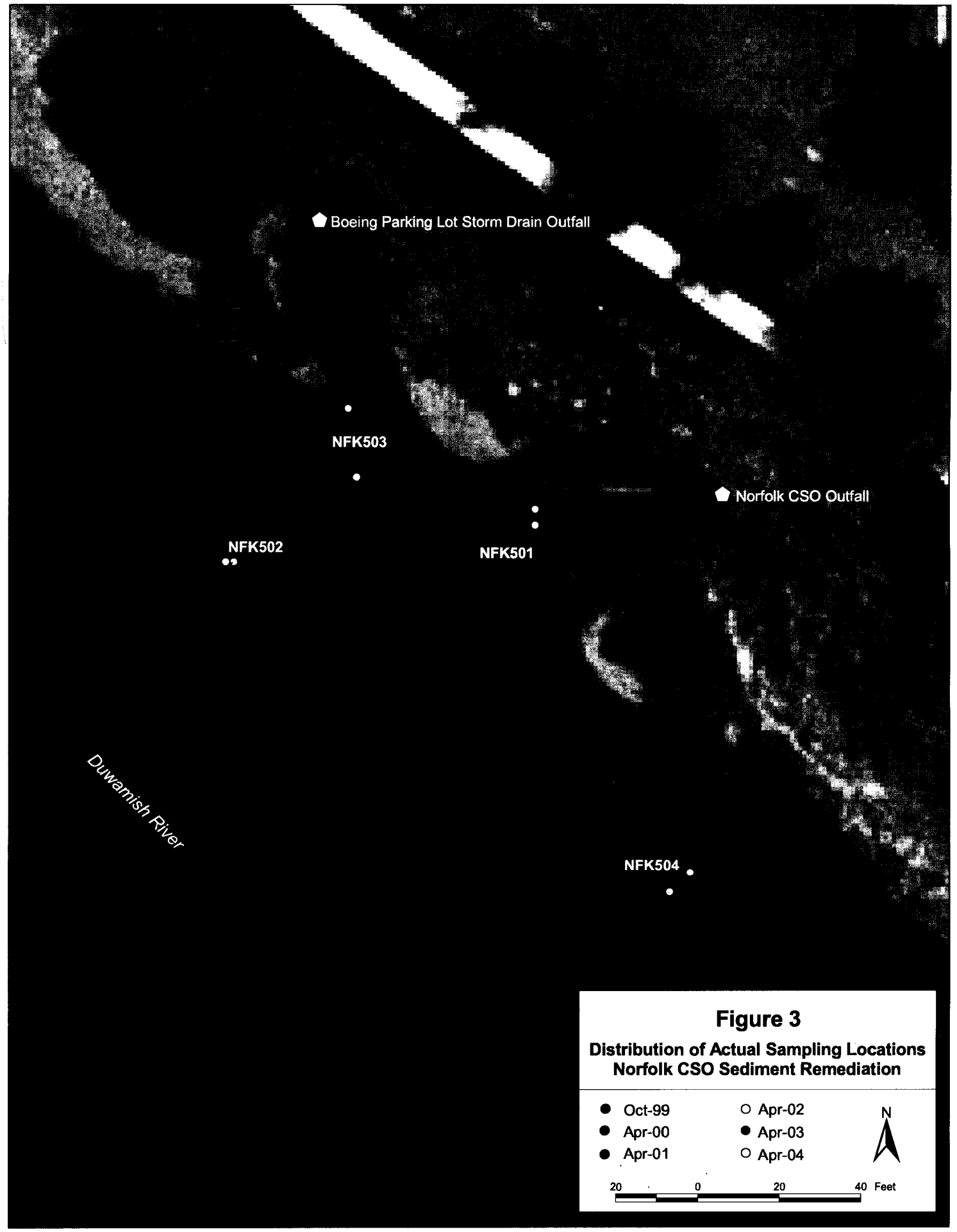
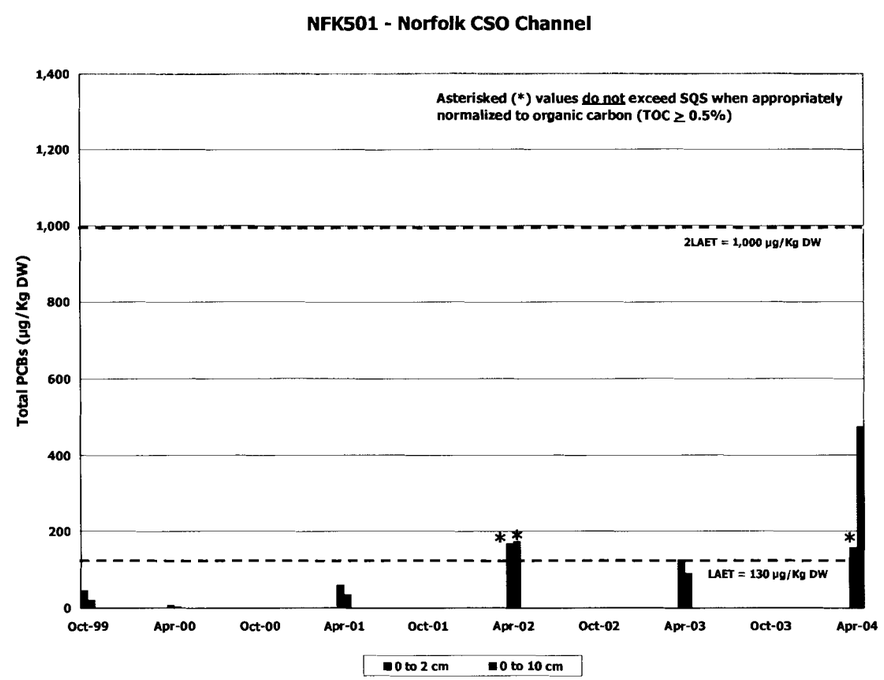
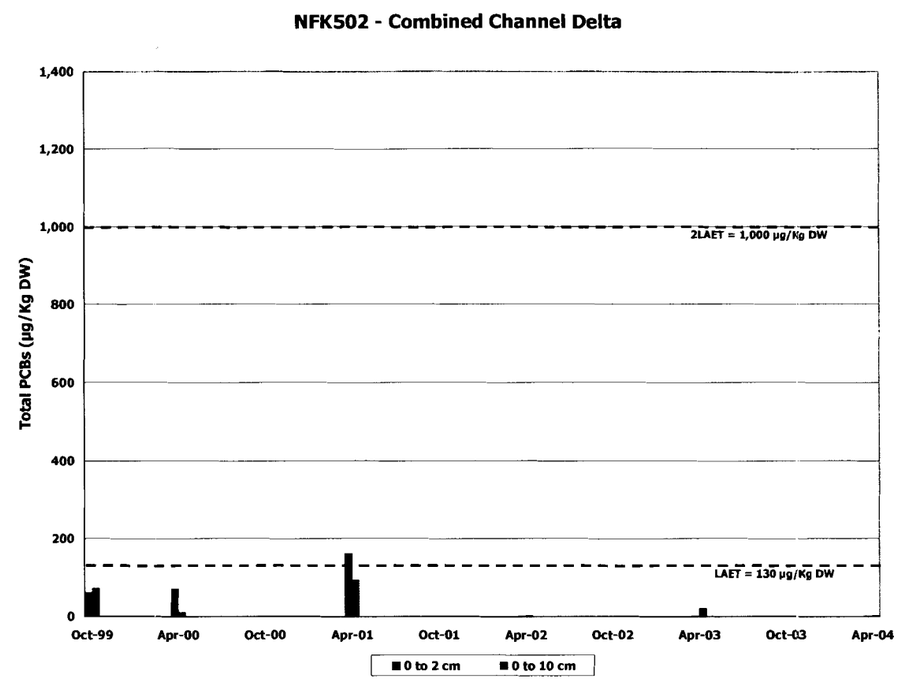


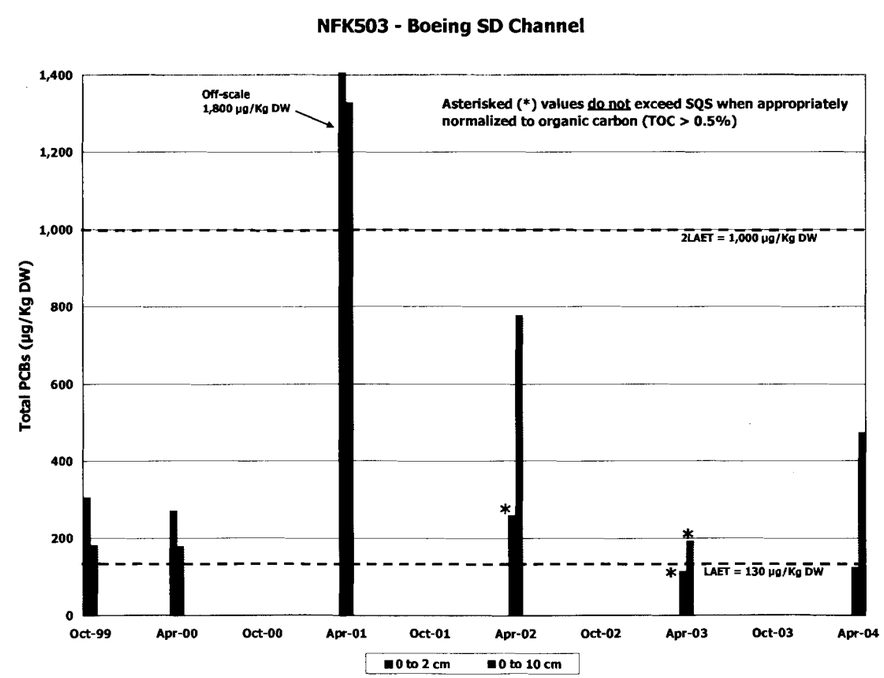
Figure 3

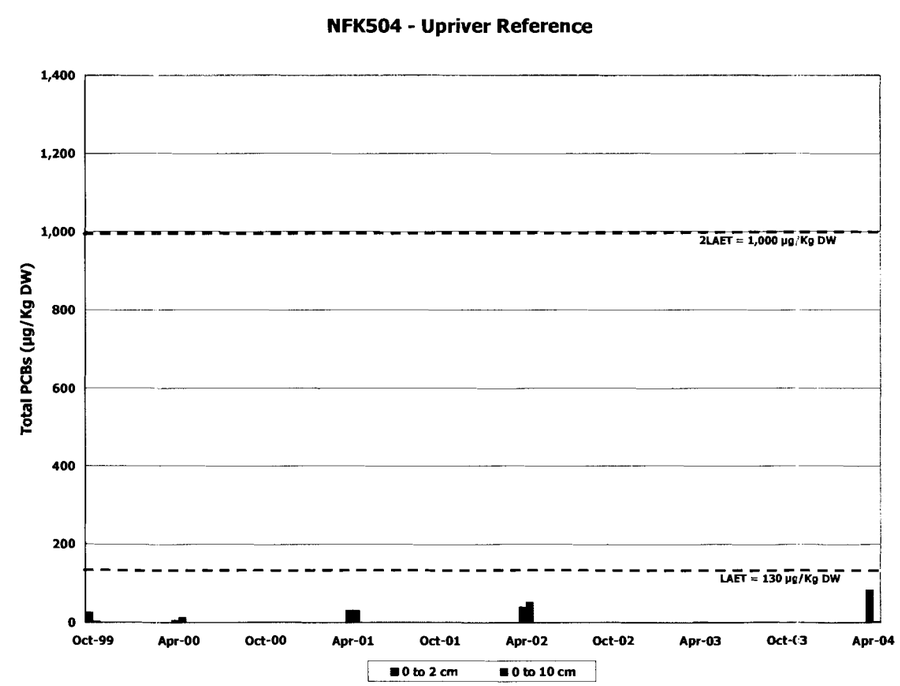
Distribution of Actual Sampling Locations
Norfolk CSO Sediment Remediation

Figure 4 – Comparison of Total PCB Concentrations Over Time at the Norfolk Site (Data Presented on a Dry Weight Basis)









TABLES

Table 1
Sample Location Coordinates
Norfolk CSO Sediment Remediation Project
Five-Year Monitoring Program, Year Five, April 2004

Station Name	Northing (NAD83)	Easting (NAD83)
NFK501 Prescribed Station	190170	1278584
NFK501 Grab 1	190170	1278587
NFK501 Grab 2	190173	1278591
NFK501 Grab 3	190164	1278589
NFK502 Prescribed Station	190159	1278514
NFK502 Grab 1	190154	1278513
NFK502 Grab 2	190158	1278516
NFK503 Prescribed Station	190195	1278544
NFK503 Grab 1	190197	1278543
NFK503 Grab 2	190191	1278542
NFK504 Prescribed Station	190080	1278625
NFK504 Grab 1	190078	1278625
NFK504 Grab 2	190080	1278628

Notes

NAD83 - North American Datum, 1983

Table 2
Particle Size Distribution
Norfolk CSO Sediment Remediation Project
Five-Year Monitoring Program, Year Five, April 2004

		Percent Distribution			
Phi Size	Class	NFK 501 0 - 2 cm	NFK501 0 - 10 cm	NFK502 0 - 2 cm	NFK502 0 - 10 cm
>p-2.00	Gravel	0.1	<MDL (0.1)	0.2	<MDL (0.1)
p-2.00	Gravel	<MDL (0.1)	<MDL (0.1)	0.2	0.1
p-1.00	Gravel	2.0	4.0	2.0	3.0
	Total Gravel	**2.1**	**4.0**	**2.4**	**3.1**
p0.00	Sand	4.0	10.0	19.9	26.4
p+1.00	Sand	11.9	22.9	46.5	40.6
p+2.00	Sand	16.2	39.5	24.0	19.8
p+3.00	Sand	4.0	8.0	3.0	5.0
p+4.00	Sand	11.8	5.0	0.7	0.8
	Total Sand	**47.9**	**85.4**	**94.1**	**92.6**
p+5.00	Silt	18.2	0.6	0.5	0.6
p+6.00	Silt	7.0	1.0	0.5	1.0
p+7.00	Silt	8.0	1.0	<MDL (0.5)	1.0
p+8.00	Silt	3.0	1.0	0.5	<MDL (0.5)
	Total Silt	**36.2**	**3.6**	**1.5**	**2.6**
p+9.00	Clay	3.0	1.0	<MDL (0.5)	0.6
≤p+10.00	Clay	9.0	3.0	3.0	3.0
	Total Clay	**12.0**	**4.0**	**3.0**	**3.6**

		Percent Distribution			
Phi Size	Class	NFK503 0 - 2 cm	NFK503 0 - 10 cm	NFK504 0 - 2 cm	NFK504 0 - 10 cm
>p-2.00	Gravel	<MDL (0.1)	<MDL (0.1)	0.6	<MDL (0.1)
p-2.00	Gravel	<MDL (0.1)	<MDL (0.1)	<MDL (0.1)	<MDL (0.1)
p-1.00	Gravel	<MDL (0.1)	0.3	0.6	0.6
	Total Gravel	**<MDL (0.1)**	**0.3**	**1.2**	**0.6**
p0.00	Sand	0.2	1.0	4.0	5.0
p+1.00	Sand	0.5	3.0	11.4	37.7
p+2.00	Sand	0.8	6.0	11.8	42.2
p+3.00	Sand	11.2	6.0	8.0	3.0
p+4.00	Sand	30.7	23.7	13.7	2.0
	Total Sand	**43.4**	**39.7**	**48.9**	**89.9**
p+5.00	Silt	19.8	21.0	17.4	3.0
p+6.00	Silt	6.0	8.0	8.0	1.0
p+7.00	Silt	8.0	6.0	5.0	1.0
p+8.00	Silt	3.0	7.0	6.0	<MDL (0.5)
	Total Silt	**36.8**	**42.0**	**36.4**	**5.0**
p+9.00	Clay	3.0	3.0	6.0	<MDL (0.5)
≤p+10.00	Clay	10.4	10.5	5.0	5.0
	Total Clay	**13.4**	**13.5**	**11.0**	**5.0**

Notes

<MDL (#) - Analyte not detected above the *method detection limit*. Value is parentheses is the numeric MDL.

Table 3
Sediment Conventional Results
Norfolk CSO Sediment Remediation Project
Five-Year Monitoring Program, Year Five, April 2004

Conventionals	NFK 501 0 - 2 cm	NFK501 0 - 10 cm	NFK502 0 - 2 cm	NKF502 0 - 10 cm
Solids (%)	50.4	77.9	87.2	79.9
TOC (mg/Kg DW)	20,000	3,130	2,280	1,650

Conventionals	NFK503 0 - 2 cm	NFK503 0 - 10 cm	NFK504 0 - 2 cm	NFK504 0 - 10 cm
Solids (%)	48.2	48.7	50.8	74.9
TOC (mg/Kg DW)	24,100	25,900	18,900	2,940

Notes

TOC - Total organic carbon.

mg/Kg DW - Milligrams per kilogram dry weight, based on percent solids analysis.

Table 4
Sediment Metal Results
Norfolk CSO Sediment Remediation Project
Five-Year Monitoring Program, Year Five, April 2004

	Concentration (mg/Kg DW)					
Metal	**NFK501 0 - 2 cm**	**NFK501 0 - 10 cm**	**NFK502 0 - 2 cm**	**NFK502 0 - 10 cm**	**SQS**	**CSL**
Arsenic	<MDL (4.8)	<MDL (3.1)	<MDL (2.9)	<MDL (3.0)	57	93
Cadmium	0.36	<MDL (0.18)	<MDL (0.17)	<MDL (0.19)	5.1	6.7
Chromium	21.2	11.9	10.9	11.5	260	270
Copper	29.0	11.9	12.0	13.3	390	390
Lead	13	4.1	6.1	5.5	450	530
Mercury	0.063	<MDL (0.024)	<MDL (0.023)	<MDL (0.025)	0.41	0.59
Silver	0.75	0.46	0.46	0.50	6.1	6.1
Zinc	78.2	38.9	44.4	43.2	410	960

	Concentration (mg/Kg DW)					
Metal	**NFK503 0 - 2 cm**	**NFK503 0 - 10 cm**	**NFK504 0 - 2 cm**	**NFK504 0 - 10 cm**	**SQS**	**CSL**
Arsenic	<MDL (5.2)	<MDL (5.1)	5.9	<MDL (3.3)	57	93
Cadmium	0.33	0.37	<MDL (0.30)	<MDL (0.20)	5.1	6.7
Chromium	21.6	22.4	19.4	12.1	260	270
Copper	30.5	33.3	28.3	12.4	390	390
Lead	13	16.3	15.7	6.0	450	530
Mercury	0.064	0.23	0.069	<MDL (0.027)	0.41	0.59
Silver	0.98	0.80	0.87	0.57	6.1	6.1
Zinc	78.4	92.0	78.0	45.4	410	960

Notes

mg/Kg DW - Milligrams per kilogram dry weight, based on percent solids analysis.

<MDL (#) - Analyte not detected above the *method detection limit*. Value is parentheses is the numeric MDL.

Table 5

Sediment Ionic Organic Results

Norfolk CSO Sediment Remediation Project

Five-Year Monitoring Program, Year Five, April 2004

	Concentration (µg/Kg DW)					
Ionic Organics	**NFK501 0 - 2 cm**	**NFK501 0 - 10 cm**	**NFK502 0 - 2 cm**	**NFK502 0 - 10 cm**	**SQS**	**CSL**
Benzoic Acid	292, B10	74, B5	47, B5	<MDL (16)	650	650
Benzyl Alcohol	<MDL (12)	<MDL (7.7)	<MDL (6.9)	<MDL (7.5)	57	73
2,4-Dimethylphenol	<MDL (14)	<MDL (9.0)	<MDL (8.0)	<MDL (8.8)	29	29
2-Methylphenol	<MDL (32)	<MDL (21)	<MDL (18)	<MDL (20)	63	63
4-Methylphenol	<MDL (32)	<MDL (21)	<MDL (18)	<MDL (20)	670	670
Pentachlorophenol	<MDL (9.9)	<MDL (6.4)	<MDL (5.7)	<MDL (6.3)	360	690
Phenol	<MDL (18)	<MDL (12)	<MDL (10)	<MDL (11)	420	1,200

	Concentration (µg/Kg DW)					
Ionic Organics	**NFK503 0 - 2 cm**	**NFK503 0 - 10 cm**	**NFK504 0 - 2 cm**	**NFK504 0 - 10 cm**	**SQS**	**CSL**
Benzoic Acid	146, B5	152, B5	130, B5	56, B5	650	650
Benzyl Alcohol	<MDL (12)	<MDL (12)	<MDL (12)	<MDL (8.0)	57	73
2,4-Dimethylphenol	<MDL (15)	<MDL (14)	<MDL (14)	<MDL (9.3)	29	29
2-Methylphenol	<MDL (33)	<MDL (33)	<MDL (31)	<MDL (21)	63	63
4-Methylphenol	<MDL (33)	<MDL (33)	<MDL (31)	<MDL (21)	670	670
Pentachlorophenol	<MDL (10)	<MDL (10)	<MDL (9.8)	<MDL (6.7)	360	690
Phenol	<MDL (19)	<MDL (18)	<MDL (18)	<MDL (12)	420	1,200

Notes

µg/Kg DW - Micrograms per kilogram dry weight, based on percent solids analysis.

<MDL (#) - Analyte not detected above the *method detection limit*. Value in parentheses is the numeric MDL.

B5, B10 - Compound detected in laboratory method blank. Sample concentration is less than 5 times the method blank concentration (B5) or greater than 5 times but less than 10 times the method blank concentration (B10).

Table 6

Sediment Non-Ionic Organic Results (Organic Carbon Normalized)

Norfolk CSO Sediment Remediation Project

Five-Year Monitoring Program, Year Five, April 2004

	Concentration (mg/Kg OC)					
Non-Ionic Organics	**NFK501 0 - 2 cm TOC 2.00%**	**NFK501 0 - 10 cm TOC 0.31%**	**NFK502 0 - 2 cm TOC 0.23%**	**NFK502 0 - 10 cm TOC 0.17%**	**SQS**	**CSL**
LPAHs						
Acenaphthene	<MDL (0.69)	<MDL (2.9)	<MDL (3.5)	<MDL (5.3)	16	57
Acenaphthylene	<MDL (1.5)	<MDL (6.1)	<MDL (7.5)	<MDL (11)	66	66
Anthracene	0.73	<MDL (1.6)	<MDL (2.0)	<MDL (3.0)	220	1,200
Fluorene	<MDL (1.3)	<MDL (5.3)	<MDL (6.5)	<MDL (9.8)	23	79
2-Methylnaphthalene	<MDL (1.4)	<MDL (5.7)	<MDL (7.0)	<MDL (11)	38	64
Naphthalene	<MDL (1.4)	<MDL (5.7)	<MDL (7.0)	<MDL (11)	99	170
Phenanthrene	4.94	2.9	<MDL (2.0)	<MDL (3.0)	100	480
Total LPAH	5.7	2.9	<MDL (2.0 - 7.5)	<MDL (3.0 - 11)	370	780
HPAHs						
Benzo(a)anthracene	3.85	2.46	1.7	2.2	110	270
Benzo(a)pyrene	3.81	3.52	2.9	3.5	99	210
Benzofluoranthenes (Total)	8.96	6.23	5.1	2.8	230	450
Benzo(g,h,i)perylene	3.30	<MDL (3.3)	<MDL (4.0)	<MDL (6.1)	31	78
Chrysene	5.60	3.86	2.3	<MDL (3.0)	110	460
Dibenzo(a,h)anthracene	<MDL (0.69)	<MDL (2.9)	<MDL (3.5)	<MDL (5.3)	12	33
Fluoranthene	11.8	6.1	4.2	<MDL (6.1)	160	1,200
Indeno(1,2,3-c,d)pyrene	2.88	<MDL (3.7)	<MDL (4.5)	<MDL (6.8)	34	88
Pyrene	8.85	4.84	4.17	4.4	1,000	1,400
Total HPAH	49.1	27	20	13	960	5,300
Chlorobenzenes						
1,2-Dichlorobenzene	<MDL (0.026)	<MDL (0.11)	<MDL (0.13)	<MDL (0.20)	2.3	2.3
1,4-Dichlorobenzene	<MDL (0.013)	<MDL (0.053)	<MDL (0.065)	<MDL (0.098)	3.1	9
Hexachlorobenzene	<MDL (0.065)	<MDL (0.27)	<MDL (0.33)	<MDL (0.50)	0.38	2.3
1,2,4-Trichlorobenzene	<MDL (0.026)	<MDL (0.11)	<MDL (0.13)	<MDL (0.20)	0.81	1.8
Phthalates						
Bis(2-ethylhexyl) Phthalate	25.7, B	14.9, B10	10.7, B5	11.7, B5	47	78
Benzyl Butyl Phthalate	1.64	<MDL (2.5)	<MDL (3.0)	<MDL (4.5)	4.9	64
Di-N-butyl Phthalate	<MDL (0.50)	<MDL (2.0)	<MDL (2.5)	<MDL (3.8)	220	1,700
Di-N-octyl Phthalate	<MDL (0.79)	<MDL (3.3)	<MDL (4.0)	<MDL (6.1)	58	4,500
Diethyl Phthalate	<MDL (0.59)	<MDL (2.5)	<MDL (3.0)	<MDL (4.5)	61	110
Dimethyl Phthalate	<MDL (0.59)	<MDL (2.5)	<MDL (3.0)	<MDL (4.5)	53	53
Miscellaneous Compounds						
Dibenzofuran	<MDL (1.4)	<MDL (5.7)	<MDL (7.0)	<MDL (11)	15	58
Hexachlorobutadiene	<MDL (0.074)	<MDL (0.31)	<MDL (0.38)	<MDL (0.57)	3.9	6.2
N-Nitrosodiphenylamine	<MDL (0.59)	<MDL (2.5)	<MDL (3.0)	<MDL (4.5)	11	11
PCBs						
Total PCBs	7.82	151	<MDL (1.0 - 2.0)	<MDL (1.5 - 3.0)	12	65

Notes

mg/Kg OC - Milligrams per kilogram organic carbon, based on total organic carbon analysis.

<MDL (#) - Analyte not detected above the *method dection limit*. Value in parentheses is the numeric MDL.

TOC % - Percent total organic carbon on a dry weight basis, based on total solids analysis.

B5, B10, B - Compound detected in laboratory method blank. Sample concentration is less than 5 times the method blank concentration (B5), greater than 5 times but less than 10 times the method blank concentration (B10), or greater than 10 times the method blank concentration (B).

Shaded Column - Organic carbon content less than 0.5% and comparison with organic carbon-normalized SQS/CSL values is inappropriate. Data presented for comparison with other stations only.

Shaded Cell with Double Border - Detected concentration exceeds the SQS and/or CSL.

Table 6 (cont.)

Sediment Non-Ionic Organic Results (Organic Carbon Normalized)

Norfolk CSO Sediment Remediation Project

Five-Year Monitoring Program, Year Five, April 2004

	Concentration (mg/Kg OC)					
	NFK503 0 - 2 cm	NFK503 0 - 10 cm	NFK504 0 - 2 cm	NFK504 0 - 10 cm		
Non-Ionic Organics	TOC 2.41%	TOC 2.59%	TOC 1.89%	TOC 0.29%	SQS	CSL
LPAHs						
Acenaphthene	<MDL (0.60)	<MDL (0.56)	5.90	<MDL (3.2)	16	57
Acenaphthylene	<MDL (1.3)	<MDL (1.2)	<MDL (1.6)	<MDL (6.8)	66	66
Anthracene	0.44	0.53	5.16	<MDL (1.8)	220	1,200
Fluorene	<MDL (1.1)	<MDL (1.0)	<MDL (1.4)	<MDL (5.9)	23	79
2-Methylnaphthalene	<MDL (1.2)	<MDL (1.1)	2.4	<MDL (6.4)	38	64
Naphthalene	<MDL (1.2)	<MDL (1.1)	1.6	<MDL (6.4)	99	170
Phenanthrene	2.23	3.21	**152**	3.5	100	480
Total LPAH	2.7	3.7	170	3.5	370	780
HPAHs						
Benzo(a)anthracene	2.22	2.91	9.28	3.48	110	270
Benzo(a)pyrene	2.35	3.54	8.52	4.47	99	210
Benzofluoranthenes (Total)	5.32	8.02	42.9	7.64	230	450
Benzo(g,h,i)perylene	1.57	2.83	5.84	<MDL (3.6)	31	78
Chrysene	3.45	4.36	34.3	5.23	110	460
Dibenzo(a,h)anthracene	<MDL (0.60)	<MDL (0.56)	1.3	<MDL (3.2)	12	33
Fluoranthene	5.67	8.73	**276**	8.91	160	1,200
Indeno(1,2,3-c,d)pyrene	1.1	2.11	5.56	<MDL (4.1)	34	88
Pyrene	5.05	7.02	148	7.64	1,000	1,400
Total HPAH	27	39.5	530	37.4	960	5,300
Chlorobenzenes						
1,2-Dichlorobenzene	<MDL (0.022)	<MDL (0.021)	<MDL (0.027)	<MDL (0.12)	2.3	2.3
1,4-Dichlorobenzene	<MDL (0.011)	<MDL (0.010)	<MDL (0.014)	<MDL (0.059)	3.1	9
Hexachlorobenzene	<MDL (0.057)	<MDL (0.052)	<MDL (0.069)	<MDL (0.30)	0.38	2.3
1,2,4-Trichlorobenzene	<MDL (0.022)	<MDL (0.021)	<MDL (0.027)	<MDL (0.12)	0.81	1.8
Phthalates						
Bis(2-ethylhexyl) Phthalate	14.2, B	24.2, B	11.9, B	13.3, B5	47	78
Benzyl Butyl Phthalate	1.11	1.08	1.56	3.5	4.9	64
Di-N-butyl Phthalate	<MDL (0.43)	<MDL (0.40)	<MDL (0.52)	<MDL (2.3)	220	1,700
Di-N-octyl Phthalate	<MDL (0.69)	<MDL (0.63)	<MDL (0.84)	<MDL (3.6)	58	4,500
Diethyl Phthalate	<MDL (0.52)	<MDL (0.48)	<MDL (0.63)	<MDL (2.7)	61	110
Dimethyl Phthalate	<MDL (0.52)	<MDL (0.48)	<MDL (0.63)	<MDL (2.7)	53	53
Miscellaneous Compounds						
Dibenzofuran	<MDL (1.2)	<MDL (1.1)	6.01	<MDL (6.4)	15	58
Hexachlorobutadiene	<MDL (0.065)	<MDL (0.060)	<MDL (0.078)	<MDL (0.34)	3.9	6.2
N-Nitrosodiphenylamine	<MDL (0.52)	<MDL (0.48)	<MDL (0.63)	<MDL (2.7)	11	11
PCBs						
Total PCBs	5.19	**18.3**	4.46	<MDL (0.91 - 1.8)	12	65

Notes

mg/Kg OC - Milligrams per kilogram organic carbon, based on total organic carbon analysis.

<MDL (#) - Analyte not detected above the *method dection limit*. Value in parentheses is the numeric MDL.

TOC % - Percent total organic carbon on a dry weight basis, based on total solids analysis.

B5, B10, B - Compound detected in laboratory method blank. Sample concentration is less than 5 times the method blank concentration (B5), greater than 5 times but less than 10 times the method blank concentration (B10), or greater than 10 times the method blank concentration (B).

Shaded Column - Organic carbon content less than 0.5% and comparison with organic carbon-normalized SQS/CSL values is inappropriate. Data presented for comparison with other stations only.

Shaded Cell with Double Border - Detected concentration exceeds the SQS and/or CSL.

Table 7

Sediment Non-Ionic Organic Results (Dry Weight Normalized)

Norfolk CSO Sediment Remediation Project
Five-Year Monitoring Program, Year Five, April 2004

	Concentration (µg/Kg DW)					
Non-Ionic Organics	**NFK501 0 - 2 cm TOC 2.00%**	**NFK501 0 - 10 cm TOC 0.31%**	**NFK502 0 - 2 cm TOC 0.23%**	**NFK502 0 - 10 cm TOC 0.17%**	**LAET* SQS**	**2LAET* CSL**
LPAHs						
Acenaphthene	<MDL (14)	<MDL (9.0)	<MDL (8.0)	<MDL (8.8)	500	730
Acenaphthylene	<MDL (30)	<MDL (19)	<MDL (17)	<MDL (19)	1,300	1,300
Anthracene	15	<MDL (5.1)	<MDL (4.6)	<MDL (5.0)	960	4,400
Fluorene	<MDL (26)	<MDL (17)	<MDL (15)	<MDL (16)	540	1,000
2-Methylnaphthalene	<MDL (28)	<MDL (18)	<MDL (16)	<MDL (18)	670	1,400
Naphthalene	<MDL (28)	<MDL (18)	<MDL (16)	<MDL (18)	2,100	2,400
Phenanthrene	99.0	9.1	<MDL (4.6)	<MDL (5.0)	1,500	5,400
Total LPAH	110	9.1	<MDL (4.6 - 17)	<MDL (5.0 - 19)	5,200	13,000
HPAHs						
Benzo(a)anthracene	77.2	7.70	3.8	3.6	1,300	1,600
Benzo(a)pyrene	76.4	11.0	6.7	5.8	1,600	3,000
Benzofluoranthenes (Total)	180	19.5	12	4.6	3,200	3,600
Benzo(g,h,i)perylene	66.1	<MDL (10)	<MDL (9.2)	<MDL (10)	670	720
Chrysene	112	12.1	5.3	<MDL (5.0)	1,400	2,800
Dibenzo(a,h)anthracene	<MDL (14)	<MDL (9.0)	<MDL (8.0)	<MDL (8.8)	230	540
Fluoranthene	236	19	9.6	<MDL (10)	1,700	2,500
Indeno(1,2,3-c,d)pyrene	57.7	<MDL (12)	<MDL (10)	<MDL (11)	600	690
Pyrene	177	15.1	9.51	7.3	2,600	3,300
Total HPAH	982	84	47	21	12,000	17,000
Chlorobenzenes						
1,2-Dichlorobenzene	<MDL (0.52)	<MDL (0.33)	<MDL (0.30)	<MDL (0.33)	35	50
1,4-Dichlorobenzene	<MDL (0.26)	<MDL (0.17)	<MDL (0.15)	<MDL (0.16)	110	120
Hexachlorobenzene	<MDL (1.3)	<MDL (0.85)	<MDL (0.76)	<MDL (0.83)	22	70
1,2,4-Trichlorobenzene	<MDL (0.52)	<MDL (0.33)	<MDL (0.30)	<MDL (0.33)	31	51
Phthalates						
Bis(2-ethylhexyl) Phthalate	516, B	46.7, B10	24.3, B5	19.3, B5	1,300	1,900
Benzyl Butyl Phthalate	32.9	<MDL (7.7)	<MDL (6.9)	<MDL (7.5)	63	470
Di-N-butyl Phthalate	<MDL (9.9)	<MDL (6.4)	<MDL (5.7)	<MDL (6.3)	1,400	5,100
Di-N-octyl Phthalate	<MDL (16)	<MDL (10)	<MDL (9.2)	<MDL (10)	420	2,100
Diethyl Phthalate	<MDL (12)	<MDL (7.7)	<MDL (6.9)	<MDL (7.5)	48	73
Dimethyl Phthalate	<MDL (12)	<MDL (7.7)	<MDL (6.9)	<MDL (7.5)	71	160
Miscellaneous Compounds						
Dibenzofuran	<MDL (28)	<MDL (18)	<MDL (16)	<MDL (18)	540	700
Hexachlorobutadiene	<MDL (1.5)	<MDL (0.96)	<MDL (0.86)	<MDL (0.94)	11	120
N-Nitrosodiphenylamine	<MDL (12)	<MDL (7.7)	<MDL (6.9)	<MDL (7.5)	28	40
PCBs						
Total PCBs	157	**473**	<MDL (2.3 - 4.6)	<MDL (2.5 - 5.0)	130	1,000

Notes

µg/Kg DW - Micrograms per kilogram dry weight, based on percent solids analysis.

<MDL (#) - Analyte not detected above the *method dection limit*. Value in parentheses is the numeric MDL.

* - LAET/2LAET equivalent to SQS/CSL criteria, respectively.

B5, B10, B - Compound detected in laboratory method blank. Sample concentration is less than 5 times the method blank concentration (B5), greater than 5 times but less than 10 times the method blank concentration (B10), or greater than 10 times the method blank concentration (B).

Shaded Column - Organic carbon content greater than 0.5% and comparison with dry weight-normalized LAET/2LAET values is inappropriate. Data presented for comparison with other stations only.

Shaded Cell with Double Border - Detected concentration exceeds the LAET and/or 2LAET.

Table 7 (cont.)

Sediment Non-Ionic Organic Results (Dry Weight Normalized)

Norfolk CSO Sediment Remediation Project

Five-Year Monitoring Program, Year Five, April 2004

	Concentration (µg/Kg DW)					
Non-Ionic Organics	**NFK503 0 - 2 cm TOC 2.41%**	**NFK503 0 - 10 cm TOC 2.59%**	**NFK504 0 - 2 cm TOC 1.89%**	**NFK504 0 - 10 cm TOC 0.29%**	**LAET* SQS**	**2LAET* CSL**
LPAHs						
Acenaphthene	<MDL (15)	<MDL (14)	111	<MDL (9.3)	500	730
Acenaphthylene	<MDL (31)	<MDL (31)	<MDL (30)	<MDL (20)	1,300	1,300
Anthracene	11	14	97.2	<MDL (5.3)	960	4,400
Fluorene	<MDL (27)	<MDL (27)	<MDL (26)	<MDL (17)	540	1,000
2-Methylnaphthalene	<MDL (29)	<MDL (29)	45	<MDL (19)	670	1,400
Naphthalene	<MDL (29)	<MDL (29)	30	<MDL (19)	2,100	2,400
Phenanthrene	53.7	83.0	2,870	10	1,500	5,400
Total LPAH	65	97	3,200	10	5,200	13,000
HPAHs						
Benzo(a)anthracene	53.5	75.4	175	10.2	1,300	1,600
Benzo(a)pyrene	56.6	91.6	161	13.1	1,600	3,000
Benzofluoranthenes (Total)	128	208	809	22.4	3,200	3,600
Benzo(g,h,i)perylene	37.8	73.3	110	<MDL (11)	670	720
Chrysene	83.0	113	648	15.4	1,400	2,800
Dibenzo(a,h)anthracene	<MDL (15)	<MDL (14)	24	<MDL (9.3)	230	540
Fluoranthene	137	226	5,200	26.2	1,700	2,500
Indeno(1,2,3-c,d)pyrene	27	54.6	105	<MDL (12)	600	690
Pyrene	122	182	2,800	22.4	2,600	3,300
Total HPAH	640	1,020	10,000	110	12,000	17,000
Chlorobenzenes						
1,2-Dichlorobenzene	<MDL (0.54)	<MDL (0.53)	<MDL (0.51)	<MDL (0.35)	35	50
1,4-Dichlorobenzene	<MDL (0.27)	<MDL (0.27)	<MDL (0.26)	<MDL (0.17)	110	120
Hexachlorobenzene	<MDL (1.4)	<MDL (1.4)	<MDL (1.3)	<MDL (0.88)	22	70
1,2,4-Trichlorobenzene	<MDL (0.54)	<MDL (0.53)	<MDL (0.51)	<MDL (0.35)	31	51
Phthalates						
Bis(2-ethylhexyl) Phthalate	342, B	626, B	224, B	39, B10	1,300	1,900
Benzyl Butyl Phthalate	26.8	27.9	29.3	10	63	470
Di-N-butyl Phthalate	<MDL (10)	<MDL (10)	<MDL (9.8)	<MDL (6.7)	1,400	5,100
Di-N-octyl Phthalate	<MDL (17)	<MDL (16)	<MDL (16)	<MDL (11)	420	2,100
Diethyl Phthalate	<MDL (12)	<MDL (12)	<MDL (12)	<MDL (8.0)	48	73
Dimethyl Phthalate	<MDL (12)	<MDL (12)	<MDL (12)	<MDL (8.0)	71	160
Miscellaneous Compounds						
Dibenzofuran	<MDL (29)	<MDL (29)	113	<MDL (19)	540	700
Hexachlorobutadiene	<MDL (1.6)	<MDL (1.5)	<MDL (1.5)	<MDL (1.0)	11	120
N-Nitrosodiphenylamine	<MDL (12)	<MDL (12)	<MDL (12)	<MDL (8.0)	28	40
PCBs						
Total PCBs	125	474	84.3	<MDL (2.7 - 5.3)	130	1,000

Notes

µg/Kg DW - Micrograms per kilogram dry weight, based on percent solids analysis.

<MDL (#) - Analyte not detected above the *method dection limit*. Value in parentheses is the numeric MDL.

* - LAET/2LAET equivalent to SQS/CSL criteria, respectively.

B5, B10, B - Compound detected in laboratory method blank. Sample concentration is less than 5 times the method blank concentration (B5), greater than 5 times but less than 10 times the method blank concentration (B10), or greater than 10 times the method blank concentration (B).

Shaded Column - Organic carbon content greater than 0.5% and comparison with dry weight-normalized LAET/2LAET values is inappropriate. Data presented for comparison with other stations only.

Shaded Cell with Double Border - Detected concentration exceeds the LAET and/or 2LAET.

Table 8a - Norfolk CSO Channel

Five-Year Dry Weight Comparison of Sediment Constituents
0 to 10 cm Depth Stratum at NFK501
Norfolk CSO Sediment Remediation Project
Five-Year Monitoring Program, Year Five, April 2004

Metals (mg/Kg DW)	Oct-99	Apr-00	Apr-01	Apr-02	Apr-03	Apr-04	SQS	CSL
Arsenic	3.5	4.1	<MDL (3.8)	5.4	8.3	<MDL (3.1)	57	93
Cadmium	<MDL (0.20)	<MDL (0.21)	<MDL (0.23)	<MDL (0.26)	0.16	<MDL (0.18)	5.1	6.7
Chromium	17.1	14.1	17.4	19.5	14.1	11.9	260	270
Copper	13.4	12.0	18.5	27.0	23.7	11.9	390	390
Lead	5.2	5.7	7.36	12	13	4.1	450	530
Mercury	<MDL (0.027)	<MDL (0.026)	0.043	0.064	0.062	<MDL (0.024)	0.41	0.59
Silver	<MDL (0.27)	<MDL (0.26)	<MDL (0.31)	<MDL (0.36)	<MDL (0.17)	0.46	6.1	6.1
Zinc	51.3	43.7	59.0	79.0	67.8	78.2	410	960
Non-Ionic Organics (µg/Kg DW)	**Oct-99**	**Apr-00**	**Apr-01**	**Apr-02**	**Apr-03**	**Apr-04**	**LAET**	**2LAET**
Acenaphthene	<MDL (15)	<MDL (15)	<MDL (11)	<MDL (13)	15	<MDL (9.0)	500	730
Acenaphthylene	<MDL (21)	<MDL (22)	<MDL (23)	<MDL (28)	<MDL (26)	<MDL (19)	1,300	1,300
Anthracene	<MDL (21)	<MDL (22)	11	20.2	14.9	<MDL (5.1)	960	4,400
Fluorene	<MDL (21)	<MDL (22)	<MDL (20)	<MDL (24)	<MDL (22)	<MDL (17)	540	1,000
2-Methylnaphthalene	<MDL (58)	<MDL (59)	<MDL (21)	<MDL (26)	<MDL (24)	<MDL (18)	670	1,400
Naphthalene	82	<MDL (59)	<MDL (21)	<MDL (26)	<MDL (24)	<MDL (18)	2,100	2,400
Phenanthrene	<MDL (21)	<MDL (22)	46.8	135	116	9.1	1,500	5,400
Total LPAHs	82	<MDL	58	155	150	9.1	5,200	13,000
Benzo(a)anthracene	<MDL (21)	<MDL (22)	40.8	94.9	76.8	7.7	1,300	1,600
Benzo(a)pyrene	<MDL (36)	<MDL (37)	61.4	117	101	11	1,600	3,000
Benzofluoranthenes (Total)	<MDL (58)	<MDL (59)	174	265	272	19.5	3,200	3,600
Benzo(g,h,i)perylene	<MDL (36)	<MDL (37)	18	74.7	99.1	<MDL (10)	670	720
Chrysene	<MDL (21)	<MDL (22)	62.1	157	140	12.1	1,400	2,800
Dibenzo(a,h)anthracene	<MDL (58)	<MDL (59)	<MDL (11)	21	19	<MDL (9.0)	230	540
Fluoranthene	<MDL (21)	<MDL (22)	124	287	253	19	1,700	2,500
Indeno(1,2,3-c,d)pyrene	<MDL (36)	<MDL (37)	21	75.3	81.3	<MDL (12)	600	690
Pyrene	29	<MDL (22)	95.7	260	235	15.1	2,600	3,300
Total HPAHs	29	<MDL	600	1,400	1,300	84	12,000	17,000
1,2-Dichlorobenzene	<MDL (0.92)	<MDL (0.95)	<MDL (0.40)	<MDL (0.49)	<MDL (0.45)	<MDL (0.33)	35	50
1,2,4-Trichlorobenzene	<MDL (0.92)	<MDL (0.95)	<MDL (0.40)	<MDL (0.49)	<MDL (0.45)	<MDL (0.33)	31	51
Hexachlorobenzene	<MDL (0.92)	<MDL (0.95)	<MDL (1.0)	<MDL (1.2)	<MDL (1.1)	<MDL (0.85)	22	70
Di-N-octyl Phthalate	<MDL (21)	<MDL (22)	<MDL (12)	<MDL (15)	<MDL (14)	<MDL (10)	420	2,100
Diethyl Phthalate	<MDL (36)	<MDL (37)	<MDL (9.2)	<MDL (11)	<MDL (10)	<MDL (7.7)	48	73
Dimethyl Phthalate	<MDL (15)	<MDL (15)	<MDL (17)	<MDL (21)	<MDL (19)	<MDL (7.7)	71	160
Dibenzofuran	<MDL (36)	<MDL (37)	<MDL (21)	<MDL (26)	<MDL (24)	<MDL (18)	540	700
Hexachlorobutadiene	<MDL (36)	<MDL (37)	<MDL (9.2)	<MDL (11)	<MDL (10)	<MDL (0.96)	11	120
N-Nitrosodiphenylamine	<MDL (36)	<MDL (37)	<MDL (31)	<MDL (37)	<MDL (35)	<MDL (7.7)	28	40
Total PCBs	20.9	<MDL (5.8)	35.5	174	89.8	**473**	130	1,000
Ionic Organics (µg/Kg DW)	**Oct-99**	**Apr-00**	**Apr-01**	**Apr-02**	**Apr-03**	**Apr-04**	**SQS**	**CSL**
Benzyl Alcohol	<MDL (36)	<MDL (37)	<MDL (9.2)	<MDL (11)	<MDL (10)	<MDL (7.7)	57	73
2-Methylphenol	<MDL (36)	<MDL (37)	<MDL (29)	<MDL (36)	<MDL (33)	<MDL (21)	63	63
4-Methylphenol	<MDL (36)	<MDL (37)	<MDL (24)	<MDL (30)	55	<MDL (21)	670	670
2,4-Dimethylphenol	<MDL (36)	<MDL (37)	<MDL (11)	<MDL (13)	<MDL (12)	<MDL (9.0)	29	29
Pentachlorophenol	<MDL (36)	<MDL (37)	<MDL (7.6)	<MDL (9.4)	<MDL (8.7)	<MDL (6.4)	360	690
Phenol	<MDL (150)	<MDL (150)	<MDL (14)	<MDL (17)	28	<MDL (12)	420	1,200
Conventionals	**Oct-99**	**Apr-00**	**Apr-01**	**Apr-02**	**Apr-03**	**Apr-04**		
Total Organic Carbon (mg/Kg DW)	3,240	2,350	8,670	21,300	22,100	3,130		
Total Organic Carbon (% DW)	0.32	0.24	0.87	2.13	2.21	0.31		
Percent Gravel	0.1	0.3	1.5	0.9	1.2	4.0		
Percent Sand	95.6	94.3	78.8	60.2	69.8	85.4		
Percent Silt	3.4	4.9	16.6	32.5	25.3	3.6		
Percent Clay	0.7	0.1	3.7	6.4	3.7	4.0		

Notes

mg/Kg DW - Milligrams per kilogram normalized to dry weight, based on percent solids analysis.
µg/Kg DW - Micrograms per kilogram normalized to dry weight, based on percent solids analysis.
<MDL (#) - Analyte not detected above the *method dection limit*. Value in parentheses is the numeric MDL.
SQS - Sediment Quality Standard (Table I, Ecology 1995).
CSL - Cleanup Screening Level (Table III, Ecology 1995).
LAET - Lowest Apparent Effects Threshhold (EPA 1988).
2LAET - Second Lowest Apparent Effects Threshhold (EPA 1988).
Shaded Cell - Analytical result exceeds a numeric sediment criterion (if appropriate to normalize to dry weight).

Table 8b - Combined Channel Delta

Five-Year Dry Weight Comparison of Sediment Constituents
0 to 10 cm Depth Stratum at NFK502
Norfolk CSO Sediment Remediation Project
Five-Year Monitoring Program, Year Five, April 2004

Metals (mg/Kg DW)	Oct-99	Apr-00	Apr-01	Apr-02	Apr-03	Apr-04	SQS	CSL
Arsenic	3.5	4.6	<MDL (3.6)	3.3	4.7	<MDL (3.0)	57	93
Cadmium	<MDL (0.19)	<MDL (0.20)	<MDL (0.23)	<MDL (0.17)	<MDL (0.17)	<MDL (0.19)	5.1	6.7
Chromium	13.9	12.5	13.3	10.1	12.1	11.5	260	270
Copper	13.8	11.2	13.1	11.2	13.3	13.3	390	390
Lead	5.7	5.4	9.62	4.3	4.2	5.5	450	530
Mercury	0.043	<MDL (0.027)	<MDL (0.030)	<MDL (0.023)	<MDL (0.023)	<MDL (0.025)	0.41	0.59
Silver	<MDL (0.26)	<MDL (0.27)	<MDL (0.30)	<MDL (0.23)	<MDL (0.22)	0.50	6.1	6.1
Zinc	52.5	46.8	46.5	43.9	44.2	43.2	410	960
Non-Ionic Organics (µg/Kg DW)	**Oct-99**	**Apr-00**	**Apr-01**	**Apr-02**	**Apr-03**	**Apr-04**	**LAET**	**2LAET**
Acenaphthene	<MDL (15)	<MDL (15)	<MDL (11)	<MDL (8.6)	<MDL (8.0)	<MDL (8.8)	500	730
Acenaphthylene	<MDL (22)	<MDL (22)	<MDL (23)	<MDL (18)	<MDL (17)	<MDL (19)	1,300	1,300
Anthracene	<MDL (22)	<MDL (22)	7.2	<MDL (4.9)	<MDL (4.6)	<MDL (5.0)	960	4,400
Fluorene	<MDL (22)	<MDL (22)	<MDL (20)	<MDL (16)	<MDL (15)	<MDL (16)	540	1,000
2-Methylnaphthalene	<MDL (60)	<MDL (58)	<MDL (21)	<MDL (17)	<MDL (16)	<MDL (18)	670	1,400
Naphthalene	67	<MDL (58)	<MDL (21)	<MDL (17)	<MDL (16)	<MDL (18)	2,100	2,400
Phenanthrene	29	<MDL (22)	31.6	<MDL (4.9)	21.2	<MDL (5.0)	1,500	5,400
Total LPAHs	96	<MDL (15-58)	39	<MDL (4.9-18)	21.2	<MDL (5.0-19)	5,200	13,000
Benzo(a)anthracene	28	<MDL (22)	38.0	8.76	19.0	3.6	1,300	1,600
Benzo(a)pyrene	<MDL (38)	<MDL (37)	24.5	13.7	16.4	5.8	1,600	3,000
Benzofluoranthenes (Total)	<MDL (60)	<MDL (58)	118	11.8	38.1	4.6	3,200	3,600
Benzo(g,h,i)perylene	<MDL (38)	<MDL (37)	<MDL (12)	<MDL (9.8)	10	(MDL (10)	670	720
Chrysene	29	<MDL (22)	42.0	<MDL (4.9)	33.8	<MDL (5.0)	1,400	2,800
Dibenzo(a,h)anthracene	<MDL (60)	<MDL (58)	<MDL (11)	<MDL (8.6)	<MDL (8.0)	<MDL (8.8)	230	540
Fluoranthene	56.7	<MDL (22)	100	<MDL (9.8)	43.4	<MDL (10)	1,700	2,500
Indeno(1,2,3-c,d)pyrene	<MDL (38)	<MDL (37)	<MDL (14)	<MDL (11)	<MDL (10)	<MDL (11)	600	690
Pyrene	47.9	<MDL (22)	50.7	6.6	39.7	7.3	2,600	3,300
Total HPAHs	160	<MDL (22-58)	373	41	200	21	12,000	17,000
1,2-Dichlorobenzene	<MDL (0.96)	<MDL (0.94)	<MDL (0.39)	<MDL (0.32)	<MDL (0.30)	<MDL (0.33)	35	50
1,2,4-Trichlorobenzene	<MDL (0.96)	<MDL (0.94)	<MDL (0.39)	<MDL (0.32)	<MDL (0.30)	<MDL (0.33)	31	51
Hexachlorobenzene	<MDL (0.96)	<MDL (0.94)	<MDL (0.99)	<MDL (0.81)	<MDL (0.76)	<MDL (0.83)	22	70
Di-N-octyl Phthalate	<MDL (22)	<MDL (22)	<MDL (12)	<MDL (9.8)	<MDL (9.2)	<MDL (10)	420	2,100
Diethyl Phthalate	<MDL (38)	<MDL (37)	<MDL (9.0)	<MDL (7.4)	<MDL (6.9)	<MDL (7.5)	48	73
Dimethyl Phthalate	<MDL (15)	<MDL (15)	<MDL (17)	<MDL (14)	<MDL (13)	<MDL (7.5)	71	160
Dibenzofuran	<MDL (38)	<MDL (37)	<MDL (21)	<MDL (17)	<MDL (16)	<MDL (18)	540	700
Hexachlorobutadiene	<MDL (38)	<MDL (37)	<MDL (1.1)	<MDL (0.92)	<MDL (0.86)	<MDL (0.94)	11	120
N-Nitrosodiphenylamine	<MDL (38)	<MDL (37)	<MDL (30)	<MDL (25)	<MDL (23)	<MDL (7.5)	28	40
Total PCBs	71.6	10	94.1	<MDL(2.5-4.9)	21.0	<MDL(2.5-5.0)	130	1,000
Ionic Organics (µg/Kg DW)	**Oct-99**	**Apr-00**	**Apr-01**	**Apr-02**	**Apr-03**	**Apr-04**	**SQS**	**CSL**
Benzyl Alcohol	<MDL (38)	<MDL (37)	<MDL (9.0)	<MDL (7.4)	<MDL (6.9)	<MDL (7.5)	57	73
2-Methylphenol	<MDL (38)	<MDL (37)	<MDL (29)	<MDL (23)	<MDL (22)	<MDL (20)	63	63
4-Methylphenol	<MDL (38)	<MDL (37)	<MDL (24)	<MDL (20)	<MDL (18)	<MDL (20)	670	670
2,4-Dimethylphenol	<MDL (38)	<MDL (37)	<MDL (11)	<MDL (8.6)	<MDL (8.0)	<MDL (8.8)	29	29
Pentachlorophenol	<MDL (38)	<MDL (37)	<MDL (7.5)	<MDL (6.2)	<MDL (5.7)	<MDL (6.3)	360	690
Phenol	<MDL (150)	<MDL (150)	<MDL (14)	<MDL (11)	<MDL (10)	<MDL (11)	420	1,200
Conventionals	**Oct-99**	**Apr-00**	**Apr-01**	**Apr-02**	**Apr-03**	**Apr-04**		
Total Organic Carbon (mg/Kg DW)	3,730	1,440	4,990	980	2,560	1,650		
Total Organic Carbon (% DW)	0.37	0.14	0.50	0.10	0.26	0.17		
Percent Gravel	0.5	1.1	<MDL (0.1)	0.9	1.7	3.1		
Percent Sand	89.9	92.6	90.7	96.8	91.8	92.6		
Percent Silt	9.3	5.8	6.8	1.6	6.3	2.6		
Percent Clay	0.9	<MDL (0.1)	2.4	0.6	<MDL (0.1)	3.6		

Notes

mg/Kg DW - Milligrams per kilogram normalized to dry weight, based on percent solids analysis.
µg/Kg DW - Micrograms per kilogram normalized to dry weight, based on percent solids analysis.
<MDL (#) - Analyte not detected above the *method dection limit*. Value in parentheses is the numeric MDL.
SQS - Sediment Quality Standard (Table I, Ecology 1995).
CSL - Cleanup Screening Level (Table III, Ecology 1995).
LAET - Lowest Apparent Effects Threshhold (EPA 1988).
2LAET - Second Lowest Apparent Effects Threshhold (EPA 1988).
Shaded Cell - Analytical result exceeds a numeric sediment criterion (if appropriate to normalize to dry weight).

Table 8c - Boeing Storm Drain Channel

Five-Year Dry Weight Comparison of Sediment Constituents
0 to 10 cm Depth Stratum at NFK503
Norfolk CSO Sediment Remediation Project
Five-Year Monitoring Program, Year Five, April 2004

Metals (mg/Kg DW)	Oct-99	Apr-00	Apr-01	Apr-02	Apr-03	Apr-04	SQS	CSL
Arsenic	4.3	4.4	<MDL (3.2)	11	14	<MDL (5.1)	57	93
Cadmium	<MDL (0.21)	<MDL (0.21)	<MDL (0.20)	<MDL (0.28)	0.31	0.37	5.1	6.7
Chromium	14.1	12.2	12.0	21.7	25.9	22.4	260	270
Copper	14.5	11.2	12.9	31.9	38.0	33.3	390	390
Lead	5.5	6.5	7.83	12	17.2	16.3	450	530
Mercury	0.052	<MDL (0.028)	0.10	0.074	0.073	0.23	0.41	0.59
Silver	<MDL (0.26)	<MDL (0.28)	<MDL (0.26)	<MDL (0.38)	<MDL (0.35)	0.80	6.1	6.1
Zinc	53.7	44.5	46.4	79.9	93.6	92.0	410	960
Non-Ionic Organics (µg/Kg DW)	**Oct-99**	**Apr-00**	**Apr-01**	**Apr-02**	**Apr-03**	**Apr-04**	**LAET**	**2LAET**
Acenaphthene	<MDL (15)	<MDL (15)	<MDL (9.4)	<MDL (14)	<MDL (14)	<MDL (14)	500	730
Acenaphthylene	<MDL (22)	<MDL (22)	<MDL (20)	<MDL (30)	<MDL (29)	<MDL (31)	1,300	1,300
Anthracene	<MDL (22)	<MDL (22)	<MDL (5.4)	14	15	14	960	4,400
Fluorene	<MDL (22)	<MDL (22)	<MDL (18)	<MDL (26)	<MDL (25)	<MDL (27)	540	1,000
2-Methylnaphthalene	<MDL (59)	<MDL (59)	<MDL (19)	<MDL (28)	<MDL (27)	<MDL (29)	670	1,400
Naphthalene	<MDL (59)	<MDL (59)	<MDL (19)	<MDL (28)	<MDL (27)	<MDL (29)	2,100	2,400
Phenanthrene	40.3	<MDL (59)	<MDL (5.4)	93.6	109	83.0	1,500	5,400
Total LPAHs	40.3	<MDL (15-59)	<MDL(5.4-20)	110	120	97	5,200	13,000
Benzo(a)anthracene	28	<MDL (22)	3.0	77.1	77.0	75.4	1,300	1,600
Benzo(a)pyrene	<MDL (37)	<MDL (37)	<MDL (4.0)	89.2	99.2	91.6	1,600	3,000
Benzofluoranthenes (Total)	<MDL (59)	<MDL (59)	<MDL (4.0)	191	237	208	3,200	3,600
Benzo(g,h,i)perylene	<MDL (37)	<MDL (37)	<MDL (11)	38.2	79.9	73.3	670	720
Chrysene	43.0	<MDL (22)	<MDL (5.4)	116	126	113	1,400	2,800
Dibenzo(a,h)anthracene	<MDL (59)	<MDL (59)	<MDL (9.4)	<MDL (14)	19	<MDL (14)	230	540
Fluoranthene	66.9	26	<MDL (11)	201	249	226	1,700	2,500
Indeno(1,2,3-c,d)pyrene	<MDL (37)	<MDL (37)	<MDL (12)	52.2	66.8	54.6	600	690
Pyrene	64.6	<MDL (22)	<MDL (5.4)	191	214	182	2,600	3,300
Total HPAHs	200	26	3.0	956	1,200	1,020	12,000	17,000
1,2-Dichlorobenzene	<MDL (0.95)	<MDL (0.95)	<MDL (0.35)	<MDL (0.52)	<MDL (0.50)	<MDL (0.53)	35	50
1,2,4-Trichlorobenzene	<MDL (0.95)	<MDL (0.95)	<MDL (0.35)	<MDL (0.52)	<MDL (0.50)	<MDL (0.53)	31	51
Hexachlorobenzene	<MDL (0.95)	<MDL (0.95)	<MDL (0.89)	<MDL (1.3)	2.5	<MDL (1.4)	22	70
Di-N-octyl Phthalate	<MDL (22)	<MDL (22)	<MDL (11)	<MDL (16)	<MDL (15)	<MDL (16)	420	2,100
Diethyl Phthalate	<MDL (37)	<MDL (37)	<MDL (8.1)	<MDL (12)	<MDL (12)	<MDL (12)	48	73
Dimethyl Phthalate	<MDL (15)	<MDL (15)	<MDL (15)	<MDL (22)	<MDL (21)	<MDL (12)	71	160
Dibenzofuran	<MDL (37)	<MDL (37)	<MDL (19)	<MDL (28)	<MDL (27)	<MDL (29)	540	700
Hexachlorobutadiene	<MDL (37)	<MDL (37)	<MDL (1.0)	<MDL (1.5)	<MDL (1.4)	<MDL (1.5)	11	120
N-Nitrosodiphenylamine	<MDL (37)	<MDL (37)	<MDL (27)	<MDL (40)	<MDL (39)	<MDL (12)	28	40
Total PCBs	**182**	**179**	**1,330**	777	193	474	130	1,000
Ionic Organics (µg/Kg DW)	**Oct-99**	**Apr-00**	**Apr-01**	**Apr-02**	**Apr-03**	**Apr-04**	**SQS**	**CSL**
Benzyl Alcohol	<MDL (37)	<MDL (37)	<MDL (8.1)	<MDL (12)	<MDL (12)	<MDL (12)	57	73
2-Methylphenol	<MDL (37)	<MDL (37)	<MDL (26)	<MDL (38)	<MDL (37)	<MDL (33)	63	63
4-Methylphenol	<MDL (37)	<MDL (37)	<MDL (22)	<MDL (32)	<MDL (31)	<MDL (33)	670	670
2,4-Dimethylphenol	<MDL (37)	<MDL (37)	<MDL (9.4)	<MDL (14)	<MDL (14)	<MDL (14)	29	29
Pentachlorophenol	<MDL (37)	<MDL (37)	<MDL (6.7)	<MDL (10)	<MDL (9.7)	<MDL (10)	360	690
Phenol	<MDL (150)	<MDL (150)	<MDL (12)	<MDL (18)	<MDL (17)	<MDL (18)	420	1,200
Conventionals	**Oct-99**	**Apr-00**	**Apr-01**	**Apr-02**	**Apr-03**	**Apr-04**		
Total Organic Carbon (mg/Kg DW)	3,070	2,010	3,600	25,500	24,300	25,900		
Total Organic Carbon (% DW)	0.31	0.20	0.36	2.55	2.43	2.59		
Percent Gravel	1.1	0.8	1.0	0.2	1.0	0.3		
Percent Sand	92.5	96.1	97.0	47.2	55.0	39.7		
Percent Silt	6.2	3.5	1.5	45.8	38.7	42.0		
Percent Clay	0.7	<MDL (0.1)	0.6	6.8	5.5	13.5		

Notes

mg/Kg DW - Milligrams per kilogram normalized to dry weight, based on percent solids analysis.
µg/Kg DW - Micrograms per kilogram normalized to dry weight, based on percent solids analysis.
<MDL (#) - Analyte not detected above the *method dection limit*. Value in parentheses is the numeric MDL.
SQS - Sediment Quality Standard (Table I, Ecology 1995).
CSL - Cleanup Screening Level (Table III, Ecology 1995).
LAET - Lowest Apparent Effects Threshhold (EPA 1988).
2LAET - Second Lowest Apparent Effects Threshhold (EPA 1988).
Shaded Cell - Analytical result exceeds a numeric sediment criterion (if appropriate to normalize to dry weight).

Table 8d - Upriver Reference Station

Five-Year Dry Weight Comparison of Sediment Constituents
0 to 10 cm Depth Stratum at NFK504
Norfolk CSO Sediment Remediation Project
Five-Year Monitoring Program, Year Five, April 2004

Metals (mg/Kg DW)	Oct-99	Apr-00	Apr-01	Apr-02	Apr-03	Apr-04	SQS	CSL
Arsenic	5.7	6.0	<MDL (4.2)	4.8	4.8	<MDL (3.3)	57	93
Cadmium	<MDL (0.19)	<MDL (0.20)	<MDL (0.25)	<MDL (0.24)	<MDL (0.17)	<MDL (0.20)	5.1	6.7
Chromium	16.4	14.0	17.8	17.6	9.86	12.1	260	270
Copper	13.7	15.1	18.8	22.4	11.3	12.4	390	390
Lead	5.5	6.7	13.8	11	4.2	6.0	450	530
Mercury	<MDL (0.026)	<MDL (0.027)	0.038	0.068	<MDL (0.024)	<MDL (0.027)	0.41	0.59
Silver	<MDL (0.26)	<MDL (0.27)	<MDL (0.33)	<MDL (0.32)	<MDL (0.22)	0.57	6.1	6.1
Zinc	52.9	46.8	60.6	61.9	40.8	45.4	410	960
Non-Ionic Organics (µg/Kg DW)	**Oct-99**	**Apr-00**	**Apr-01**	**Apr-02**	**Apr-03**	**Apr-04**	**LAET**	**2LAET**
Acenaphthene	<MDL (15)	<MDL (15)	<MDL (12)	<MDL (11)	<MDL (8.3)	<MDL (9.3)	500	730
Acenaphthylene	<MDL (22)	<MDL (21)	<MDL (25)	<MDL (24)	<MDL (18)	<MDL (20)	1,300	1,300
Anthracene	<MDL (22)	<MDL (21)	<MDL (6.7)	12	<MDL (4.7)	<MDL (5.3)	960	4,400
Fluorene	<MDL (22)	<MDL (21)	<MDL (22)	<MDL (21)	<MDL (15)	<MDL (17)	540	1,000
2-Methylnaphthalene	<MDL (58)	<MDL (57)	<MDL (23)	<MDL (23)	<MDL (17)	<MDL (19)	670	1,400
Naphthalene	66	<MDL (57)	<MDL (23)	<MDL (23)	<MDL (17)	<MDL (19)	2,100	2,400
Phenanthrene	<MDL (22)	<MDL (21)	10	58.8	5.5	10	1,500	5,400
Total LPAHs	66	<MDL (21-57)	10	71	5.5	10	5,200	13,000
Benzo(a)anthracene	<MDL (22)	<MDL (21)	18.0	59.5	5.98	10.2	1,300	1,600
Benzo(a)pyrene	<MDL (37)	<MDL (36)	<MDL (5.0)	72.4	7.32	13.1	1,600	3,000
Benzofluoranthenes (Total)	<MDL (58)	<MDL (57)	25	157	17.2	22.4	3,200	3,600
Benzo(g,h,i)perylene	<MDL (37)	<MDL (36)	<MDL (13)	15	<MDL (9.4)	<MDL (11)	670	720
Chrysene	<MDL (22)	35	8.2	89.8	7.3	15.4	1,400	2,800
Dibenzo(a,h)anthracene	<MDL (58)	<MDL (57)	<MDL (12)	<MDL (11)	<MDL (8.3)	<MDL (9.3)	230	540
Fluoranthene	<MDL (22)	63.6	27.5	160	15	26.2	1,700	2,500
Indeno(1,2,3-c,d)pyrene	<MDL (37)	<MDL (36)	<MDL (15)	36.9	<MDL (11)	<MDL (12)	600	690
Pyrene	<MDL (22)	47.9	<MDL (6.7)	137	15.1	22.4	2,600	3,300
Total HPAHs	<MDL (22-58)	150	79	730	68	110	12,000	17,000
1,2-Dichlorobenzene	<MDL (0.93)	<MDL (0.92)	<MDL (0.43)	<MDL (0.42)	<MDL (0.31)	<MDL (0.35)	35	50
1,2,4-Trichlorobenzene	<MDL (0.93)	<MDL (0.92)	<MDL (0.43)	<MDL (0.42)	<MDL (0.31)	<MDL (0.35)	31	51
Hexachlorobenzene	<MDL (0.93)	<MDL (0.92)	<MDL (1.1)	<MDL (1.1)	<MDL (0.78)	<MDL (0.88)	22	70
Di-N-octyl Phthalate	<MDL (22)	<MDL (21)	<MDL (13)	<MDL (13)	<MDL (9.4)	<MDL (11)	420	2,100
Diethyl Phthalate	<MDL (37)	<MDL (36)	<MDL (10)	<MDL (9.7)	<MDL (7.1)	<MDL (8.0)	48	73
Dimethyl Phthalate	<MDL (15)	<MDL (15)	<MDL (18)	<MDL (18)	<MDL (13)	<MDL (8.0)	71	160
Dibenzofuran	<MDL (37)	<MDL (36)	<MDL (23)	<MDL (23)	<MDL (17)	<MDL (19)	540	700
Hexachlorobutadiene	<MDL (37)	<MDL (36)	<MDL (1.2)	<MDL (1.2)	<MDL (0.88)	<MDL (1.0)	11	120
N-Nitrosodiphenylamine	<MDL (37)	<MDL (36)	<MDL (33)	<MDL (32)	<MDL (24)	<MDL (8.0)	28	40
Total PCBs	<MDL (5.7)	13.2	31	51.5	<MDL(2.4-4.7)	<MDL(2.7-5.3)	130	1,000
Ionic Organics (µg/Kg DW)	**Oct-99**	**Apr-00**	**Apr-01**	**Apr-02**	**Apr-03**	**Apr-04**	**SQS**	**CSL**
Benzyl Alcohol	<MDL (37)	<MDL (36)	<MDL (10)	<MDL (9.7)	<MDL (7.1)	<MDL (8.0)	57	73
2-Methylphenol	<MDL (37)	<MDL (36)	<MDL (32)	<MDL (31)	<MDL (22)	<MDL (21)	63	63
4-Methylphenol	<MDL (37)	<MDL (36)	<MDL (27)	<MDL (26)	<MDL (19)	<MDL (21)	670	670
2,4-Dimethylphenol	<MDL (37)	<MDL (36)	<MDL (12)	<MDL (11)	<MDL (8.3)	<MDL (9.3)	29	29
Pentachlorophenol	<MDL (37)	<MDL (36)	<MDL (8.3)	<MDL (8.1)	<MDL (5.9)	<MDL (6.7)	360	690
Phenol	<MDL (150)	<MDL (150)	<MDL (15)	<MDL (15)	<MDL (11)	<MDL (12)	420	1,200
Conventionals	**Oct-99**	**Apr-00**	**Apr-01**	**Apr-02**	**Apr-03**	**Apr-04**		
Total Organic Carbon (mg/Kg DW)	1,890	3,090	9,080	13,100	1,100	2,940		
Total Organic Carbon (% DW)	0.19	0.31	0.91	1.31	0.11	0.29		
Percent Gravel	0.9	0.6	0.5	1.1	3.1	0.6		
Percent Sand	96.4	90.0	65.4	72.9	94.3	89.9		
Percent Silt	1.8	9.1	27.7	22.5	2.5	5.0		
Percent Clay	0.7	0.1	6.6	3.7	<MDL (0.1)	5.0		

Notes

mg/Kg DW - Milligrams per kilogram normalized to dry weight, based on percent solids analysis.
µg/Kg DW - Micrograms per kilogram normalized to dry weight, based on percent solids analysis.
<MDL (#) - Analyte not detected above the *method dection limit*. Value in parentheses is the numeric MDL.
SQS - Sediment Quality Standard (Table I, Ecology 1995).
CSL - Cleanup Screening Level (Table III, Ecology 1995).
LAET - Lowest Apparent Effects Threshhold (EPA 1988).
2LAET - Second Lowest Apparent Effects Threshhold (EPA 1988).
Shaded Cell - Analytical result exceeds a numeric sediment criterion (if appropriate to normalize to dry weight).

Table 9a - Norfolk CSO Channel

Five-Year Dry Weight Comparison of Sediment Constituents
0 to 2 cm Depth Stratum at NFK501
Norfolk CSO Sediment Remediation Project
Five-Year Monitoring Program, Year Five, April 2004

Metals (mg/Kg DW)	Oct-99	Apr-00	Apr-01	Apr-02	Apr-03	Apr-04	SQS	CSL
Arsenic	4.6	5.1	<MDL (3.6)	7.4	7.8	<MDL (0.48)	57	93
Cadmium	<MDL (0.20)	<MDL (0.20)	<MDL (0.22)	<MDL (0.32)	0.23	0.36	5.1	6.7
Chromium	15.6	17.1	16.1	19.8	18.0	21.2	260	270
Copper	15.5	14.1	17.2	27.4	30.9	29.0	390	390
Lead	6.2	6.4	11.6	12	222	13	450	530
Mercury	0.039	0.043	0.069	0.076	0.11	0.063	0.41	0.59
Silver	<MDL (0.27)	<MDL (0.26)	<MDL (0.29)	<MDL (0.40)	<MDL (0.21)	0.75	6.1	6.1
Zinc	52.4	48.4	56.6	76.4	89.9	78.2	410	960
Non-Ionic Organics (µg/Kg DW)	**Oct-99**	**Apr-00**	**Apr-01**	**Apr-02**	**Apr-03**	**Apr-04**	**LAET**	**2LAET**
Acenaphthene	<MDL (15)	<MDL (14)	<MDL (10)	<MDL (15)	23	<MDL (14)	500	730
Acenaphthylene	<MDL (22)	<MDL (21)	<MDL (22)	<MDL (32)	<MDL (34)	<MDL (30)	1,300	1,300
Anthracene	<MDL (22)	<MDL (21)	8.0	21.9	22.6	15	960	4,400
Fluorene	<MDL (22)	<MDL (21)	<MDL (19)	<MDL (27)	<MDL (30)	<MDL (26)	540	1,000
2-Methylnaphthalene	<MDL (58)	<MDL (57)	<MDL (20)	<MDL (30)	<MDL (32)	<MDL (28)	670	1,400
Naphthalene	90	<MDL (57)	<MDL (20)	<MDL (30)	<MDL (32)	<MDL (28)	2,100	2,400
Phenanthrene	28	44.7	65.3	183	189	99.0	1,500	5,400
Total LPAHs	120	44.7	73	205	230	110	5,200	13,000
Benzo(a)anthracene	26	37.5	60.4	120	114	77.2	1,300	1,600
Benzo(a)pyrene	<MDL (36)	41	92.6	150	154	76.4	1,600	3,000
Benzofluoranthenes (Total)	<MDL (58)	57	198	359	396	180	3,200	3,600
Benzo(g,h,i)perylene	76.2	<MDL (35)	24.8	96.6	135	66.1	670	720
Chrysene	32	58.2	81.9	213	203	112	1,400	2,800
Dibenzo(a,h)anthracene	<MDL (58)	<MDL (57)	<MDL (10)	25	37.8	<MDL (14)	230	540
Fluoranthene	60.2	101	162	363	396	236	1,700	2,500
Indeno(1,2,3-c,d)pyrene	<MDL (36)	<MDL (35)	33.6	104	119	57.7	600	690
Pyrene	59.1	79.0	125	346	284	177	2,600	3,300
Total HPAHs	250	370	778	1,800	1,840	982	12,000	17,000
1,2-Dichlorobenzene	<MDL (0.93)	<MDL (0.91)	<MDL (0.38)	<MDL (0.55)	<MDL (0.59)	<MDL (0.52)	35	50
1,2,4-Trichlorobenzene	<MDL (0.93)	<MDL (0.91)	<MDL (0.38)	<MDL (0.55)	<MDL (0.59)	<MDL (0.52)	31	51
Hexachlorobenzene	<MDL (0.93)	<MDL (0.91)	<MDL (0.96)	<MDL (1.4)	<MDL (1.5)	<MDL (1.3	22	70
Di-N-octyl Phthalate	<MDL (22)	<MDL (21)	<MDL (12)	<MDL (17)	146	<MDL (16)	420	2,100
Diethyl Phthalate	<MDL (36)	<MDL (35)	<MDL (8.8)	<MDL (13)	<MDL (14)	<MDL (12)	48	73
Dimethyl Phthalate	<MDL (15)	<MDL (14)	<MDL (16)	<MDL (23)	<MDL (25)	<MDL (12)	71	160
Dibenzofuran	<MDL (36)	<MDL (35)	<MDL (20)	<MDL (30)	<MDL (32)	<MDL (28)	540	700
Hexachlorobutadiene	<MDL (36)	<MDL (35)	<MDL (1.1)	<MDL (1.6)	<MDL (1.7)	<MDL (1.5)	11	120
N-Nitrosodiphenylamine	<MDL (36)	<MDL (35)	<MDL (29)	<MDL (42)	<MDL (46)	<MDL (12)	28	40
Total PCBs	45.9	6.8	60.9	168	125	157	130	1,000
Ionic Organics (µg/Kg DW)	**Oct-99**	**Apr-00**	**Apr-01**	**Apr-02**	**Apr-03**	**Apr-04**	**SQS**	**CSL**
Benzyl Alcohol	<MDL (36)	<MDL (35)	<MDL (8.8)	<MDL (13)	<MDL (14)	<MDL (12)	57	73
2-Methylphenol	<MDL (36)	<MDL (35)	<MDL (28)	<MDL (40)	<MDL (43)	<MDL (32)	63	63
4-Methylphenol	<MDL (36)	<MDL (35)	<MDL (23)	<MDL (34)	<MDL (37)	<MDL (32)	670	670
2,4-Dimethylphenol	<MDL (36)	<MDL (35)	<MDL (10)	<MDL (15)	<MDL (16)	<MDL (14)	29	29
Pentachlorophenol	<MDL (36)	<MDL (35)	<MDL (7.3)	<MDL (11)	<MDL (11)	<MDL (9.9)	360	690
Phenol	<MDL (150)	<MDL (140)	<MDL (13)	<MDL (19)	75.7	<MDL (18)	420	1,200
Conventionals	**Oct-99**	**Apr-00**	**Apr-01**	**Apr-02**	**Apr-03**	**Apr-04**		
Total Organic Carbon (mg/Kg DW)	4,170	5,530	8,180	23,000	29,300	20,000		
Total Organic Carbon (% DW)	0.42	0.55	0.82	2.30	2.93	2.00		
Percent Gravel	0.5	0.1	0.2	0.2	1.0	2.1		
Percent Sand	91.0	83.6	81.5	53.3	56.4	47.9		
Percent Silt	6.8	14.8	14.5	39.5	36.0	36.2		
Percent Clay	1.6	0.9	3.8	7.1	6.7	12.0		

Notes

mg/Kg DW - Milligrams per kilogram normalized to dry weight, based on percent solids analysis.
µg/Kg DW - Micrograms per kilogram normalized to dry weight, based on percent solids analysis.
<MDL (#) - Analyte not detected above the *method dection limit*. Value in parentheses is the numeric MDL.
SQS - Sediment Quality Standard (Table I, Ecology 1995).
CSL - Cleanup Screening Level (Table III, Ecology 1995).
LAET - Lowest Apparent Effects Threshhold (EPA 1988).
2LAET - Second Lowest Apparent Effects Threshhold (EPA 1988).
Shaded Cell - Analytical result exceeds a numeric sediment criterion (if appropriate to normalize to dry weight).

Table 9b - Combined Channel Delta

Five-Year Dry Weight Comparison of Sediment Constituents
0 to 2 cm Depth Stratum at NFK502
Norfolk CSO Sediment Remediation Project
Five-Year Monitoring Program, Year Five, April 2004

Metals (mg/Kg DW)	Oct-99	Apr-00	Apr-01	Apr-02	Apr-03	Apr-04	SQS	CSL
Arsenic	6.2	5.3	<MDL (3.6)	4.6	4.3	<MDL (2.9)	57	93
Cadmium	<MDL (0.23)	<MDL (0.21)	<MDL (0.21)	<MDL (0.18)	<MDL (0.15)	<MDL (0.17)	5.1	6.7
Chromium	14.7	15.2	16.7	11.2	15.1	10.9	260	270
Copper	18.6	13.3	15.5	11.7	13.7	12.0	390	390
Lead	9.0	7.0	9.39	4.4	3.5	6.1	450	530
Mercury	0.042	0.063	0.031	<MDL (0.023)	<MDL (0.022)	<MDL (0.023)	0.41	0.59
Silver	<MDL (0.31)	<MDL (0.27)	<MDL (0.28)	<MDL (0.24)	<MDL (0.21)	0.46	6.1	6.1
Zinc	62.2	49.4	51.6	43.7	44.5	44.4	410	960
Non-Ionic Organics (µg/Kg DW)	**Oct-99**	**Apr-00**	**Apr-01**	**Apr-02**	**Apr-03**	**Apr-04**	**LAET**	**2LAET**
Acenaphthene	<MDL (17)	<MDL (15)	<MDL (10)	<MDL (8.3)	<MDL (7.7)	<MDL (8.0)	500	730
Acenaphthylene	<MDL (25)	<MDL (22)	<MDL (22)	<MDL (18)	<MDL (17)	<MDL (17)	1,300	1,300
Anthracene	<MDL (25)	<MDL (22)	7.3	<MDL (4.8)	<MDL (4.4)	<MDL (4.6)	960	4,400
Fluorene	<MDL (25)	<MDL (22)	<MDL (19)	<MDL (15)	<MDL (14)	<MDL (15)	540	1,000
2-Methylnaphthalene	<MDL (67)	<MDL (59)	<MDL (21)	<MDL (17)	<MDL (15)	<MDL (16)	670	1,400
Naphthalene	68	<MDL (59)	<MDL (21)	<MDL (17)	<MDL (15)	<MDL (16)	2,100	2,400
Phenanthrene	62.4	25	39.0	<MDL (4.8)	9.14	<MDL (4.6)	1,500	5,400
Total LPAHs	130	25	46	<MDL(4.8-18)	9.14	<MDL (4.6-17)	5,200	13,000
Benzo(a)anthracene	56.7	<MDL (22)	37.9	7.26	8.04	3.8	1,300	1,600
Benzo(a)pyrene	59	<MDL (37)	56.8	12.1	12.0	6.7	1,600	3,000
Benzofluoranthenes (Total)	<MDL (67)	<MDL (59)	128	9.31	27.1	12	3,200	3,600
Benzo(g,h,i)perylene	<MDL (42)	<MDL (37)	<MDL (12)	<MDL (9.5)	<MDL (8.8)	<MDL (9.2)	670	720
Chrysene	84.7	29	49.0	<MDL (4.8)	12.5	5.3	1,400	2,800
Dibenzo(a,h)anthracene	<MDL (67)	<MDL (59)	<MDL (10)	<MDL (8.3)	<MDL (7.7)	<MDL (8.0)	230	540
Fluoranthene	132	54.0	110	<MDL (9.5)	24.2	9.6	1,700	2,500
Indeno(1,2,3-c,d)pyrene	46	<MDL (37)	22	<MDL (11)	<MDL (9.9)	<MDL (10)	600	690
Pyrene	126	37.8	79.1	<MDL (4.8)	21.5	9.51	2,600	3,300
Total HPAHs	500	120	480	28.7	105	47	12,000	17,000
1,2-Dichlorobenzene	<MDL (1.1)	<MDL (0.94)	<MDL (0.39)	<MDL (0.31)	<MDL (0.29)	<MDL (0.30)	35	50
1,2,4-Trichlorobenzene	<MDL (1.1)	<MDL (0.94)	<MDL (0.39)	<MDL (0.31)	<MDL (0.29)	<MDL (0.30)	31	51
Hexachlorobenzene	<MDL (1.1)	<MDL (0.94)	<MDL (0.98)	<MDL (0.78)	<MDL (0.73)	<MDL (0.76)	22	70
Di-N-octyl Phthalate	<MDL (25)	<MDL (22)	<MDL (12)	<MDL (9.5)	<MDL (8.8)	<MDL (9.2)	420	2,100
Diethyl Phthalate	<MDL (42)	<MDL (37)	<MDL (8.9)	<MDL (7.1)	<MDL (6.6)	<MDL (6.9)	48	73
Dimethyl Phthalate	<MDL (17)	<MDL (15)	<MDL (16)	<MDL (13)	<MDL (12)	<MDL (6.9)	71	160
Dibenzofuran	<MDL (42)	<MDL (37)	<MDL (21)	<MDL (17)	<MDL (15)	<MDL (16)	540	700
Hexachlorobutadiene	<MDL (42)	<MDL (37)	<MDL (1.1)	<MDL (0.89)	<MDL (0.83)	<MDL (0.86)	11	120
N-Nitrosodiphenylamine	<MDL (42)	<MDL (37)	<MDL (30)	<MDL (24)	<MDL (22)	<MDL (6.9)	28	40
Total PCBs	61.8	70.6	161	<MDL(2.4-4.8)	<MDL(2.2-4.4)	<MDL(2.3-4.6)	130	1,000
Ionic Organics (µg/Kg DW)	**Oct-99**	**Apr-00**	**Apr-01**	**Apr-02**	**Apr-03**	**Apr-04**	**SQS**	**CSL**
Benzyl Alcohol	<MDL (42)	<MDL (37)	<MDL (8.9)	<MDL (7.1)	<MDL (6.6)	<MDL (6.9)	57	73
2-Methylphenol	<MDL (42)	<MDL (37)	,MDL (28)	<MDL (23)	<MDL (21)	<MDL (18)	63	63
4-Methylphenol	<MDL (42)	<MDL (37)	<MDL (24)	<MDL (19)	<MDL (18)	<MDL (18)	670	670
2,4-Dimethylphenol	<MDL (42)	<MDL (37)	<MDL (10)	<MDL (8.3)	<MDL (7.7)	<MDL (8.0)	29	29
Pentachlorophenol	<MDL (42)	<MDL (37)	<MDL (7.5)	<MDL (5.9)	<MDL (5.5)	<MDL (5.7)	360	690
Phenol	<MDL (170)	<MDL (150)	<MDL (13)	<MDL (11)	<MDL (9.9)	<MDL (10)	420	1,200
Conventionals	**Oct-99**	**Apr-00**	**Apr-01**	**Apr-02**	**Apr-03**	**Apr-04**		
Total Organic Carbon (mg/Kg DW)	7,030	3,390	6,510	1,260	1,690	2,280		
Total Organic Carbon (% DW)	0.70	0.34	0.65	0.13	0.17	0.23		
Percent Gravel	0.6	0.8	<MDL (0.1)	0.8	2.9	2.4		
Percent Sand	83.6	86.9	89.1	93.2	92.0	94.1		
Percent Silt	13.2	12.7	7.7	5.5	5.2	1.5		
Percent Clay	3.4	0.1	3.1	0.6	<MDL (0.1)	3.0		

Notes

mg/Kg DW - Milligrams per kilogram normalized to dry weight, based on percent solids analysis.
µg/Kg DW - Micrograms per kilogram normalized to dry weight, based on percent solids analysis.
<MDL (#) - Analyte not detected above the *method dection limit*. Value in parentheses is the numeric MDL.
SQS - Sediment Quality Standard (Table I, Ecology 1995).
CSL - Cleanup Screening Level (Table III, Ecology 1995).
LAET - Lowest Apparent Effects Threshhold (EPA 1988).
2LAET - Second Lowest Apparent Effects Threshhold (EPA 1988).
Shaded Cell - Analytical result exceeds a numeric sediment criterion (if appropriate to normalize to dry weight).

Table 9c - Boeing Storm Drain Channel

Five-Year Dry Weight Comparison of Sediment Constituents
0 to 2 cm Depth Stratum at NFK503
Norfolk CSO Sediment Remediation Project
Five-Year Monitoring Program, Year Five, April 2004

Metals (mg/Kg DW)	Oct-99	Apr-00	Apr-01	Apr-02	Apr-03	Apr-04	SQS	CSL
Arsenic	4.0	5.0	<MDL (3.3)	5.7	10	<MDL (5.2)	57	93
Cadmium	<MDL (0.21)	<MDL (0.21)	<MDL (0.20)	<MDL (0.30)	0.23	0.33	5.1	6.7
Chromium	15.4	13.0	13.9	15.8	22.2	21.6	260	270
Copper	17.1	13.4	11.4	16.9	33.5	30.5	390	390
Lead	6.3	6.5	7.36	8.0	15.2	13	450	530
Mercury	0.029	0.028	<MDL (0.025)	0.095	0.091	0.064	0.41	0.59
Silver	<MDL (0.26)	<MDL (0.28)	<MDL (0.27)	<MDL (0.40)	<MDL (0.31)	0.98	6.1	6.1
Zinc	52.6	46.0	43.4	71.9	77.2	78.4	410	960
Non-Ionic Organics (µg/Kg DW)	**Oct-99**	**Apr-00**	**Apr-01**	**Apr-02**	**Apr-03**	**Apr-04**	**LAET**	**2LAET**
Acenaphthene	<MDL (15)	<MDL (15)	<MDL (9.4)	<MDL (15)	<MDL (14)	<MDL (15)	500	730
Acenaphthylene	<MDL (22)	<MDL (22)	<MDL (20)	<MDL (32)	<MDL (31)	<MDL (31)	1,300	1,300
Anthracene	<MDL (22)	<MDL (22)	<MDL (5.4)	17.5	14	11	960	4,400
Fluorene	<MDL (22)	<MDL (22)	<MDL (17)	<MDL (27)	<MDL (27)	<MDL (27)	540	1,000
2-Methylnaphthalene	<MDL (60)	<MDL (59)	<MDL (19)	<MDL (30)	<MDL (29)	<MDL (29)	670	1,400
Naphthalene	61	<MDL (59)	<MDL (19)	<MDL (30)	<MDL (29)	<MDL (29)	2,100	2,400
Phenanthrene	80.1	25	8.4	114	103	53.7	1,500	5,400
Total LPAHs	140	25	8.4	132	120	65	5,200	13,000
Benzo(a)anthracene	48.8	<MDL (22)	8.14	92.4	68.7	53.5	1,300	1,600
Benzo(a)pyrene	53	<MDL (37)	<MDL (4.0)	110	89.3	56.6	1,600	3,000
Benzofluoranthenes (Total)	76	<MDL (59)	16	213	225	128	3,200	3,600
Benzo(g,h,i)perylene	<MDL (38)	<MDL (37)	<MDL (11)	52.5	77.4	37.8	670	720
Chrysene	72.4	34	7.9	146	115	83.0	1,400	2,800
Dibenzo(a,h)anthracene	<MDL (60)	<MDL (59)	<MDL (9.4)	18	15	<MDL (15)	230	540
Fluoranthene	119	52.2	24.5	249	216	137	1,700	2,500
Indeno(1,2,3-c,d)pyrene	<MDL (38)	<MDL (37)	<MDL (12)	58.9	63.2	27	600	690
Pyrene	125	38.4	5.9	234	190	122	2,600	3,300
Total HPAHs	490	120	62.0	1,200	1,100	640	12,000	17,000
1,2-Dichlorobenzene	<MDL (0.96)	<MDL (0.95	<MDL (0.35)	<MDL (0.55)	<MDL (0.53)	<MDL (0.54)	35	50
1,2,4-Trichlorobenzene	<MDL (0.96)	<MDL (0.95	<MDL (0.35)	<MDL (0.55)	<MDL (0.53)	<MDL (0.54)	31	51
Hexachlorobenzene	<MDL (0.96)	<MDL (0.95	<MDL (0.88)	<MDL (1.4)	<MDL (1.4)	<MDL (1.4)	22	70
Di-N-octyl Phthalate	<MDL (22)	<MDL (22)	<MDL (11)	<MDL (17)	<MDL (16)	<MDL (17)	420	2,100
Diethyl Phthalate	<MDL (38)	<MDL (37)	<MDL (8.0)	<MDL (13)	<MDL (12)	<MDL (12)	48	73
Dimethyl Phthalate	<MDL (15)	<MDL (15)	<MDL (15)	<MDL (23)	<MDL (23)	<MDL (12)	71	160
Dibenzofuran	<MDL (38)	<MDL (37)	<MDL (19)	<MDL (30)	<MDL (29)	<MDL (29)	540	700
Hexachlorobutadiene	<MDL (38)	<MDL (37)	<MDL (1.0)	<MDL (1.6)	<MDL (1.5)	<MDL (1.6)	11	120
N-Nitrosodiphenylamine	<MDL (38)	<MDL (37)	<MDL (27)	<MDL (42)	<MDL (41)	<MDL (12)	28	40
Total PCBs	306	**271**	**1,880**	260	114	125	130	1,000
Ionic Organics (µg/Kg DW)	**Oct-99**	**Apr-00**	**Apr-01**	**Apr-02**	**Apr-03**	**Apr-04**	**SQS**	**CSL**
Benzyl Alcohol	<MDL (38)	<MDL (37)	<MDL (8.0)	<MDL (13)	<MDL (12)	<MDL (12)	57	73
2-Methylphenol	<MDL (38)	<MDL (37)	<MDL (25)	<MDL (40)	<MDL (39)	<MDL (33)	63	63
4-Methylphenol	<MDL (38)	<MDL (37)	<MDL (21)	<MDL (34)	112	<MDL (33)	670	670
2,4-Dimethylphenol	<MDL (38)	<MDL (37)	<MDL (9.4)	<MDL (15)	<MDL (14)	<MDL (15)	29	29
Pentachlorophenol	<MDL (38)	<MDL (37)	<MDL (6.7)	<MDL (11)	<MDL (10)	<MDL (10)	360	690
Phenol	<MDL (150)	<MDL (150)	<MDL (12)	<MDL (19)	33	<MDL (19)	420	1,200
Conventionals	**Oct-99**	**Apr-00**	**Apr-01**	**Apr-02**	**Apr-03**	**Apr-04**		
Total Organic Carbon (mg/Kg DW)	6,490	4,930	2,770	26,200	27,600	24,100		
Total Organic Carbon (% DW)	0.65	0.49	0.28	2.62	2.76	2.41		
Percent Gravel	1.3	0.5	1.0	0.2	0.8	<MDL (0.1)		
Percent Sand	90.8	93.7	95.9	44.6	40.3	43.4		
Percent Silt	6.5	5.9	2.6	46.7	52.6	36.8		
Percent Clay	1.5	0.1	0.6	8.5	6.1	13.4		

Notes

mg/Kg DW - Milligrams per kilogram normalized to dry weight, based on percent solids analysis.
µg/Kg DW - Micrograms per kilogram normalized to dry weight, based on percent solids analysis.
<MDL (#) - Analyte not detected above the *method dection limit*. Value in parentheses is the numeric MDL.
SQS - Sediment Quality Standard (Table I, Ecology 1995).
CSL - Cleanup Screening Level (Table III, Ecology 1995).
LAET - Lowest Apparent Effects Threshhold (EPA 1988).
2LAET - Second Lowest Apparent Effects Threshhold (EPA 1988).
Shaded Cell - Analytical result exceeds a numeric sediment criterion (if appropriate to normalize to dry weight).

Table 9d - Upriver Reference Station
Five-Year Dry Weight Comparison of Sediment Constituents
0 to 2 cm Depth Stratum at NFK504
Norfolk CSO Sediment Remediation Project
Five-Year Monitoring Program, Year Five, April 2004

Metals (mg/Kg DW)	Oct-99	Apr-00	Apr-01	Apr-02	Apr-03	Apr-04	SQS	CSL
Arsenic	6.3	7.3	<MDL (4.7)	5.9	5.6	5.9	57	93
Cadmium	<MDL (0.22)	<MDL (0.23)	<MDL (0.28)	<MDL (0.23)	<MDL (0.18)	<MDL (0.30)	5.1	6.7
Chromium	18.2	22.1	21.1	16.7	12.3	19.4	260	270
Copper	17.1	18.4	24.9	23.3	13.5	28.3	390	390
Lead	8.2	8.7	18.0	9.5	5.4	15.7	450	530
Mercury	0.028	0.049	0.072	0.040	<MDL (0.022)	0.069	0.41	0.59
Silver	<MDL (0.29)	<MDL (0.30)	<MDL (0.38)	<MDL (0.31)	<MDL (0.22)	0.87	6.1	6.1
Zinc	56.6	56.1	68.3	56.1	43.3	78.0	410	960
Non-Ionic Organics (µg/Kg DW)	**Oct-99**	**Apr-00**	**Apr-01**	**Apr-02**	**Apr-03**	**Apr-04**	**LAET**	**2LAET**
Acenaphthene	<MDL (16)	<MDL (17)	<MDL (12)	<MDL (11)	<MDL (8.3)	111	500	730
Acenaphthylene	<MDL (23)	<MDL (24)	<MDL (25)	<MDL (23)	<MDL (18)	<MDL (30)	1,300	1,300
Anthracene	<MDL (23)	<MDL (24)	<MDL (6.7)	39.8	<MDL (4.7)	97.2	960	4,400
Fluorene	<MDL (23)	<MDL (24)	<MDL (22)	<MDL (20)	<MDL (15)	<MDL (26)	540	1,000
2-Methylnaphthalene	<MDL (63)	<MDL (66)	<MDL (23)	<MDL (22)	<MDL (17)	45	670	1,400
Naphthalene	70	<MDL (66)	<MDL (23)	<MDL (22)	<MDL (17)	30	2,100	2,400
Phenanthrene	38	76.5	10	85.7	30.1	2,870	1,500	5,400
Total LPAHs	110	76.5	10	126	30.1	3,200	5,200	13,000
Benzo(a)anthracene	36	66.0	18.0	171	4.6	175	1,300	1,600
Benzo(a)pyrene	<MDL (39)	59	<MDL (5.0)	61.7	4.4	161	1,600	3,000
Benzofluoranthenes (Total)	64	110	25	145	15	809	3,200	3,600
Benzo(g,h,i)perylene	<MDL (39)	44	<MDL (13)	14	<MDL (9.5)	110	670	720
Chrysene	53.1	94.7	8.2	384	8.4	648	1,400	2,800
Dibenzo(a,h)anthracene	<MDL (63)	<MDL (66)	<MDL (12)	<MDL (11)	<MDL (8.3)	24	230	540
Fluoranthene	76.1	178	27.5	259	32.4	5,200	1,700	2,500
Indeno(1,2,3-c,d)pyrene	<MDL (39)	52	<MDL (15)	26	<MDL (11)	105	600	690
Pyrene	75.9	159	<MDL (6.7)	240	24.9	2,800	2,600	3,300
Total HPAHs	310	760	79	1,300	90	10,000	12,000	17,000
1,2-Dichlorobenzene	<MDL (1.0)	<MDL (1.1)	<MDL (0.43)	<MDL (0.40)	<MDL (0.31)	<MDL (0.51)	35	50
1,2,4-Trichlorobenzene	<MDL (1.0)	<MDL (1.1)	<MDL (0.43)	<MDL (0.40)	<MDL (0.31)	<MDL (0.51)	31	51
Hexachlorobenzene	<MDL (1.0)	<MDL (1.1)	<MDL (1.1)	<MDL (1.0)	<MDL (0.78)	<MDL (1.3)	22	70
Di-N-octyl Phthalate	<MDL (23)	<MDL (24)	<MDL (13)	<MDL (12)	<MDL (9.5)	<MDL (16)	420	2,100
Diethyl Phthalate	<MDL (39)	<MDL (41)	<MDL (10)	<MDL (9.3)	<MDL (7.1)	<MDL (12)	48	73
Dimethyl Phthalate	<MDL (16)	<MDL (17)	<MDL (18)	<MDL (17)	<MDL (13)	<MDL (12)	71	160
Dibenzofuran	<MDL (39)	<MDL (41)	<MDL (23)	<MDL (22)	<MDL (17)	113	540	700
Hexachlorobutadiene	<MDL (39)	<MDL (41)	<MDL (1.2)	<MDL (1.2)	<MDL (0.89)	<MDL (1.5)	11	120
N-Nitrosodiphenylamine	<MDL (39)	<MDL (41)	<MDL (33)	<MDL (31)	<MDL (24)	<MDL (12)	28	40
Total PCBs	25	6.6	31	38.9	<MDL(2.4-4.7)	84.3	130	1,000
Ionic Organics (µg/Kg DW)	**Oct-99**	**Apr-00**	**Apr-01**	**Apr-02**	**Apr-03**	**Apr-04**	**SQS**	**CSL**
Benzyl Alcohol	<MDL (39)	<MDL (41)	<MDL (11)	<MDL (9.3)	<MDL (7.1)	<MDL (12)	57	73
2-Methylphenol	<MDL (39)	<MDL (41)	<MDL (36)	<MDL (29)	<MDL (22)	<MDL (31)	63	63
4-Methylphenol	<MDL (39)	<MDL (41)	<MDL (30)	<MDL (25)	<MDL (19)	<MDL (31)	670	670
2,4-Dimethylphenol	<MDL (39)	<MDL (41)	<MDL (13)	<MDL (11)	<MDL (8.3)	<MDL (14)	29	29
Pentachlorophenol	<MDL (39)	<MDL (41)	<MDL (9.5)	<MDL (7.8)	<MDL (5.9)	<MDL (9.8)	360	690
Phenol	<MDL (160)	<MDL (170)	<MDL (17)	<MDL (14)	<MDL (11)	<MDL (18)	420	1,200
Conventionals	**Oct-99**	**Apr-00**	**Apr-01**	**Apr-02**	**Apr-03**	**Apr-04**		
Total Organic Carbon (mg/Kg DW)	5,610	7,900	15,600	10,800	2,280	18,900		
Total Organic Carbon (% DW)	0.56	0.79	1.56	1.08	0.23	1.89		
Percent Gravel	1.7	1.0	0.5	1.4	2.4	1.2		
Percent Sand	82.3	74.1	80.7	78.0	93.5	48.9		
Percent Silt	13.6	23.8	14.4	17.6	4.1	36.4		
Percent Clay	3.0	0.9	4.6	3.1	<MDL (0.1)	11.0		

Notes

mg/Kg DW - Milligrams per kilogram normalized to dry weight, based on percent solids analysis.
µg/Kg DW - Micrograms per kilogram normalized to dry weight, based on percent solids analysis.
<MDL (#) - Analyte not detected above the *method dection limit*. Value in parentheses is the numeric MDL.
SQS - Sediment Quality Standard (Table I, Ecology 1995).
CSL - Cleanup Screening Level (Table III, Ecology 1995).
LAET - Lowest Apparent Effects Threshhold (EPA 1988).
2LAET - Second Lowest Apparent Effects Threshhold (EPA 1988).
Shaded Cell - Analytical result exceeds a numeric sediment criterion (if appropriate to normalize to dry weight).

Table 10

Summary of Data Analysis for "B" Flagged Compounds
Benzoic Acid and Bis(2-ethylhexyl) Phthalate

Norfolk CSO Sediment Remediation Project

Five-Year Monitoring Program, Year Five, April 2004

Benzoic Acid ***Method Blank = 43 µg/Kg, SQS/CSL = 650 µg/Kg DW***

	Concentration µg/Kg DW				
	A	B	C	D	E
NFK501 (2 cm)	292	249	207	292	<MDL (430)
NFK501 (10 cm)	74	31	19	<MDL (215)	<MDL (430)
NFK502 (2 cm)	47	<MDL (15)	<MDL (15)	<MDL (215)	<MDL (430)
NFK502 (10 cm)	<MDL (16)	<MDL (16)	<MDL (16)	<MDL (215)	<MDL (430)
NFK503 (2 cm)	146	103	57	<MDL (215)	<MDL (430)
NFK503 (10 cm)	152	109	64	<MDL (215)	<MDL (430)
NFK504 (2 cm)	130	87	45	<MDL (215)	<MDL (430)
NFK504 (10 cm)	56	<MDL (17)	<MDL (17)	<MDL (215)	<MDL (430)

Bis(2-ethylhexyl) Phthalate ***Method Blank = 7.0 µg/Kg, LAET/2LAET = 1,300/1,900 µg/Kg DW***

	Concentration µg/Kg DW				
	A	B	C	D	E
NFK501 (2 cm)	516	509	502	516	516
NFK501 (10 cm)	46.7	39.7	37.7	46.7	<MDL (70)
NFK502 (2 cm)	24.3	17.3	16.3	<MDL (35)	<MDL (70)
NFK502 (10 cm)	19.3	12	11	<MDL (35)	<MDL (70)
NFK503 (2 cm)	342	335	327	342	342
NFK503 (10 cm)	626	619	612	626	626
NFK504 (2 cm)	224	217	210	224	224
NFK504 (10 cm)	39.0	32.0	29.7	39.0	<MDL (70)

Bis(2-ethylhexyl) Phthalate ***Method Blank = 7.0 µg/Kg, SQS/CSL = 47/78 mg/Kg OC***

	Concentration mg/Kg OC				
	A	B	C	D	E
NFK501 (2 cm)	25.8	25.5	25.1	25.8	25.8
NFK501 (10 cm)	14.9	12.7	12.0	14.9	<MDL (22)
NFK502 (2 cm)	10.7	7.59	7.14	<MDL (15)	<MDL (31)
NFK502 (10 cm)	11.7	7.5	6.4	<MDL (21)	<MDL (42)
NFK503 (2 cm)	14.2	13.9	13.6	14.2	14.2
NFK503 (10 cm)	24.2	23.9	23.6	24.2	24.2
NFK504 (2 cm)	11.9	11.5	11.1	11.9	11.9
NFK504 (10 cm)	13.3	10.9	10.1	13.3	<MDL (24)

Notes

A - Sample concentration as reported with no correction for method blank concentration.

B - Method blank concentration subtracted from dry weight sample concentration (after normalization to dry weight).

C - Method blank concentration subtracted from wet weight sample concentration (prior to normalization to dry weight).

D - Method detection limit raised to five times the method blank concentration.

E - Method detection limit raised to ten times the method blank concentration.

µg/Kg DW - Micrograms per kilogram normalized to dry weight, based on percent solids analysis.

mg/Kg OC - Milligrams per kilogram normalized to organic carbon, based on total organic carbon analysis.

<MDL (#) - Analyte not detected above the *method detection limit.* Value in parentheses is the numeric MDL.

SQS/CSL - Sediment Quality Standard/Cleanup Screening Level (Ecology, 1995).

LAET/2LAET - Lowest Apparent Effects Threshhold/Second Lowest Apparent Effects Threshhold (EPA, 1988).

-04	LAET	*Data Normalized to Organic Carbon*	Concentration (mg/Kg OC) Oct-99	Apr-00	Apr-01	Apr-02	Apr-03	Apr-04	SQS
		Benzyl Butyl Phthalate (0 to 2 cm)							
.9		NFK501	n/a	<MDL (3.8)	**3.62**	<MDL (3.7)	<MDL (2.5)	**1.65**	
(6.9)		NFK502	<MDL (3.6)	n/a	**3.39**	n/a	n/a	n/a	
.8		NFK503	<MDL (3.4)	n/a	n/a	<MDL (2.6)	<MDL (1.9)	**1.11**	
.3		NFK504	<MDL (4.1)	<MDL (3.0)	**2.24**	<MDL (3.2)	n/a	**1.55**	
	63	**Benzyl Butyl Phthalate (0 to 10 cm)**							**4.9**
(7.7)		NFK501	n/a	n/a	**6.63**	<MDL (2.3)	<MDL (1.8)	n/a	
(7.5)		NFK502	n/a	n/a	n/a	n/a	n/a	n/a	
.9		NFK503	n/a	n/a	n/a	<MDL (2.7)	<MDL (1.5)	**1.08**	
0		NFK504	n/a	n/a	**3.08**	<MDL (2.8)	n/a	n/a	
		Bis(2-ethylhexyl) Phthalate (0 to 2 cm)							
6		NFK501	n/a	<MDL (38)	**42.7**	**41.7**	**33.0**	**25.8**	
(24)		NFK502	<MDL (24)	n/a	**31.6**	n/a	n/a	n/a	
2		NFK503	<MDL (18)	n/a	n/a	**43.1**	**22.1**	**14.2**	
4		NFK504	<MDL (25)	**<MDL (52)**	**24.9**	**63.1**	n/a	**11.9**	
	1,300	**Bis(2-ethylhexyl) Phthalate (0 to 10 cm)**							**47**
(47)		NFK501	n/a	n/a	**28.4**	**40.9**	**25.3**	n/a	
(19)		NFK502	n/a	n/a	n/a	n/a	n/a	n/a	
6		NFK503	n/a	n/a	n/a	**40.4**	**24.3**	**24.2**	
(39)		NFK504	n/a	n/a	**36.5**	**46.9**	n/a	n/a	
		Di-N-butyl Phthalate (0 to 2 cm)							
(9.9)		NFK501	n/a	<MDL (6.3)	<MDL (5.7)	**0.926**	<MDL (1.1)	<MDL (0.50)	
(5.7)		NFK502	<MDL (6.0)	n/a	<MDL (5.1)	n/a	n/a	n/a	
(10)		NFK503	<MDL (5.9)	n/a	n/a	**0.61**	<MDL (1.3)	<MDL (0.41)	
(9.8)		NFK504	<MDL (7.0)	<MDL (5.2)	<MDL (3.6)	**0.88**	n/a	<MDL (0.52)	
	1,400	**Di-N-butyl Phthalate (0 to 10 cm)**							**220**
(6.4)		NFK501	n/a	n/a	<MDL (5.1)	**0.70**	<MDL (1.1)	n/a	
(6.3)		NFK502	n/a	n/a	n/a	n/a	n/a	n/a	
(10)		NFK503	n/a	n/a	n/a	**0.39**	<MDL (1.1)	<MDL (0.39)	
(6.7)		NFK504	n/a	n/a	<MDL (4.3)	**1.1**	n/a	n/a	
		Di-N-octyl Phthalate (0 to 2 cm)							
(16)		NFK501	n/a	<MDL (3.8)	<MDL (1.5)	<MDL (0.74)	**4.98**	<MDL (0.80)	
(9.2)		NFK502	<MDL (3.6)	n/a	<MDL (1.8)	n/a	n/a	n/a	
(17)		NFK503	<MDL (3.4)	n/a	n/a	<MDL (0.65)	<MDL (0.58)	<MDL (0.71)	
(16)		NFK504	<MDL (4.1)	<MDL (3.0)	<MDL (0.96)	<MDL (1.1)	n/a	<MDL (0.85)	
	420	**Di-N-octyl Phthalate (0 to 10 cm)**							**58**
(10)		NFK501	n/a	n/a	<MDL (1.4)	<MDL (0.70)	<MDL (0.63)	n/a	
(10)		NFK502	n/a	n/a	n/a	n/a	n/a	n/a	
(16)		NFK503	n/a	n/a	n/a	<MDL (0.63)	<MDL (0.62)	<MDL (0.62)	
(11)		NFK504	n/a	n/a	<MDL (1.4)	<MDL (0.99)	n/a	n/a	
		Diethyl Phthalate (0 to 2 cm)							
(12)		NFK501	n/a	<MDL (6.3)	<MDL (5.7)	<MDL (0.57)	<MDL (0.48)	<MDL (0.60)	
(6.9)		NFK502	<MDL (6.0)	n/a	<MDL (5.1)	n/a	n/a	n/a	
(12)		NFK503	<MDL (5.9)	n/a	n/a	<MDL (0.50)	<MDL (0.43)	<MDL (0.50)	
(12)		NFK504	<MDL (7.0)	<MDL (5.2)	<MDL (3.6)	<MDL (0.86)	n/a	<MDL (0.63)	
	48	**Diethyl Phthalate (0 to 10 cm)**							**61**
(7.7)		NFK501	n/a	n/a	<MDL (5.1)	<MDL (0.52)	<MDL (0.45)	n/a	
(7.5)		NFK502	n/a	n/a	n/a	n/a	n/a	n/a	
(12)		NFK503	n/a	n/a	n/a	<MDL (0.47)	<MDL (0.49)	<MDL (0.46)	
(8.0)		NFK504	n/a	n/a	<MDL (4.3)	<MDL (0.74)	n/a	n/a	
		Dimethyl Phthalate (0 to 2 cm)							
(12)		NFK501	n/a	<MDL (2.5)	<MDL (2.0)	<MDL (1.0)	<MDL (0.85)	<MDL (0.60)	
(6.9)		NFK502	<MDL (2.4)	n/a	<MDL (2.5)	n/a	n/a	n/a	
(12)		NFK503	<MDL (2.3)	n/a	n/a	<MDL (0.88)	<MDL (0.83)	<MDL (0.50)	
(12)		NFK504	<MDL (2.9)	<MDL (2.2)	<MDL (1.3)	<MDL (1.6)	n/a	<MDL (0.63)	
	71	**Dimethyl Phthalate (0 to 10 cm)**							**53**
(7.7)		NFK501	n/a		<MDL (2.0)	<MDL (0.99)	<MDL (0.85)	n/a	

Notes

- µg/Kg DW - Micrograms per kilogram normalized to dry weight.
- mg/Kg OC - Milligrams per kilogram normalized to organic carbon.
- LAET - Lowest apparent effects threshhold (EPA, 1988).
- SQS - Sediment quality standard (Ecology, 1995).
- n/a - Organic carbon normalization not applicable (TOC < 0.5%).
- <MDL (#) - Result less than method detection limit (numeric MDL).
- <MDL (#) - Method detection limit raised due to laboratory contamination.
- **<MDL (#)** - Raised method detection limit exceeds LAET or SQS.
- **#** - Detected analytical result exceeds SQS.

APPENDIX A
COMPLETE ANALYTICAL RESULTS

King County Environmental Lab Analytical Report

Norfolk CSO Sediment Remediation
Five-Year Monitoring Program
Year Five Sampling Event
April 2004

Locator:	NFK501	NFK501	NFK502	NFK502
Descrip:	Norfolk CSO Channel	Norfolk CSO Channel	Combined Channel Delta	Combined Channel Delta
Stratum:	0 to 2 cm	0 to 10 cm	0 to 2 cm	0 to 10 cm
Sampled:	Apr 05, 2004	Apr 05, 2004	Apr 05, 2004	Apr 05, 2004
Lab ID:	L31635-1	L31635-2	L31635-3	L31635-4
Matrix:	SALTWTRSED	SALTWTRSED	SALTWTRSED	SALTWTRSED
% Solids:	50.4	77.9	87.2	79.9

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
			- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis		
COMBINED LABS																				
M=CV ASTM D422(03-02-005-001)																				
Gravel *	2	E	0.1	1	%	5	E	0.1	1	%	3	E	0.1	1	%	3	E	0.1	1	%
Sand *	48.1		0.1	1	%	85.1		0.1	1	%	94.2		0.1	1	%	92.3		0.1	1	%
Silt *	35.5		0.5	1	%	4		0.5	1	%	2		0.5	1	%	3		0.5	1	%
Clay *	11.5		0.5	1	%	5		0.5	1	%	3		0.5	1	%	3		0.5	1	%
p+0.00 *	4		0.1	1	%	10		0.1	1	%	19.9		0.1	1	%	26.4		0.1	1	%
p+1.00 *	11.9		0.1	1	%	22.9		0.1	1	%	46.5		0.1	1	%	40.6		0.1	1	%
p+10.0(equal/more than) *	9		0.5	1	%	3		0.5	1	%	3		0.5	1	%	3		0.5	1	%
p+2.00 *	16.2		0.1	1	%	39.5		0.1	1	%	24		0.1	1	%	19.8		0.1	1	%
p+3.00 *	4		0.1	1	%	8		0.1	1	%	3		0.1	1	%	5		0.1	1	%
p+4.00 *	11.8		0.1	1	%	5		0.1	1	%	0.7	<RDL	0.1	1	%	0.8	<RDL	0.1	1	%
p+5.00 *	18.2		0.5	1	%	0.6	<RDL	0.5	1	%	0.5	<RDL	0.5	1	%	0.6	<RDL	0.5	1	%
p+6.00 *	7		0.5	1	%	1	RDL	0.5	1	%	0.5	<RDL	0.5	1	%	1	RDL	0.5	1	%
p+7.00 *	8		0.5	1	%	1	RDL	0.5	1	%		<MDL	0.5	1	%	1	RDL	0.5	1	%
p+8.00 *	3		0.5	1	%	1	RDL	0.5	1	%	0.5	<RDL	0.5	1	%		<MDL	0.5	1	%
p+9.00 *	3		0.5	1	%	1	RDL	0.5	1	%		<MDL	0.5	1	%	0.6	<RDL	0.5	1	%
p-1.00 *	2		0.1	1	%	4		0.1	1	%	2		0.1	1	%	3		0.1	1	%
p-2.00 *		<MDL	0.1	1	%		<MDL	0.1	1	%	0.2	<RDL	0.1	1	%	0.1	<RDL	0.1	1	%
p-2.00(less than) *	0.1	<RDL	0.1	1	%		<MDL	0.1	1	%	0.2	<RDL	0.1	1	%		<MDL	0.1	1	%
M=CV EPA9060-PSEP96 (03-04-002-002)																				
Total Organic Carbon	20000		1300	2660	mg/Kg	3130		1100	2130	mg/Kg	2280		490	986	mg/Kg	1650		500	1000	mg/Kg
M=CV SM2540-G (03-01-007-002)																				
Total Solids *	50.4		0.005	0.01	%	77.9		0.005	0.01	%	87.2		0.005	0.01	%	79.9		0.005	0.01	%
M=ES NONE																				
Sampcoordx1 *	1278587				ft	1278587				ft	1278513				ft	1278513				ft
Sampcoordx2 *	1278591				ft	1278591				ft	1278516				ft	1278516				ft
Sampcoordx3 *	1278589				ft	1278589				ft										
Sampcoordy1 *	190170				ft	190170				ft	190154				ft	190154				ft
Sampcoordy2 *	190173				ft	190173				ft	190158				ft	190158				ft
Sampcoordy3 *	190164				ft	190164				ft										
Sample Depth *	1				m	1				m	2				m	2				m
Sample Start Time *	950				hr	950				hr	1100				hr	1100				hr
Sediment Sampling Depth *	16				cm	16				cm	14				cm	15				cm
Sediment Sampling Range *	0 - 2 cm				cm	0 - 10 cm				cm	0 - 2 cm				cm	0 - 10 cm				cm
Tidal Condition	E				none	E				none	E				none	E				none
Tide Height *	4				ft	4				ft	2				ft	2				ft

King County Environmental Lab Analytical Report

Norfolk CSO Sediment Remediation
Five-Year Monitoring Program
Year Five Sampling Event
April 2004

Locator:	NFK501	NFK501	NFK502	NFK502
Descrip:	Norfolk CSO Channel	Norfolk CSO Channel	Combined Channel Delta	Combined Channel Delta
Stratum:	0 to 2 cm	0 to 10 cm	0 to 2 cm	0 to 10 cm
Sampled:	Apr 05, 2004	Apr 05, 2004	Apr 05, 2004	Apr 05, 2004
Lab ID:	L31635-1	L31635-2	L31635-3	L31635-4
Matrix:	SALTWTRSED	SALTWTRSED	SALTWTRSED	SALTWTRSED
% Solids:	50.4	77.9	87.2	79.9

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
			- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis		
COMBINED LABS																				
M=MT EPA245.5/245.2 (06-01-004-003)																				
Mercury, Total, CVAA	0.063	<RDL	0.038	0.379	mg/Kg		<MDL	0.024	0.245	mg/Kg		<MDL	0.023	0.224	mg/Kg		<MDL	0.025	0.244	mg/Kg
M=MT EPA3050A/6010B (06-02-004-002)																				
Aluminum, Total, ICP	14800	L	9.7	48.2	mg/Kg	8680	L	6.2	30.8	mg/Kg	8150	L	5.6	28.3	mg/Kg	8670	L	6	30.3	mg/Kg
Arsenic, Total, ICP		<MDL	4.8	24.2	mg/Kg		<MDL	3.1	15.4	mg/Kg		<MDL	2.9	14.1	mg/Kg		<MDL	3	15.1	mg/Kg
Beryllium, Total, ICP	0.38	<RDL	0.097	0.482	mg/Kg	0.19	<RDL	0.062	0.308	mg/Kg	0.21	<RDL	0.056	0.283	mg/Kg	0.21	<RDL	0.06	0.303	mg/Kg
Cadmium, Total, ICP	0.36	<RDL	0.3	1.45	mg/Kg		<MDL	0.18	0.923	mg/Kg		<MDL	0.17	0.849	mg/Kg		<MDL	0.19	0.91	mg/Kg
Chromium, Total, ICP	21.2		0.48	2.42	mg/Kg	11.9		0.31	1.54	mg/Kg	10.9		0.29	1.41	mg/Kg	11.5		0.3	1.51	mg/Kg
Copper, Total, ICP	29		0.38	1.93	mg/Kg	11.9		0.24	1.23	mg/Kg	12		0.23	1.13	mg/Kg	13.3		0.24	1.21	mg/Kg
Iron, Total, ICP	25800		4.8	24.2	mg/Kg	16300		3.1	15.4	mg/Kg	21200		2.9	14.1	mg/Kg	20800		3	15.1	mg/Kg
Lead, Total, ICP	13	<RDL	3	14.5	mg/Kg	4.1	<RDL	1.8	9.23	mg/Kg	6.1	<RDL	1.7	8.49	mg/Kg	5.5	<RDL	1.9	9.1	mg/Kg
Manganese, Total, ICP	462		0.19	0.966	mg/Kg	236		0.12	0.615	mg/Kg	278		0.11	0.565	mg/Kg	309		0.12	0.607	mg/Kg
Nickel, Total, ICP	17.8		1.9	9.66	mg/Kg	13.1		1.2	6.15	mg/Kg	11.2		1.1	5.65	mg/Kg	12.3		1.2	6.07	mg/Kg
Selenium, Total, ICP		<MDL	4.8	24.2	mg/Kg		<MDL	3.1	15.4	mg/Kg		<MDL	2.9	14.1	mg/Kg		<MDL	3	15.1	mg/Kg
Silver, Total, ICP	0.75	<RDL,L	0.38	1.93	mg/Kg	0.46	<RDL,L	0.24	1.23	mg/Kg	0.46	<RDL,L	0.23	1.13	mg/Kg	0.5	<RDL,L	0.24	1.21	mg/Kg
Thallium, Total, ICP		<MDL	19	96.6	mg/Kg	12	<RDL	12	61.5	mg/Kg	13	<RDL	11	56.5	mg/Kg		<MDL	12	60.7	mg/Kg
Zinc, Total, ICP	78.2		0.48	2.42	mg/Kg	38.9		0.31	1.54	mg/Kg	44.4		0.29	1.41	mg/Kg	43.2		0.3	1.51	mg/Kg
M=OR EPA 3550B/8270C (7-3-01-004)																				
1,2,4-Trichlorobenzene		<MDL,G	0.52	1.05	ug/Kg		<MDL,G	0.33	0.68	ug/Kg		<MDL,G	0.3	0.608	ug/Kg		<MDL,G	0.33	0.663	ug/Kg
1,2-Dichlorobenzene		<MDL,G	0.52	1.05	ug/Kg		<MDL,G	0.33	0.68	ug/Kg		<MDL,G	0.3	0.608	ug/Kg		<MDL,G	0.33	0.663	ug/Kg
1,2-Diphenylhydrazine		<MDL	20	39.7	ug/Kg		<MDL	13	25.7	ug/Kg		<MDL	11	22.9	ug/Kg		<MDL	13	25	ug/Kg
1,3-Dichlorobenzene		<MDL,G	0.52	1.05	ug/Kg		<MDL,G	0.33	0.68	ug/Kg		<MDL,G	0.3	0.608	ug/Kg		<MDL,G	0.33	0.663	ug/Kg
1,4-Dichlorobenzene		<MDL,G	0.26	0.524	ug/Kg		<MDL,G	0.17	0.339	ug/Kg		<MDL,G	0.15	0.303	ug/Kg		<MDL,G	0.16	0.33	ug/Kg
2,4,5-Trichlorophenol		<MDL	24	47.6	ug/Kg		<MDL,G	15	30.8	ug/Kg		<MDL	14	27.5	ug/Kg		<MDL,G	15	30	ug/Kg
2,4,6-Trichlorophenol		<MDL	26	51.6	ug/Kg		<MDL,G	17	33.4	ug/Kg		<MDL	15	29.8	ug/Kg		<MDL,G	16	32.5	ug/Kg
2,4-Dichlorophenol		<MDL,G	32	63.5	ug/Kg		<MDL,G	21	41.1	ug/Kg		<MDL,G	18	36.7	ug/Kg		<MDL,G	20	40.1	ug/Kg
2,4-Dimethylphenol		<MDL,X	14	27.8	ug/Kg		<MDL,X,G	9	18	ug/Kg		<MDL,X	8	16.1	ug/Kg		<MDL,X,G	8.8	17.5	ug/Kg
2,4-Dinitrophenol		<MDL,G	26	53	ug/Kg		<MDL,G	17	34.3	ug/Kg		<MDL,G	15	30.6	ug/Kg		<MDL,G	16	33.4	ug/Kg
2,4-Dinitrotoluene		<MDL	6	11.9	ug/Kg		<MDL	3.9	7.7	ug/Kg		<MDL	3.4	6.88	ug/Kg		<MDL	3.8	7.51	ug/Kg
2,6-Dinitrotoluene		<MDL	20	39.7	ug/Kg		<MDL	13	25.7	ug/Kg		<MDL	11	22.9	ug/Kg		<MDL	13	25	ug/Kg
2-Chloronaphthalene		<MDL	32	63.5	ug/Kg		<MDL	21	41.1	ug/Kg		<MDL	18	36.7	ug/Kg		<MDL	20	40.1	ug/Kg
2-Chlorophenol		<MDL,G	16	31.7	ug/Kg		<MDL,G	10	20.5	ug/Kg		<MDL,G	9.2	18.3	ug/Kg		<MDL,G	10	20	ug/Kg
2-Methylnaphthalene		<MDL,G	28	55.6	ug/Kg		<MDL,G	18	35.9	ug/Kg		<MDL,G	16	32.1	ug/Kg		<MDL,G	18	35	ug/Kg
2-Methylphenol		<MDL,G	32	75.4	ug/Kg		<MDL,G	21	48.8	ug/Kg		<MDL,G	18	43.6	ug/Kg		<MDL,G	20	47.6	ug/Kg
2-Nitroaniline		<MDL	26	53	ug/Kg		<MDL	17	34.3	ug/Kg		<MDL	15	30.6	ug/Kg		<MDL	16	33.4	ug/Kg
2-Nitrophenol		<MDL,G	30	59.5	ug/Kg		<MDL,G	19	38.5	ug/Kg		<MDL,G	17	34.4	ug/Kg		<MDL,G	19	37.5	ug/Kg
[illegible]hlorobenzidine		<MDL,X	26	53	ug/Kg		<MDL,X	17	34.3	ug/Kg		<MDL,X	15	30.6	ug/Kg		<MDL,X	16	33.4	ug/Kg

King County Environmental Lab Analytical Report

Norfolk CSO Sediment Remediation
Five-Year Monitoring Program
Year Five Sampling Event
April 2004

Locator:	NFK501	NFK501	NFK502	NFK502
Descrip:	Norfolk CSO Channel	Norfolk CSO Channel	Combined Channel Delta	Combined Channel Delta
Stratum:	0 to 2 cm	0 to 10 cm	0 to 2 cm	0 to 10 cm
Sampled:	Apr 05, 2004	Apr 05, 2004	Apr 05, 2004	Apr 05, 2004
Lab ID:	L31635-1	L31635-2	L31635-3	L31635-4
Matrix:	SALTWTRSED	SALTWTRSED	SALTWTRSED	SALTWTRSED
% Solids:	50.4	77.9	87.2	79.9

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis			
COMBINED LABS																				
3-Nitroaniline		<MDL,X	26	53	ug/Kg		<MDL,X	17	34.3	ug/Kg		<MDL,X	15	30.6	ug/Kg		<MDL,X	16	33.4	ug/Kg
4,6-Dinitro-O-Cresol		<MDL,G	26	53	ug/Kg		<MDL,G	17	34.3	ug/Kg		<MDL,G	15	30.6	ug/Kg		<MDL,G	16	33.4	ug/Kg
4-Bromophenyl Phenyl Ether		<MDL	18	35.7	ug/Kg		<MDL	12	23.1	ug/Kg		<MDL	10	20.6	ug/Kg		<MDL	11	22.5	ug/Kg
4-Chloro-3-Methylphenol		<MDL	26	53	ug/Kg		<MDL,G	17	34.3	ug/Kg		<MDL	15	30.6	ug/Kg		<MDL,G	16	33.4	ug/Kg
4-Chloroaniline		<MDL,X	5.4	10.6	ug/Kg		<MDL,X	3.5	6.84	ug/Kg		<MDL,X	3.1	6.11	ug/Kg		<MDL,X	3.4	6.67	ug/Kg
4-Chlorophenyl Phenyl Ether		<MDL	26	51.6	ug/Kg		<MDL	17	33.4	ug/Kg		<MDL	15	29.8	ug/Kg		<MDL	16	32.5	ug/Kg
4-Methylphenol		<MDL,G	32	63.5	ug/Kg		<MDL,G	21	41.1	ug/Kg		<MDL,G	18	36.7	ug/Kg		<MDL,G	20	40.1	ug/Kg
4-Nitroaniline		<MDL,G	26	53	ug/Kg		<MDL,G	17	34.3	ug/Kg		<MDL,G	15	30.6	ug/Kg		<MDL,G	16	33.4	ug/Kg
4-Nitrophenol		<MDL	26	53	ug/Kg		<MDL,G	17	34.3	ug/Kg		<MDL	15	30.6	ug/Kg		<MDL,G	16	33.4	ug/Kg
Acenaphthene		<MDL	14	27.8	ug/Kg		<MDL	9	18	ug/Kg		<MDL	8	16.1	ug/Kg		<MDL	8.8	17.5	ug/Kg
Acenaphthylene		<MDL	30	59.5	ug/Kg		<MDL	19	38.5	ug/Kg		<MDL	17	34.4	ug/Kg		<MDL	19	37.5	ug/Kg
Aniline		<MDL,X	260	530	ug/Kg		<MDL,X	170	343	ug/Kg		<MDL,X	150	306	ug/Kg		<MDL,X	160	334	ug/Kg
Anthracene	15	<RDL,G	7.9	15.9	ug/Kg		<MDL,G	5.1	10.3	ug/Kg		<MDL,G	4.6	9.17	ug/Kg		<MDL,G	5	10	ug/Kg
Benzo(a)anthracene	77.2	E	4	7.94	ug/Kg	7.7	E	2.6	5.13	ug/Kg	3.8	<RDL,E	2.3	4.59	ug/Kg	3.6	<RDL,E	2.5	5.01	ug/Kg
Benzo(a)pyrene	76.4	G,E	6	11.9	ug/Kg	11	G,E	3.9	7.7	ug/Kg	6.7	<RDL,G,E	3.4	6.88	ug/Kg	5.8	<RDL,G,E	3.8	7.51	ug/Kg
Benzo(b)fluoranthene	88.5		6	11.9	ug/Kg	9.86		3.9	7.7	ug/Kg	6.5	<RDL	3.4	6.88	ug/Kg	4.6	<RDL	3.8	7.51	ug/Kg
Benzo(g,h,i)perylene	66.1		16	31.7	ug/Kg		<MDL	10	20.5	ug/Kg		<MDL	9.2	18.3	ug/Kg		<MDL	10	20	ug/Kg
Benzo(k)fluoranthene	91.1	E	6	11.9	ug/Kg	9.65	E	3.9	7.7	ug/Kg	5	<RDL,E	3.4	6.88	ug/Kg		<MDL,E	3.8	7.51	ug/Kg
Benzoic Acid	292	B	26	132	ug/Kg	74	<RDL,G,B	17	85.6	ug/Kg	47	<RDL,B	15	76.5	ug/Kg		<MDL,G,B	16	83.5	ug/Kg
Benzyl Alcohol		<MDL,G	12	23.8	ug/Kg		<MDL,G	7.7	15.4	ug/Kg		<MDL,G	6.9	13.8	ug/Kg		<MDL,G	7.5	15	ug/Kg
Benzyl Butyl Phthalate	32.9		12	23.8	ug/Kg		<MDL	7.7	15.4	ug/Kg		<MDL	6.9	13.8	ug/Kg		<MDL	7.5	15	ug/Kg
Bis(2-Chloroethoxy)Methane		<MDL,G	34	67.5	ug/Kg		<MDL,G	22	43.6	ug/Kg		<MDL,G	19	39	ug/Kg		<MDL,G	21	42.6	ug/Kg
Bis(2-Chloroethyl)Ether		<MDL,G	30	59.5	ug/Kg		<MDL,G	19	38.5	ug/Kg		<MDL,G	17	34.4	ug/Kg		<MDL,G	19	37.5	ug/Kg
Bis(2-Chloroisopropyl)Ether		<MDL,G	30	59.5	ug/Kg		<MDL,G	19	38.5	ug/Kg		<MDL,G	17	34.4	ug/Kg		<MDL,G	19	37.5	ug/Kg
Bis(2-Ethylhexyl)Phthalate	516	B	13	27.8	ug/Kg	46.7	B	8.6	18	ug/Kg	24.3	B	7.7	16.1	ug/Kg	19.3	B	8.4	17.5	ug/Kg
Caffeine		<MDL	12	23.8	ug/Kg		<MDL	7.7	15.4	ug/Kg		<MDL	6.9	13.8	ug/Kg		<MDL	7.5	15	ug/Kg
Carbazole		<MDL	14	27.8	ug/Kg		<MDL	9	18	ug/Kg		<MDL	8	16.1	ug/Kg		<MDL	8.8	17.5	ug/Kg
Chrysene	112	E	7.9	15.9	ug/Kg	12.1	E	5.1	10.3	ug/Kg	5.3	<RDL,E	4.6	9.17	ug/Kg		<MDL,E	5	10	ug/Kg
Coprostanol		<MDL	28	55.6	ug/Kg		<MDL	18	35.9	ug/Kg		<MDL	16	32.1	ug/Kg		<MDL	18	35	ug/Kg
Dibenzo(a,h)anthracene		<MDL	14	27.8	ug/Kg		<MDL	9	18	ug/Kg		<MDL	8	16.1	ug/Kg		<MDL	8.8	17.5	ug/Kg
Dibenzofuran		<MDL	28	55.6	ug/Kg		<MDL	18	35.9	ug/Kg		<MDL	16	32.1	ug/Kg		<MDL	18	35	ug/Kg
Diethyl Phthalate		<MDL	12	23.8	ug/Kg		<MDL	7.7	15.4	ug/Kg		<MDL	6.9	13.8	ug/Kg		<MDL	7.5	15	ug/Kg
Dimethyl Phthalate		<MDL	12	43.7	ug/Kg		<MDL	7.7	28.2	ug/Kg		<MDL	6.9	25.2	ug/Kg		<MDL	7.5	27.5	ug/Kg
Di-N-Butyl Phthalate		<MDL	9.9	19.8	ug/Kg		<MDL	6.4	12.8	ug/Kg		<MDL	5.7	11.5	ug/Kg		<MDL	6.3	12.5	ug/Kg
Di-N-Octyl Phthalate		<MDL	16	31.7	ug/Kg		<MDL	10	20.5	ug/Kg		<MDL	9.2	18.3	ug/Kg		<MDL	10	20	ug/Kg
Fluoranthene	236		16	31.7	ug/Kg	19	<RDL	10	20.5	ug/Kg	9.6	<RDL	9.2	18.3	ug/Kg		<MDL	10	20	ug/Kg
Fluorene		<MDL	26	51.6	ug/Kg		<MDL	17	33.4	ug/Kg		<MDL	15	29.8	ug/Kg		<MDL	16	32.5	ug/Kg

King County Environmental Lab Analytical Report

Norfolk CSO Sediment Remediation
Five-Year Monitoring Program
Year Five Sampling Event
April 2004

Locator:	NFK501	NFK501	NFK502	NFK502
Descrip:	Norfolk CSO Channel	Norfolk CSO Channel	Combined Channel Delta	Combined Channel Delta
Stratum:	0 to 2 cm	0 to 10 cm	0 to 2 cm	0 to 10 cm
Sampled:	Apr 05, 2004	Apr 05, 2004	Apr 05, 2004	Apr 05, 2004
Lab ID:	L31635-1	L31635-2	L31635-3	L31635-4
Matrix:	SALTWTRSED	SALTWTRSED	SALTWTRSED	SALTWTRSED
% Solids:	50.4	77.9	87.2	79.9

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis			
COMBINED LABS																				
Hexachlorobenzene		<MDL	1.3	2.64	ug/Kg		<MDL	0.85	1.71	ug/Kg		<MDL	0.76	1.53	ug/Kg		<MDL	0.83	1.66	ug/Kg
Hexachlorobutadiene		<MDL,G	1.5	2.98	ug/Kg		<MDL,G	0.96	1.93	ug/Kg		<MDL,G	0.86	1.72	ug/Kg		<MDL,G	0.94	1.88	ug/Kg
Hexachlorocyclopentadiene		<MDL,G	54	264	ug/Kg		<MDL,G	35	171	ug/Kg		<MDL,G	31	153	ug/Kg		<MDL,G	34	166	ug/Kg
Hexachloroethane		<MDL,G	30	59.5	ug/Kg		<MDL,G	19	38.5	ug/Kg		<MDL,G	17	34.4	ug/Kg		<MDL,G	19	37.5	ug/Kg
Indeno(1,2,3-Cd)Pyrene	57.7	G	18	35.7	ug/Kg		<MDL,G	12	23.1	ug/Kg		<MDL,G	10	20.6	ug/Kg		<MDL,G	11	22.5	ug/Kg
Isophorone		<MDL,G	38	75.4	ug/Kg		<MDL,G	24	48.8	ug/Kg		<MDL,G	22	43.6	ug/Kg		<MDL,G	24	47.6	ug/Kg
Naphthalene		<MDL,G	28	55.6	ug/Kg		<MDL,G	18	35.9	ug/Kg		<MDL,G	16	32.1	ug/Kg		<MDL,G	18	35	ug/Kg
Nitrobenzene		<MDL,G	32	63.5	ug/Kg		<MDL,G	21	41.1	ug/Kg		<MDL,G	18	36.7	ug/Kg		<MDL,G	20	40.1	ug/Kg
N-Nitrosodimethylamine		<MDL,G	54	106	ug/Kg		<MDL,G	35	68.4	ug/Kg		<MDL,G	31	61.1	ug/Kg		<MDL,G	34	66.7	ug/Kg
N-Nitrosodi-N-Propylamine		<MDL	18	35.7	ug/Kg		<MDL	12	23.1	ug/Kg		<MDL	10	20.6	ug/Kg		<MDL	11	22.5	ug/Kg
N-Nitrosodiphenylamine		<MDL,G	12	79.4	ug/Kg		<MDL,G	7.7	51.3	ug/Kg		<MDL,G	6.9	45.9	ug/Kg		<MDL,G	7.5	50.1	ug/Kg
Pentachlorophenol		<MDL	9.9	19.8	ug/Kg		<MDL,G	6.4	12.8	ug/Kg		<MDL	5.7	11.5	ug/Kg		<MDL,G	6.3	12.5	ug/Kg
Phenanthrene	99	G	7.9	15.9	ug/Kg	9.1	<RDL,G	5.1	10.3	ug/Kg		<MDL,G	4.6	9.17	ug/Kg		<MDL,G	5	10	ug/Kg
Phenol		<MDL,G	18	35.7	ug/Kg		<MDL,G	12	23.1	ug/Kg		<MDL,G	10	20.6	ug/Kg		<MDL,G	11	22.5	ug/Kg
Pyrene	177	G,E	7.9	15.9	ug/Kg	15.1	G,E	5.1	10.3	ug/Kg	9.51	G,E	4.6	9.17	ug/Kg	7.3	<RDL,G,E	5	10	ug/Kg
Pyridine		<MDL,X	54	106	ug/Kg		<MDL,X	35	68.4	ug/Kg		<MDL,X	31	61.1	ug/Kg		<MDL,X	34	66.7	ug/Kg
M=OR EPA 8081A/8082 (7-3-03-002)																				
Aroclor 1016		<MDL	4	7.94	ug/Kg		<MDL	2.6	5.13	ug/Kg		<MDL	2.3	4.59	ug/Kg		<MDL	2.5	5.01	ug/Kg
Aroclor 1221		<MDL	7.9	15.9	ug/Kg		<MDL	5.1	10.3	ug/Kg		<MDL	4.6	9.17	ug/Kg		<MDL	5	10	ug/Kg
Aroclor 1232		<MDL	7.9	15.9	ug/Kg		<MDL	5.1	10.3	ug/Kg		<MDL	4.6	9.17	ug/Kg		<MDL	5	10	ug/Kg
Aroclor 1242		<MDL	4	7.94	ug/Kg		<MDL	2.6	5.13	ug/Kg		<MDL	2.3	4.59	ug/Kg		<MDL	2.5	5.01	ug/Kg
Aroclor 1248	99.2		4	7.94	ug/Kg	313		2.6	5.13	ug/Kg		<MDL	2.3	4.59	ug/Kg		<MDL	2.5	5.01	ug/Kg
Aroclor 1254	57.5	L	4	7.94	ug/Kg	160	L	2.6	5.13	ug/Kg		<MDL,L	2.3	4.59	ug/Kg		<MDL,L	2.5	5.01	ug/Kg
Aroclor 1260		<MDL	4	7.94	ug/Kg		<MDL	2.6	5.13	ug/Kg		<MDL	2.3	4.59	ug/Kg		<MDL	2.5	5.01	ug/Kg

* Not converted to dry weight basis for this parameter

King County Environmental Lab Analytical Report

Norfolk CSO Sediment Remediation
Five-Year Monitoring Program
Year Five Sampling Event
April 2004

Locator:	NFK503	NFK503	NFK504	NFK504
Descrip:	Boeing SD Channel	Boeing SD Channel	Upriver Reference	Upriver Reference
Stratum:	0 to 2 cm	0 to 10 cm	0 to 2 cm	0 to 10 cm
Sampled:	Apr 05, 2004	Apr 05, 2004	Apr 05, 2004	Apr 05, 2004
Lab ID:	L31635-5	L31635-6	L31635-7	L31635-8
Matrix:	SALTWTRSED	SALTWTRSED	SALTWTRSED	SALTWTRSED
% Solids:	48.2	48.7	50.8	74.9

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
	- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis				
COMBINED LABS																				
M=CV ASTM D422(03-02-005-001)																				
Gravel *		<MDL,E	0.1	1	%	0.4	<RDL,E	0.1	1	%	1	RDL,E	0.1	1	%	0.6	<RDL,E	0.1	1	%
Sand *	43.2		0.1	1	%	40.3		0.1	1	%	48.3		0.1	1	%	90.3		0.1	1	%
Silt *	37.5		0.5	1	%	43.1		0.5	1	%	36.8		0.5	1	%	5		0.5	1	%
Clay *	13.5		0.5	1	%	13.7		0.5	1	%	11.2		0.5	1	%	5		0.5	1	%
p+0.00 *	0.2	<RDL	0.1	1	%	1	RDL	0.1	1	%	4		0.1	1	%	5		0.1	1	%
p+1.00 *	0.5	<RDL	0.1	1	%	3		0.1	1	%	11.4		0.1	1	%	37.7		0.1	1	%
p+10.0(equal/more than) *	10.4		0.5	1	%	10.5		0.5	1	%	5		0.5	1	%	5		0.5	1	%
p+2.00 *	0.8	<RDL	0.1	1	%	6		0.1	1	%	11.8		0.1	1	%	42.2		0.1	1	%
p+3.00 *	11.2		0.1	1	%	6		0.1	1	%	8		0.1	1	%	3		0.1	1	%
p+4.00 *	30.7		0.1	1	%	23.7		0.1	1	%	13.7		0.1	1	%	2		0.1	1	%
p+5.00 *	19.8		0.5	1	%	21		0.5	1	%	17.4		0.5	1	%	3		0.5	1	%
p+6.00 *	6		0.5	1	%	8		0.5	1	%	8		0.5	1	%	1	RDL	0.5	1	%
p+7.00 *	8		0.5	1	%	6		0.5	1	%	5		0.5	1	%	1	RDL	0.5	1	%
p+8.00 *	3		0.5	1	%	7		0.5	1	%	6		0.5	1	%		<MDL	0.5	1	%
p+9.00 *	3		0.5	1	%	3		0.5	1	%	6		0.5	1	%		<MDL	0.5	1	%
p-1.00 *		<MDL	0.1	1	%	0.3	<RDL	0.1	1	%	0.6	<RDL	0.1	1	%	0.6	<RDL	0.1	1	%
p-2.00 *		<MDL	0.1	1	%		<MDL	0.1	1	%		<MDL	0.1	1	%		<MDL	0.1	1	%
p-2.00(less than) *		<MDL	0.1	1	%		<MDL	0.1	1	%	0.6	<RDL	0.1	1	%		<MDL	0.1	1	%
M=CV EPA9060-PSEP96 (03-04-002-002)																				
Total Organic Carbon	24100		1600	3200	mg/Kg	25900		1600	3200	mg/Kg	18900		1600	3270	mg/Kg	2940		490	988	mg/Kg
M=CV SM2540-G (03-01-007-002)																				
Total Solids *	48.2		0.005	0.01	%	48.7		0.005	0.01	%	50.8		0.005	0.01	%	74.9		0.005	0.01	%
M=ES NONE																				
Sampcoordx1 *	1278543				ft	1278543				ft	1278625				ft	1278625				ft
Sampcoordx2 *	1278542				ft	1278542				ft	1278628				ft	1278628				ft
Sampcoordx3 *																				
Sampcoordy1 *	190197				ft	190197				ft	190078				ft	190078				ft
Sampcoordy2 *	190191				ft	190191				ft	190080				ft	190080				ft
Sampcoordy3 *																				
Sample Depth *	1				m	1				m	1				m	1				m
Sample Start Time *	1030				hr	1030				hr	1130				hr	1130				hr
Sediment Sampling Depth *	12				cm	12				cm	17				cm	15				cm
Sediment Sampling Range *	0 - 2 cm				cm	0 - 10 cm				cm	0 - 2 cm				cm	0 - 10 cm				cm
Tidal Condition	E				none	E				none	S				none	S				none
Tide Height *	3				ft	3				ft	1.1				ft	1.1				ft

King County Environmental Lab Analytical Report

Norfolk CSO Sediment Remediation
Five-Year Monitoring Program
Year Five Sampling Event
April 2004

Locator:	NFK503					NFK503					NFK504					NFK504				
Descrip:	Boeing SD Channel					Boeing SD Channel					Upriver Reference					Upriver Reference				
Stratum:	0 to 2 cm					0 to 10 cm					0 to 2 cm					0 to 10 cm				
Sampled:	Apr 05, 2004					Apr 05, 2004					Apr 05, 2004					Apr 05, 2004				
Lab ID:	L31635-5					L31635-6					L31635-7					L31635-8				
Matrix:	SALTWTRSED					SALTWTRSED					SALTWTRSED					SALTWTRSED				
% Solids:	48.2					48.7					50.8					74.9				
Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis			
COMBINED LABS																				
M=MT EPA245.5/245.2 (06-01-004-003)																				
Mercury, Total, CVAA	0.064	<RDL	0.041	0.409	mg/Kg	0.23	<RDL	0.041	0.411	mg/Kg	0.069	<RDL	0.037	0.38	mg/Kg		<MDL	0.027	0.268	mg/Kg
M=MT EPA3050A/6010B (06-02-004-002)																				
Aluminum, Total, ICP	17600	L	11	52.5	mg/Kg	17900	L	10	52.2	mg/Kg	13600	L	9.6	48.6	mg/Kg	8880	L	6.7	33.5	mg/Kg
Arsenic, Total, ICP		<MDL	5.2	26.1	mg/Kg		<MDL	5.1	26.1	mg/Kg	5.9	<RDL	4.9	24.2	mg/Kg		<MDL	3.3	16.8	mg/Kg
Beryllium, Total, ICP	0.44	<RDL	0.11	0.525	mg/Kg	0.45	<RDL	0.1	0.522	mg/Kg	0.33	<RDL	0.096	0.486	mg/Kg	0.21	<RDL	0.067	0.335	mg/Kg
Cadmium, Total, ICP	0.33	<RDL	0.31	1.57	mg/Kg	0.37	<RDL	0.31	1.56	mg/Kg		<MDL	0.3	1.46	mg/Kg		<MDL	0.2	1.01	mg/Kg
Chromium, Total, ICP	21.6		0.52	2.61	mg/Kg	22.4		0.51	2.61	mg/Kg	19.4		0.49	2.42	mg/Kg	12.1		0.33	1.68	mg/Kg
Copper, Total, ICP	30.5		0.41	2.1	mg/Kg	33.3		0.41	2.09	mg/Kg	28.3		0.39	1.94	mg/Kg	12.4		0.27	1.35	mg/Kg
Iron, Total, ICP	28200		5.2	26.1	mg/Kg	30000		5.1	26.1	mg/Kg	28300		4.9	24.2	mg/Kg	20600		3.3	16.8	mg/Kg
Lead, Total, ICP	13	<RDL	3.1	15.7	mg/Kg	16.3		3.1	15.6	mg/Kg	15.7		3	14.6	mg/Kg	6	<RDL	2	10.1	mg/Kg
Manganese, Total, ICP	786		0.21	1.05	mg/Kg	485		0.21	1.04	mg/Kg	406		0.19	0.97	mg/Kg	244		0.13	0.672	mg/Kg
Nickel, Total, ICP	19.1		2.1	10.5	mg/Kg	18.8		2.1	10.4	mg/Kg	15.2		1.9	9.7	mg/Kg	11.4		1.3	6.72	mg/Kg
Selenium, Total, ICP		<MDL	5.2	26.1	mg/Kg		<MDL	5.1	26.1	mg/Kg		<MDL	4.9	24.2	mg/Kg		<MDL	3.3	16.8	mg/Kg
Silver, Total, ICP	0.98	<RDL,L	0.41	2.1	mg/Kg	0.8	<RDL,L	0.41	2.09	mg/Kg	0.87	<RDL,L	0.39	1.94	mg/Kg	0.57	<RDL,L	0.27	1.35	mg/Kg
Thallium, Total, ICP		<MDL	21	105	mg/Kg		<MDL	21	104	mg/Kg		<MDL	19	97	mg/Kg	13	<RDL	13	67.2	mg/Kg
Zinc, Total, ICP	78.4		0.52	2.61	mg/Kg	92		0.51	2.61	mg/Kg	78		0.49	2.42	mg/Kg	45.4		0.33	1.68	mg/Kg
M=OR EPA 3550B/8270C (7-3-01-004)																				
1,2,4-Trichlorobenzene		<MDL,G	0.54	1.1	ug/Kg		<MDL,G	0.53	1.09	ug/Kg		<MDL,G	0.51	1.04	ug/Kg		<MDL,G	0.35	0.708	ug/Kg
1,2-Dichlorobenzene		<MDL,G	0.54	1.1	ug/Kg		<MDL,G	0.53	1.09	ug/Kg		<MDL,G	0.51	1.04	ug/Kg		<MDL,G	0.35	0.708	ug/Kg
1,2-Diphenylhydrazine		<MDL	21	41.5	ug/Kg		<MDL	21	41.1	ug/Kg		<MDL	20	39.4	ug/Kg		<MDL	13	26.7	ug/Kg
1,3-Dichlorobenzene		<MDL,G	0.54	1.1	ug/Kg		<MDL,G	0.53	1.09	ug/Kg		<MDL,G	0.51	1.04	ug/Kg		<MDL,G	0.35	0.708	ug/Kg
1,4-Dichlorobenzene		<MDL,G	0.27	0.548	ug/Kg		<MDL,G	0.27	0.542	ug/Kg		<MDL,G	0.26	0.52	ug/Kg		<MDL,G	0.17	0.352	ug/Kg
2,4,5-Trichlorophenol		<MDL	25	49.8	ug/Kg		<MDL	25	49.3	ug/Kg		<MDL	24	47.2	ug/Kg		<MDL	16	32	ug/Kg
2,4,6-Trichlorophenol		<MDL	27	53.9	ug/Kg		<MDL	27	53.4	ug/Kg		<MDL	26	51.2	ug/Kg		<MDL	17	34.7	ug/Kg
2,4-Dichlorophenol		<MDL,G	33	66.4	ug/Kg		<MDL,G	33	65.7	ug/Kg		<MDL,G	31	63	ug/Kg		<MDL,G	21	42.7	ug/Kg
2,4-Dimethylphenol		<MDL,X	15	29	ug/Kg		<MDL,X	14	28.7	ug/Kg		<MDL,X	14	27.6	ug/Kg		<MDL,X	9.3	18.7	ug/Kg
2,4-Dinitrophenol		<MDL,G	27	55.4	ug/Kg		<MDL,G	27	54.8	ug/Kg		<MDL,G	26	52.6	ug/Kg		<MDL,G	17	35.6	ug/Kg
2,4-Dinitrotoluene		<MDL	6.2	12.4	ug/Kg		<MDL	6.2	12.3	ug/Kg		<MDL	5.9	11.8	ug/Kg		<MDL	4	8.01	ug/Kg
2,6-Dinitrotoluene		<MDL	21	41.5	ug/Kg		<MDL	21	41.1	ug/Kg		<MDL	20	39.4	ug/Kg		<MDL	13	26.7	ug/Kg
2-Chloronaphthalene		<MDL	33	66.4	ug/Kg		<MDL	33	65.7	ug/Kg		<MDL	31	63	ug/Kg		<MDL	21	42.7	ug/Kg
2-Chlorophenol		<MDL,G	17	33.2	ug/Kg		<MDL,G	16	32.9	ug/Kg		<MDL,G	16	31.5	ug/Kg		<MDL,G	11	21.4	ug/Kg
2-Methylnaphthalene		<MDL,G	29	58.1	ug/Kg		<MDL,G	29	57.5	ug/Kg	45	<RDL,G	28	55.1	ug/Kg		<MDL,G	19	37.4	ug/Kg
2-Methylphenol		<MDL,G	33	78.8	ug/Kg		<MDL,G	33	78	ug/Kg		<MDL,G	31	74.8	ug/Kg		<MDL,G	21	50.7	ug/Kg
2-Nitroaniline		<MDL	27	55.4	ug/Kg		<MDL	27	54.8	ug/Kg		<MDL	26	52.6	ug/Kg		<MDL	17	35.6	ug/Kg
2-Nitrophenol		<MDL,G	31	62.2	ug/Kg		<MDL,G	31	61.6	ug/Kg		<MDL,G	30	59.1	ug/Kg		<MDL,G	20	40.1	ug/Kg
3,3'-Dichlorobenzidine		<MDL,X	27	55.4	ug/Kg		<MDL,X	27	54.8	ug/Kg		<MDL,X	26	52.6	ug/Kg		<MDL,X	17	35.6	ug/Kg

King County Environmental Lab Analytical Report

Norfolk CSO Sediment Remediation
Five-Year Monitoring Program
Year Five Sampling Event
April 2004

Locator:	NFK503					NFK503					NFK504					NFK504				
Descrip:	Boeing SD Channel					Boeing SD Channel					Upriver Reference					Upriver Reference				
Stratum:	0 to 2 cm					0 to 10 cm					0 to 2 cm					0 to 10 cm				
Sampled:	Apr 05, 2004					Apr 05, 2004					Apr 05, 2004					Apr 05, 2004				
Lab ID:	L31635-5					L31635-6					L31635-7					L31635-8				
Matrix:	SALTWTRSED					SALTWTRSED					SALTWTRSED					SALTWTRSED				
% Solids:	48.2					48.7					50.8					74.9				
Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis			
COMBINED LABS																				
3-Nitroaniline		<MDL,X	27	55.4	ug/Kg		<MDL,X	27	54.8	ug/Kg		<MDL,X	26	52.6	ug/Kg		<MDL,X	17	35.6	ug/Kg
4,6-Dinitro-O-Cresol		<MDL,G	27	55.4	ug/Kg		<MDL,G	27	54.8	ug/Kg		<MDL,G	26	52.6	ug/Kg		<MDL,G	17	35.6	ug/Kg
4-Bromophenyl Phenyl Ether		<MDL	19	37.3	ug/Kg		<MDL	18	37	ug/Kg		<MDL	18	35.4	ug/Kg		<MDL	12	24	ug/Kg
4-Chloro-3-Methylphenol		<MDL	27	55.4	ug/Kg		<MDL	27	54.8	ug/Kg		<MDL	26	52.6	ug/Kg		<MDL	17	35.6	ug/Kg
4-Chloroaniline		<MDL,X	5.6	11.1	ug/Kg		<MDL,X	5.5	10.9	ug/Kg		<MDL,X	5.3	10.5	ug/Kg		<MDL,X	3.6	7.12	ug/Kg
4-Chlorophenyl Phenyl Ether		<MDL	27	53.9	ug/Kg		<MDL	27	53.4	ug/Kg		<MDL	26	51.2	ug/Kg		<MDL	17	34.7	ug/Kg
4-Methylphenol		<MDL,G	33	66.4	ug/Kg		<MDL,G	33	65.7	ug/Kg		<MDL,G	31	63	ug/Kg		<MDL,G	21	42.7	ug/Kg
4-Nitroaniline		<MDL,G	27	55.4	ug/Kg		<MDL,G	27	54.8	ug/Kg		<MDL,G	26	52.6	ug/Kg		<MDL,G	17	35.6	ug/Kg
4-Nitrophenol		<MDL	27	55.4	ug/Kg		<MDL	27	54.8	ug/Kg		<MDL	26	52.6	ug/Kg		<MDL	17	35.6	ug/Kg
Acenaphthene		<MDL	15	29	ug/Kg		<MDL	14	28.7	ug/Kg	111		14	27.6	ug/Kg		<MDL	9.3	18.7	ug/Kg
Acenaphthylene		<MDL	31	62.2	ug/Kg		<MDL	31	61.6	ug/Kg		<MDL	30	59.1	ug/Kg		<MDL	20	40.1	ug/Kg
Aniline		<MDL,X	270	554	ug/Kg		<MDL,X	270	548	ug/Kg		<MDL,X	260	526	ug/Kg		<MDL,X	170	356	ug/Kg
Anthracene	11	<RDL,G	8.3	16.6	ug/Kg	14	<RDL,G	8.2	16.4	ug/Kg	97.2	G	7.9	15.7	ug/Kg		<MDL,G	5.3	10.7	ug/Kg
Benzo(a)anthracene	53.5	E	4.1	8.3	ug/Kg	75.4	E	4.1	8.21	ug/Kg	175	E	3.9	7.87	ug/Kg	10.2	E	2.7	5.34	ug/Kg
Benzo(a)pyrene	56.6	G,E	6.2	12.4	ug/Kg	91.6	G,E	6.2	12.3	ug/Kg	161	G,E	5.9	11.8	ug/Kg	13.1	G,E	4	8.01	ug/Kg
Benzo(b)fluoranthene	68.7		6.2	12.4	ug/Kg	107		6.2	12.3	ug/Kg	392		5.9	11.8	ug/Kg	12.3		4	8.01	ug/Kg
Benzo(g,h,i)perylene	37.8		17	33.2	ug/Kg	73.3		16	32.9	ug/Kg	110		16	31.5	ug/Kg		<MDL	11	21.4	ug/Kg
Benzo(k)fluoranthene	59.3	E	6.2	12.4	ug/Kg	101	E	6.2	12.3	ug/Kg	417	E	5.9	11.8	ug/Kg	10.1	E	4	8.01	ug/Kg
Benzoic Acid	146	B	27	138	ug/Kg	152	B	27	137	ug/Kg	130	<RDL,B	26	131	ug/Kg	56	<RDL,B	17	89.1	ug/Kg
Benzyl Alcohol		<MDL,G	12	24.9	ug/Kg		<MDL,G	12	24.6	ug/Kg		<MDL,G	12	23.6	ug/Kg		<MDL,G	8	16	ug/Kg
Benzyl Butyl Phthalate	26.8		12	24.9	ug/Kg	27.9		12	24.6	ug/Kg	29.3		12	23.6	ug/Kg	10	<RDL	8	16	ug/Kg
Bis(2-Chloroethoxy)Methane		<MDL,G	35	70.5	ug/Kg		<MDL,G	35	69.8	ug/Kg		<MDL,G	33	66.9	ug/Kg		<MDL,G	23	45.4	ug/Kg
Bis(2-Chloroethyl)Ether		<MDL,G	31	62.2	ug/Kg		<MDL,G	31	61.6	ug/Kg		<MDL,G	30	59.1	ug/Kg		<MDL,G	20	40.1	ug/Kg
Bis(2-Chloroisopropyl)Ether		<MDL,G	31	62.2	ug/Kg		<MDL,G	31	61.6	ug/Kg		<MDL,G	30	59.1	ug/Kg		<MDL,G	20	40.1	ug/Kg
Bis(2-Ethylhexyl)Phthalate	342	B	14	29	ug/Kg	626	B	14	28.7	ug/Kg	224	B	13	27.6	ug/Kg	39	B	8.9	18.7	ug/Kg
Caffeine		<MDL	12	24.9	ug/Kg		<MDL	12	24.6	ug/Kg		<MDL	12	23.6	ug/Kg		<MDL	8	16	ug/Kg
Carbazole		<MDL	15	29	ug/Kg		<MDL	14	28.7	ug/Kg	108		14	27.6	ug/Kg		<MDL	9.3	18.7	ug/Kg
Chrysene	83	E	8.3	16.6	ug/Kg	113	E	8.2	16.4	ug/Kg	648	E	7.9	15.7	ug/Kg	15.4	E	5.3	10.7	ug/Kg
Coprostanol		<MDL	29	58.1	ug/Kg		<MDL	29	57.5	ug/Kg		<MDL	28	55.1	ug/Kg		<MDL	19	37.4	ug/Kg
Dibenzo(a,h)anthracene		<MDL	15	29	ug/Kg		<MDL	14	28.7	ug/Kg	24	<RDL	14	27.6	ug/Kg		<MDL	9.3	18.7	ug/Kg
Dibenzofuran		<MDL	29	58.1	ug/Kg		<MDL	29	57.5	ug/Kg	113		28	55.1	ug/Kg		<MDL	19	37.4	ug/Kg
Diethyl Phthalate		<MDL	12	24.9	ug/Kg		<MDL	12	24.6	ug/Kg		<MDL	12	23.6	ug/Kg		<MDL	8	16	ug/Kg
Dimethyl Phthalate		<MDL	12	45.6	ug/Kg		<MDL	12	45.2	ug/Kg		<MDL	12	43.3	ug/Kg		<MDL	8	29.4	ug/Kg
Di-N-Butyl Phthalate		<MDL	10	20.7	ug/Kg		<MDL	10	20.5	ug/Kg		<MDL	9.8	19.7	ug/Kg		<MDL	6.7	13.4	ug/Kg
Di-N-Octyl Phthalate		<MDL	17	33.2	ug/Kg		<MDL	16	32.9	ug/Kg		<MDL	16	31.5	ug/Kg		<MDL	11	21.4	ug/Kg
Fluoranthene	137		17	33.2	ug/Kg	226		16	32.9	ug/Kg	5200		16	31.5	ug/Kg	26.2		11	21.4	ug/Kg
Fluorene		<MDL	27	53.9	ug/Kg		<MDL	27	53.4	ug/Kg		<MDL	26	51.2	ug/Kg		<MDL	17	34.7	ug/Kg

King County Environmental Lab Analytical Report

Norfolk CSO Sediment Remediation
Five-Year Monitoring Program
Year Five Sampling Event
April 2004

Locator:	NFK503	NFK503	NFK504	NFK504
Descrip:	Boeing SD Channel	Boeing SD Channel	Upriver Reference	Upriver Reference
Stratum:	0 to 2 cm	0 to 10 cm	0 to 2 cm	0 to 10 cm
Sampled:	Apr 05, 2004	Apr 05, 2004	Apr 05, 2004	Apr 05, 2004
Lab ID:	L31635-5	L31635-6	L31635-7	L31635-8
Matrix:	SALTWTRSED	SALTWTRSED	SALTWTRSED	SALTWTRSED
% Solids:	48.2	48.7	50.8	74.9

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis			
COMBINED LABS																				
Hexachlorobenzene		<MDL	1.4	2.76	ug/Kg		<MDL	1.4	2.73	ug/Kg		<MDL	1.3	2.62	ug/Kg		<MDL	0.88	1.78	ug/Kg
Hexachlorobutadiene		<MDL,G	1.6	3.11	ug/Kg		<MDL,G	1.5	3.08	ug/Kg		<MDL,G	1.5	2.95	ug/Kg		<MDL,G	1	2	ug/Kg
Hexachlorocyclopentadiene		<MDL,G	56	276	ug/Kg		<MDL,G	55	273	ug/Kg		<MDL,G	53	262	ug/Kg		<MDL,G	36	178	ug/Kg
Hexachloroethane		<MDL,G	31	62.2	ug/Kg		<MDL,G	31	61.6	ug/Kg		<MDL,G	30	59.1	ug/Kg		<MDL,G	20	40.1	ug/Kg
Indeno(1,2,3-Cd)Pyrene	27	<RDL,G	19	37.3	ug/Kg	54.6	G	18	37	ug/Kg	105	G	18	35.4	ug/Kg		<MDL,G	12	24	ug/Kg
Isophorone		<MDL,G	39	78.8	ug/Kg		<MDL,G	39	78	ug/Kg		<MDL,G	37	74.8	ug/Kg		<MDL,G	25	50.7	ug/Kg
Naphthalene		<MDL,G	29	58.1	ug/Kg		<MDL,G	29	57.5	ug/Kg	30	<RDL,G	28	55.1	ug/Kg		<MDL,G	19	37.4	ug/Kg
Nitrobenzene		<MDL,G	33	66.4	ug/Kg		<MDL,G	33	65.7	ug/Kg		<MDL,G	31	63	ug/Kg		<MDL,G	21	42.7	ug/Kg
N-Nitrosodimethylamine		<MDL,G	56	111	ug/Kg		<MDL,G	55	109	ug/Kg		<MDL,G	53	105	ug/Kg		<MDL,G	36	71.2	ug/Kg
N-Nitrosodi-N-Propylamine		<MDL	19	37.3	ug/Kg		<MDL	18	37	ug/Kg		<MDL	18	35.4	ug/Kg		<MDL	12	24	ug/Kg
N-Nitrosodiphenylamine		<MDL,G	12	83	ug/Kg		<MDL,G	12	82.1	ug/Kg		<MDL,G	12	78.7	ug/Kg		<MDL,G	8	53.4	ug/Kg
Pentachlorophenol		<MDL	10	20.7	ug/Kg		<MDL	10	20.5	ug/Kg		<MDL	9.8	19.7	ug/Kg		<MDL	6.7	13.4	ug/Kg
Phenanthrene	53.7	G	8.3	16.6	ug/Kg	83	G	8.2	16.4	ug/Kg	2870	G	7.9	15.7	ug/Kg	10	<RDL,G	5.3	10.7	ug/Kg
Phenol		<MDL,G	19	37.3	ug/Kg		<MDL,G	18	37	ug/Kg		<MDL,G	18	35.4	ug/Kg		<MDL,G	12	24	ug/Kg
Pyrene	122	G,E	8.3	16.6	ug/Kg	182	G,E	8.2	16.4	ug/Kg	2800	G,E	7.9	15.7	ug/Kg	22.4	G,E	5.3	10.7	ug/Kg
Pyridine		<MDL,X	56	111	ug/Kg		<MDL,X	55	109	ug/Kg		<MDL,X	53	105	ug/Kg		<MDL,X	36	71.2	ug/Kg
M=OR EPA 8081A/8082 (7-3-03-002)																				
Aroclor 1016		<MDL	4.1	8.3	ug/Kg		<MDL	4.1	8.21	ug/Kg		<MDL	3.9	7.87	ug/Kg		<MDL	2.7	5.34	ug/Kg
Aroclor 1221		<MDL	8.3	16.6	ug/Kg		<MDL	8.2	16.4	ug/Kg		<MDL	7.9	15.7	ug/Kg		<MDL	5.3	10.7	ug/Kg
Aroclor 1232		<MDL	8.3	16.6	ug/Kg		<MDL	8.2	16.4	ug/Kg		<MDL	7.9	15.7	ug/Kg		<MDL	5.3	10.7	ug/Kg
Aroclor 1242		<MDL	4.1	8.3	ug/Kg		<MDL	4.1	8.21	ug/Kg		<MDL	3.9	7.87	ug/Kg		<MDL	2.7	5.34	ug/Kg
Aroclor 1248	83.8		4.1	8.3	ug/Kg	333		4.1	8.21	ug/Kg	39.8		3.9	7.87	ug/Kg		<MDL	2.7	5.34	ug/Kg
Aroclor 1254	41.1	L	4.1	8.3	ug/Kg	141	L	4.1	8.21	ug/Kg	44.5	L	3.9	7.87	ug/Kg		<MDL,L	2.7	5.34	ug/Kg
Aroclor 1260		<MDL	4.1	8.3	ug/Kg		<MDL	4.1	8.21	ug/Kg		<MDL	3.9	7.87	ug/Kg		<MDL	2.7	5.34	ug/Kg

* Not converted to dry weight basis for this parameter

APPENDIX B
QUALITY ASSURANCE REVIEW

KING COUNTY ENVIRONMENTAL LABORATORY
QUALITY ASSURANCE REVIEW

for

ESTUARINE SEDIMENT ANALYTICAL DATA

NORFOLK CSO SEDIMENT REMEDIATION PROJECT
FIVE-YEAR MONITORING PROGRAM
APRIL 2004 SAMPLING EVENT

Prepared by:

Fritz Grothkopp
Laboratory Project Manager
Environmental Laboratory Section

Reviewed by:

Colin Elliot
Quality Assurance Officer
Environmental Laboratory Section

July 2004

King County Environmental Laboratory
322 West Ewing Street
Seattle, Washington 98119-1507
(206) 684-2300

INTRODUCTION

This quality assurance (QA) narrative is intended to document the QA review conducted on the chemistry analyses performed for the Norfolk CSO Sediment Remediation Study. The QA narrative is organized into the five sections listed below.

- General Comments
- Sample Collection
- Conventional Analyses
- Metal Chemistry
- Organic Chemistry

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

This QA review and narrative (specifically defined as QA1) have been conducted in accordance with guidelines established through the Puget Sound Dredged Disposal Analysis (PSDDA) program and the Sediment Management Standards (WAC 173-204-610). Other approaches incorporated in the QA review have been established through collaboration between the King County Environmental Laboratory (KC Laboratory) and the Washington State Department of Ecology (Ecology) Sediment Management Unit.

GENERAL COMMENTS

Scope of Samples Submitted
This QA review is associated with estuarine sediment samples collected in April 5, 2004 as part of the Norfolk CSO Sediment Remediation Study.

Except where noted in the subcontracting sections of this QA review, all analyses have been conducted by the King County Environmental Laboratory (KCEL). Sediment analytical data are reported with associated data qualifiers and have undergone QA1 review, as summarized in this narrative report.

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

- Comparing reported data to the planned project analyses summarized in Table 1.
- Compliance with storage conditions and holding times.
- Frequency of analysis of the complete set of quality control (QC) samples outlined in Table 2.

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

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

Target Lists
The reported target lists have been compared to the target analytes listed in *Table 1 - Marine Sediment Quality Standards Chemical Criteria* and *Table 3 - Puget Sound Marine Sediment Cleanup Screening Levels Chemical Criteria* contained in Chapter 173-204 WAC.

Detection Limits
The KC Laboratory distinguishes between the reporting detection limit (RDL) and the method detection limit (MDL).

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

Some subcontracted laboratory data are available with an MDL only, in accordance with the subcontracting laboratory policies. All analytical parameters are reported with detection limit(s). For some methods the detection limits reported may vary from sample to sample depending on the amount of sample analyzed and any additional dilutions required.

Storage Conditions and Holding Times
Storage conditions and holding times have been evaluated using guidelines established during the Third Annual PSDDA Review Meeting. The approach used to evaluate Total Organic Carbon for holding time has been established between the KC Laboratory and Ecology during previous QA1 review efforts. Extraction and analysis holding times for each method are summarized in each analytical section.

Method Blanks
Method blank results have been used to evaluate the possible laboratory contamination of samples. Method blank results have been reviewed for the presence of analytes detected at or greater than the MDL.

Standard Reference Materials
Standard reference material (SRM) recoveries have been used to evaluate possible low or high analytical bias on a batch-specific basis. SRM analysis is included with metals and selected organic and conventional parameters (see Table 2). SRMs are purchased from the National Institute of Standards and Technology (NIST) or National Research Council of Canada (NRCC) and have certified analyte values. Lab Control Samples (or spiked blanks) may also be analyzed by the analytical laboratory as part of overall quality control but the results are not used to qualify the sample data.

Matrix Spikes
Matrix spike recoveries have been used to evaluate possible low or high analytical bias on a matrix and batch-specific basis. Matrix spikes are analyzed with metals, organics and selected conventionals parameters (see Table 2).

Laboratory Replicate Samples
Replicate analysis (laboratory duplicates or triplicates) is used as an indicator of method precision and is used to qualify data on an analyte and batch-specific basis. Not all replicate data are used, however, as an indicator for data qualification. Only sets of replicate results which include at least one result greater than the RDL are considered for data qualification. These guidelines have been used to account for the fact that precision obtained near the detection limit is not representative of precision obtained throughout the entire analytical range.

Surrogates
Surrogate recoveries have been used to evaluate possible low or high analytical bias on a sample-specific basis. Surrogates are only analyzed for organic parameters.

Data Qualifiers
The data qualification system used for this data submission is presented in Table 3. These data qualifiers address situations that require qualification and generally conform to QA1 guidance. Changes made to SRM data qualification have been discussed with and approved by the Sediment Management Unit of Ecology. The qualifiers shown in Table 3 are also used for the SEDQUAL electronic data format (except for <MDL and <RDL).

Units and Significant Figures
Data have been reported in accordance with laboratory policy at the time of data generation. Data generally have been reported to three significant figures if above the RDL and two significant figures if equal to or below the RDL.

SAMPLE COLLECTION

This section describes sampling activities associated with the collection of 8 composite sediment samples on April 5, 2004. All sampling activities were conducted following guidance suggested in the Puget Sound Estuarine Protocols (PSEP, 1996 and 1998).

Sampling Locations and Station Positioning

Sampling locations (stations) were selected and the prescribed coordinates determined prior to field activities. Stations were selected to match the historical sampling locations for this on-going monitoring project. The prescribed station coordinates are presented in the following table. Also presented in the table are the actual coordinates recorded during sampling activities. All station coordinates are recorded in state plane coordinate system North American Datum 1983 (NAD83).

Lab Sample #	Station Name	Prescribed Northing	Field Northing	Prescribed Easting	Field Easting
L31635-1, -2	NFK501	190170	190170	1278584	1278587
			190173		1278591
			190164		1278589
L31635-3, -4	NFK502	190159	190154	1278514	1278513
			190158		1278516
	(Third cast not collected*)				
L31635-5, -6	NFK503	190195	190197	1278544	1278543
			190191		1278542
	(Third cast not collected*)				
L31635-7, -8	NFK504	190080	190078	1278625	1278625
			190080		1278628
	(Third cast not collected*)				

*Only two casts were made to supply the necessary sample material, as the sampling effort had to be expedited due to rapidly outgoing tidal conditions.

Sediment grab samples were collected from the King County research vessel *Chinook*, which is equipped with a differential global positioning system (DGPS). Field coordinates were recorded using DGPS for each acceptable deployment of the grab sampler as it contacted the sediment. Coordinates for each grab sampler deployment are included in the previous table.

The average coordinates for the sampler deployments are within 4 feet (1.2 meters) of the prescribed coordinates. The sampling coordinates at station NFK501 were up to 7 feet off in order to avoid river debris.

Lab Sample #	Locator	Sample Type	Sediment Depth Interval	Sample Usage
L31635-1	NFK501	Surface Grab	0 to 2 cm	Chemistry
L31635-2	NFK501	Surface Grab	0 to 10 cm	Chemistry
L31635-3	NFK502	Surface Grab	0 to 2 cm	Chemistry
L31635-4	NFK502	Surface Grab	0 to 10 cm	Chemistry
L31635-5	NFK503	Surface Grab	0 to 2 cm	Chemistry
L31635-6	NFK503	Surface Grab	0 to 10 cm	Chemistry
L31635-7	NFK504	Surface Grab	0 to 2 cm	Chemistry
L31635-8	NFK504	Surface Grab	0 to 10 cm	Chemistry

Sample Collection and Handling

Eight composite samples in total were collected April 5, 2004 from the Norfolk Sediment Cap Monitoring Project site using a stainless steel, modified, 0.1 m^2 dual Van Veen grab sampler deployed from the *Chinook* via hydrowire. For each deployment, a surface-to-2 cm sample was collected from one side of each grab, and a surface-to-10 cm sample was collected from the opposite side. Water depth at the four

stations ranged between 1 to 2 meters (not corrected for tide). The sediment penetration depths of the sampler ranged from 12 to 17 cm, with the average being 14.6 cm.

The top 2 cm samples were collected using a 200 cm^2 "cookie cutter" and stainless steel spatula. The 10 cm samples were collected using a stainless steel spoon. Both 2 cm and 10 cm aliquots were taken from each Van Veen cast by sampling each fraction (2 cm or 10 cm) from a different side of the Van Veen sampler. At each station, aliquots representing the two different sampling ranges were kept segregated through the use of two separate stainless-steel bowls, covered with foil between grab deployments. Once sufficient sample material had been collected at each station, each sample was then thoroughly homogenized in its respective bowl, prior to sample aliquots being transferred into pre-labeled containers. Sample containers were supplied by the King County Environmental Laboratory and were pre-cleaned according to analytical specifications.

Individual sets of pre-cleaned sample compositing equipment were dedicated to each station, precluding the need for decontamination of said equipment while in the field. The Van Veen grab sampler was decontaminated between stations by scrubbing with a brush and ambient water followed by a thorough *in situ* rinsing.

Samples were stored in ice-filled coolers from the time of collection until delivery to the King County Environmental Laboratory. Samples were delivered under chain-of-custody and were maintained as such throughout the analytical process. Samples were stored frozen (-18°C) by the laboratory until analysis with the exception of samples for particle size distribution (PSD) analysis. PSD samples were stored refrigerated at approximately 4°C. A more complete description of sample handling and storage can be found in each analytical chemistry section of this narrative.

CONVENTIONAL ANALYSES

Completeness
Conventional data are reported for all samples and parameters summarized in Table 1. These samples were analyzed in association with the complete set of QC samples outlined in Table 2.

Subcontracted Analyses
All analyses were performed at the King County Environmental Lab.

Methods
PSD analysis was performed in accordance with ASTM and Puget Sound Protocols methodologies (*Recommended Protocols for Measuring Conventional Sediment Variables in Puget Sound* - page 9 - PSEP, 1986). TOC analysis was performed in accordance with SM5310-B. Total solids analysis were performed in accordance with SM2540-B.

Detection Limits, Units and Significant Figures
For analyses performed at the KC Laboratory, data are reported in accordance with laboratory policy at the time the data were generated. Data are reported to three significant figures for results greater than the RDL and two significant figures for results equal to or less than the RDL. For results reported with less than two or three significant figures, significant zeroes are implied. This may not apply to subcontracted data.

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

Parameter	Sample #	Date Collected	Extract Date*	Date Analyzed	Sample Hold Time	Extract Hold Time
Particle Size Distribution	L31635-1 to -8	04/05/2004	NA	05/12/2004	6 mo. at 4°C	NA
Percent Solids	L31635-1 to -8	04/05/2004	NA	04/21/2004	6 mo. at -18°C	NA
Total Organic Carbon	L31635-1 to -8	04/05/2004	04/14/2004	04/23/2004	6 mo. at -18°C	6 mo. at -18°C

*Sample preparation start date for TOC

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

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

Standard Reference Materials
An SRM (Buffalo River Sediment) was analyzed in connection with TOC analysis. The percent recovery for the SRM analysis was within the 80 to 120% QC limits.

Matrix Spikes
Matrix spikes were analyzed for TOC. All results were within control limits.

Laboratory Replicate Samples
Laboratory triplicate samples were analyzed for all conventional parameters. The percent relative standard deviations (%RSD) for all triplicate analyses were less than or equal to the 20% QC limit with the exception of PSD.

The %RSD for the gravel portion of the PSD measurement is greater than 20%. These categories represent less than 10% of the total particle distribution of the sample. Higher variability is expected for categories that represent 10% of less of the total mass. The results have been flagged with an "E" qualifier.

METALS CHEMISTRY

Completeness
Metal chemistry data are reported for all samples and parameters summarized in Table 1. These samples were analyzed for mercury and other metals in association with the complete set of QC samples outlined in Table 2.

Subcontracted Analyses
Metals analysis was not subcontracted for this set of samples.

Methods
Mercury analysis was performed in accordance with EPA Method 245.5. Analysis for other metals was performed in accordance with EPA method 3050A/6010B.

Target List
The reported target list includes all metals specified in Table 1. Additional metals have been reported as available.

Detection Limits, Units and Significant Figures
For analyses performed at the KC Laboratory, data are reported in accordance with laboratory policy at the time the data were generated. Data are reported to three significant figures for results greater than the RDL and two significant figures for results equal to or less than the RDL. For results reported with less than two or three significant figures, significant zeroes are implied.

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

Parameter	Sample #	Date Collected	Date Digested	Date Analyzed	Sample Hold Time	Digestate Hold Time
Metals	L31635-1 through -8	04/05/2004	4/21/04	4/22/04	2 years/-18°C	6 months
Mercury	L31635-1, and -3 through -8	4/5/04	4/16/04	4/19/04	28 days/-18°C	N/A
	L31635-2	4/5/04	4/20/04	4/21/04		

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

Method Blanks
All metals method blanks results were less than the MDL

Standard Reference Materials
The SRM analyzed in association with samples included in this data submission is PACS-2. An SRM recovery less than the QC limit of 80% has not been used to qualify data because the digestion technique used for sample analysis is different from the technique used during analysis to determine the SRM values. Only SRM recoveries greater than 120% will be used to qualify data.

The reported SRM recovery of 173% for silver is greater than the 120% QC limit. Silver results for all samples in this data submission have been qualified with the *L* flag.

Matrix Spikes
All matrix spike recoveries were within the 75 to 125% QC limits with the following exception:

- The reported matrix spike recovery of 307% for aluminum is greater than the 125% QC limit. Aluminum results for all samples in this data submission have been qualified with the *L* flag.

Laboratory Replicate Samples

The relative percent differences (RPDs) for laboratory duplicate results for all metals were less than or equal to the QC limit of 20%.

ORGANIC CHEMISTRY

Completeness
Organics data are reported for all samples and parameters summarized in Table 1. These samples were analyzed in association with the complete set of QC samples outlined in Table 2.

Methods
BNA analysis was performed in accordance with EPA method 8270. PCB analysis was performed in accordance with EPA methods 8082.

Target List
The reported BNA target list includes all compounds specified in *Table 1 - Marine Sediment Quality Standards Chemical Criteria* and *Table 3 - Puget Sound Marine Sediment Cleanup Screening Levels Chemical Criteria* contained in Chapter 173-204 WAC with the exception of benzo(j)fluoranthene. The KC Laboratory has verified that analytical conditions are sufficient to calculate a total benzofluoranthene result using the reported *b* and *k* isomers. Reported PCB data include Aroclors 1016, 1221, 1232, 1242, 1248, 1254, and 1260.

Detection Limits, Units and Significant Figures
For analyses performed at the KC Laboratory, data are reported in accordance with laboratory policy at the time the data were generated. Data are reported to three significant figures for results greater than the RDL and two significant figures for results equal to or less than the RDL. For results reported with less than two or three significant figures, significant zeroes are implied.

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

Parameter	Sample #	Date Collected	Date Extracted	Date Analyzed	Sample Hold Time	Extract Hold Time
BNAs	L31635-1 to -8	04/05/2004	04/09/2004	21, 22, 26, 28-Apr-2004	1 year/-18°C	40 days/4°C
PCBs	L31635-1 to -8	04/05/2004	04/09/2004	20, 21-Apr-2004	1 year/ -18°C	40 days/4°C

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

Method Blanks
The method blank analyzed with BNAs for L31635 had results above the MDL for bis(2-ethylhexyl) phthalate and benzoic acid. Bis(2-ethylhexyl) phthalate and benzoic acid results for all associated samples have been qualified with the *B* flag. All bis(2-ethylhexyl) phthalate and benzoic acid results for these samples must be treated as estimated values. All PCB method blank results were less than the MDL.

Surrogate Recoveries
BNAs
BNA sample data are qualified when the average surrogate recovery for either or both the acid and base/neutral fractions are outside the 50 to 150% QC limits. All average surrogate recoveries (acid and base neutral) were within the acceptable recovery range for all surrogate compounds with the following exceptions.

- The average surrogate recovery of 48% for the acid fraction of sample L31635-2 was less than the lower QC control limit and, as a result, all acid fraction compounds for this sample have been qualified with the *G* flag.

- The average surrogate recovery of 43% for the acid fraction of sample L31635-4 was less than the lower QC control limit and, as a result, all acid fraction compounds for this sample have been qualified with the G flag.

PCBs
PCB sample data are qualified when both surrogate recoveries are outside QC limits. At least one PCB surrogate recovery was within the 50 to 150% QC limits for all samples in this data submission.

Standard Reference Materials
BNAs
The sediment SRM analyzed in association with the reported BNA results is SRM 1944a, certified by the National Institute of Standards and Technology (NIST). Only a partial list of BNA parameters have certified values in SRM 1944a and therefore only those are used to qualify the data. Results for this partial list of compounds for the one batch of samples have been qualified based on the SRM recoveries outside the 80 to 120% QC limits. The recoveries and flags are summarized in the following table.

Compound	% Recovery	Flag
Naphthalene	13	G
Phenanthrene	70	G
Anthracene	46	G
Fluoranthene	80	
Pyrene	74	G
Benzo(a)anthracene	82	
Chrysene	87	
Benzo(b)fluoranthene	86	
Benzo(k)fluoranthene	113	
Benzo(a)pyrene	72	G
Indeno(1,2,3-c,d)pyrene	75	G
Dibenzo(a,h)anthracene	114	
Benzo(g,h,i)perylene	83	

PCBs
The sediment SRM analyzed in association with the reported PCB results is HS-2, certified by the National Research Council of Canada. SRM HS-2 has a certified value for Aroclor 1254. The recovery of the certified parameters must be within 80 to 120% or the appropriate data are flagged. The SRM recovery of 134% for Aroclor 1254 exceeds the upper QC control limit of 120% and, as a result associated sample data for Aroclor 1254 have been qualified with the *L* flag.

Matrix Spikes
BNAs
The matrix spike recoveries for each BNA compound must be within the 50 to 150% QC limits. If not, all results for those particular compounds within the batch of samples must be flagged as follows. A G flag is applied if the recovery is between 10 and 50%, an X flag is applied if less than 10% recovery and an L flag is applied if greater than 150% recovery. The following table summarizes the matrix spike recoveries for specific compounds that are outside the QC limits and the appropriate flag.

Compound	% Recovery	Flag
N-Nitrosodimethylamine	32	G
Phenol	49	G
Bis(2-Chloroethyl)ether	36	G
2-Chlorophenol	42	G
1,3-Dichlorobenzene	36	G
1,4-Dichlorobenzene	36	G
1,2-Dichlorobenzene	37	G
Bis(2-Chloroisopropyl)ether	37	G
Hexachloroethane	36	G
Nitrobenzene	41	G
Isophorone	49	G
2-Nitrophenol	39	G
2,4-Dimethylphenol	3	X
Bis(2Chloroethoxy)Methane	46	G
2,4-Dichlorophenol	49	G
1,2,4-Trichlorobenzene	38	G
Naphthalene	39	G
Hexachlorobutadiene	38	G
Hexachlorocyclobutadiene	30	G
2,4-Dinitrophenol	46	G
4,6-Dinitro-O-Cresol	44	G
N-Nitrosodiphenylamine	38	G
3,3'-Dichlorobenzidine	0	X
Aniline	0	X
Benzyl alcohol	41	G
2-Methylphenol	32	G
4-Methylphenol	35	G
4-Chloroaniline	0	X
2-Methylnaphthalene	49	G
3-Nitroaniline	0	X
4-Nitroaniline	13	G
Pyridine	0	X

PCBs

The matrix spike recoveries for PCB compounds must be within the 50 to 150% QC limits. A G flag is applied if the recovery is between 10 and 50%, an X flag is applied if less than 10% recovery and an L flag is applied if greater than 150% recovery. Aroclor 1260 and 1016 only are used as the spiking compounds for PCB analysis. All PCB matrix spike recoveries are within the QC limits.

Laboratory Replicate Samples

Lab Replicate (duplicate) samples for Organics have a target acceptance limit 35% for the Relative Percent Difference (RPD). Please note that this is a change from previous sediment events for this project All duplicate analyses showed acceptable RPD values except for the following:

BNAs

Pyrene, benzo(a)anthracene, chrysene, benzo(k)fluoranthene and benzo(a)pyrene had RPD values of 38, 48, 60, 74 and 36 percent respectively. All results for these compounds have been qualified with the *E* flag.

PCBs

No RPD limits were exceeded for the compounds reported.

TABLE 1
SEDIMENT SAMPLE INVENTORY

Sample	Locator / Description	PSD	Solids	TOC	Metals[1]	BNA[2]	PCB
L31635-1	NFK501/Norfolk CSO channel, 0-2 cm	X	X	X	X	X	X
L31635-2	NFK501/Norfolk CSO channel, 0-10 cm	X	X	X	X	X	X
L31635-3	NFK502/Combined Channel Delta, 0-2 cm	X	X	X	X	X	X
L31635-4	NFK502/Combined Channel Delta, 0-10 cm	X	X	X	X	X	X
L31635-5	NFK503/Boeing SD channel, 0-2 cm	X	X	X	X	X	X
L31635-6	NFK503/Boeing SD channel, 0-10 cm	X	X	X	X	X	X
L31635-7	NFK504/Upriver of CSO/SD, 0-2 cm	X	X	X	X	X	X
L31635-8	NFK504/Upriver of CSO/SD, 0-10 cm	X	X	X	X	X	X

1 Metals = Hg, Al, As, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, Tl, Zn, Fe
2 BNA = includes Chlorobenzenes

TABLE 2
QC SAMPLE FREQUENCY FOR SEDIMENT CHEMICAL AND PHYSICAL PARAMETERS

Parameter	Method Blank	Duplicate	Triplicate	Matrix Spike	SRM	Surrogates
PSD	No	10% of samples	10% of samples	No	No	No
Total Solids	1 per QC batch	5% minimum, 1 per QC batch	5% minimum, 1 per QC batch	No	No	No
TOC	1 per QC batch	5% minimum, 1 per QC batch	5% minimum, 1 per QC batch	5% minimum, 1 per QC batch	1 per QC batch	No
Metals	1 per QC batch	5% minimum, 1 per QC batch	No	5% minimum, 1 per QC batch	1 per QC batch	No
BNA (w/ Chlorobenzenes)	1 per QC batch	5% minimum, 1 per QC batch	No	5% minimum, 1 per QC batch	1 per QC batch	Yes
PCB	1 per QC batch	5% minimum, 1 per QC batch	No	5% minimum, 1 per QC batch	1 per QC batch	Yes

Table 3 – SUMMARY OF SEDIMENT DATA QUALIFIERS

Condition to Qualify	Flag	Organic QC Limits	Metal QC Limits	Conventional QC Limits	Comment
Very low matrix spike recovery	X	< 10 %	< 10 %	< 10 %	
low matrix spike recovery	G	< 50%	< 75%	< 75% *	
High matrix spike recovery	L	> 150%	>125%	>125% *	
low standard reference material recovery	G	< 80%	NA	< 80%	
High standard reference material recovery	L	>120%	>120%	>120%	
High duplicate relative percent difference	E	>35 %	>20%	NA	for organics and metals
High triplicate relative standard deviation	E	NA	NA	> 20 %	for conventionals
less than the reporting detection limit	<RDL**	NA	NA	NA	
less than the method detection limit	<MDL**	NA	NA	NA	
Contamination reported in blank	B	>MDL	>MDL	>MDL	
Biased data based on very low surrogate recoveries	X	all fraction surrogates <10%	NA	NA	Average surrogate recovery for BNA
Biased data based on low surrogate recoveries	G	all fraction surrogates <50%	NA	NA	Average surrogate recovery for BNA
Biased data based on high surrogate recoveries	L	all fraction surrogates >150%	NA	NA	average surrogate recovery for BNA
Rejected - unusable for all purposes	R	NA	NA	NA	
a sample handling criteria has not been met	H	NA	NA	NA	container, hold time, preservation

65% to 135% for Total Sulfides.

** For SEDQUAL files, <MDL uses a "U" flag, <RDL is not flagged.

FIELD SHEETS AND CHAIN OF CUSTODY DOCUMENTS

Login Number: P31635 Page: 1

NORFOLK 5-YEAR MONITORING, 1999 ON

T_NFK_MONITORING

Project Number: 423056-160 Personnel: JB, KC, MP

Sample Number	P31635-1	P31635-2	P31635-3
Locator	NFK501	NFK501	NFK502
Short Loc. Desc.	NFK501	NFK501	NFK502
Locator Desc.	NORFOLK CSO CHANNEL PRIOR TO CONFL	NORFOLK CSO CHANNEL PRIOR TO CONFL	DELTA OF CSO CHANNEL AFTER CONFLUE
Site	DUWAMISH RIVER	DUWAMISH RIVER	DUWAMISH RIVER
Start Time			
End Time			
Sample Depth	1 →	→	2
Collect Date	5 Apr 04 →	→	→
Comments	3 - 1/2 Grab Composite, 0 - 2 cm	3 - 1/2 Grab Composite, 0 - 10 cm	3 - 1/2 Grab Composite, 0 - 2 cm
SAMP METH	20032 →	→	→
SED DEPTH	14,17,16 (16) →	→	15,14 ~~15~~ (14)
SED SAMP RANGE	0-2 cm	0-10 cm	0-2 cm
SED TYPE	JB ~~14,17~~ 2ØD11	3DN2Ø →	→
TIDE COND	E	E	E
TIDE HT	4	4	2
TIME	0950 →	→	1100
Dept., Matrix, Prod			
add personnel	3 SALTWTRSED PSD	3 SALTWTRSED PSD	3 SALTWTRSED PSD
	3 SALTWTRSED TOC	3 SALTWTRSED TOC	3 SALTWTRSED TOC
	3 SALTWTRSED TOTS	3 SALTWTRSED TOTS	3 SALTWTRSED TOTS
	6 SALTWTRSED AG-ICP	6 SALTWTRSED AG-ICP	6 SALTWTRSED AG-ICP
	6 SALTWTRSED AL-ICP	6 SALTWTRSED AL-ICP	6 SALTWTRSED AL-ICP
	6 SALTWTRSED AS-ICP	6 SALTWTRSED AS-ICP	6 SALTWTRSED AS-ICP
	6 SALTWTRSED BE-ICP	6 SALTWTRSED BE-ICP	6 SALTWTRSED BE-ICP
	6 SALTWTRSED CD-ICP	6 SALTWTRSED CD-ICP	6 SALTWTRSED CD-ICP
	6 SALTWTRSED CR-ICP	6 SALTWTRSED CR-ICP	6 SALTWTRSED CR-ICP
	6 SALTWTRSED CU-ICP	6 SALTWTRSED CU-ICP	6 SALTWTRSED CU-ICP

COORDS WG 74297 A/MP 5/5

#2,3 had leafy debris + amphipod tubes → WG 74435 A&M MP 5/13 502 NSO

Data

continue ...

CHAIN OF CUSTODY

RELINQUISHED BY	RECEIVED BY	Date
Signature: John A. Blaine 4-5-04	Signature: Melinda Kangala	5 Apr 04
Printed Name: John A. Blaine 1505	M. Kangala	Time: 1505
Sample Number(s): All	Sample Number(s):	(All)

NORFOLK 5-YEAR MONITORING, 1999 ON

ject Number: 423056-160 Personnel: _____

Sample Number	P31635-1			P31635-2			P31635-3		
	6	SALTWTRSED	FE-ICP	6	SALTWTRSED	FE-ICP	6	SALTWTRSED	FE-ICP
	6	SALTWTRSED	HG-CVAA	6	SALTWTRSED	HG-CVAA	6	SALTWTRSED	HG-CVAA
	6	SALTWTRSED	MN-ICP	6	SALTWTRSED	MN-ICP	6	SALTWTRSED	MN-ICP
	6	SALTWTRSED	NI-ICP	6	SALTWTRSED	NI-ICP	6	SALTWTRSED	NI-ICP
	6	SALTWTRSED	PB-ICP	6	SALTWTRSED	PB-ICP	6	SALTWTRSED	PB-ICP
	6	SALTWTRSED	SE-ICP	6	SALTWTRSED	SE-ICP	6	SALTWTRSED	SE-ICP
	6	SALTWTRSED	TL-ICP	6	SALTWTRSED	TL-ICP	6	SALTWTRSED	TL-ICP
	6	SALTWTRSED	ZN-ICP	6	SALTWTRSED	ZN-ICP	6	SALTWTRSED	ZN-ICP
	7	SALTWTRSED	BNALLFULL	7	SALTWTRSED	BNALLFULL	7	SALTWTRSED	BNALLFULL
	7	SALTWTRSED	PCBLL	7	SALTWTRSED	PCBLL	7	SALTWTRSED	PCBLL

continue ...

NORFOLK 5-YEAR MONITORING, 1999 ON

Project Number: 423056-160 Personnel: _____

Sample Number	P31635-4	P31635-5	P31635-6
Locator	NFK502	NFK503	NFK503
Short Loc. Desc.	NFK502	NFK503	NFK503
Locator Desc.	DELTA OF CSO CHANNEL AFTER CONFLUE	BOEING SD CHANNEL PRIOR TO CONFLUE	BOEING SD CHANNEL PRIOR TO CONFLUE
Site	DUWAMISH RIVER	DUWAMISH RIVER	DUWAMISH RIVER
Start Time			
End Time			
Sample Depth	2	1	→
Collect Date	5 Apr 04	5 Apr 04	→
Comments	3 - 1/2 Grab Composite, 0 - 10 cm	3 - 1/2 Grab Composite, 0 - 2 cm	3 - 1/2 Grab Composite, 0 - 10 cm
SAMP METH	20032	→	→
SED DEPTH	15	10,14 12	12
SED SAMP RANGE	0-10 cm	0-2 cm	0-10 cm
SED TYPE	30N20	23N21	23N21
TIDE COND	E	E	E
TIDE HT	2	3	3
TIME	1100	1030	→
Dept., Matrix, Prod			
	3 SALTWTRSED PSD	3 SALTWTRSED PSD	3 SALTWTRSED PSD
	3 SALTWTRSED TOC	3 SALTWTRSED TOC	3 SALTWTRSED TOC
	3 SALTWTRSED TOTS	3 SALTWTRSED TOTS	3 SALTWTRSED TOTS
	6 SALTWTRSED AG-ICP	6 SALTWTRSED AG-ICP	6 SALTWTRSED AG-ICP
	6 SALTWTRSED AL-ICP	6 SALTWTRSED AL-ICP	6 SALTWTRSED AL-ICP
	6 SALTWTRSED AS-ICP	6 SALTWTRSED AS-ICP	6 SALTWTRSED AS-ICP
	6 SALTWTRSED BE-ICP	6 SALTWTRSED BE-ICP	6 SALTWTRSED BE-ICP
	6 SALTWTRSED CD-ICP	6 SALTWTRSED CD-ICP	6 SALTWTRSED CD-ICP
	6 SALTWTRSED CR-ICP	6 SALTWTRSED CR-ICP	6 SALTWTRSED CR-ICP
	6 SALTWTRSED CU-ICP	6 SALTWTRSED CU-ICP	6 SALTWTRSED CU-ICP

stems, leaves on last grab

amphipod tubes 'cluster'

continue ...

NORFOLK 5-YEAR MONITORING, 1999 ON

·oject Number: 423056-160 Personnel: _____

Sample Number	P31635-4			P31635-5			P31635-6		
	6	SALTWTRSED	FE-ICP	6	SALTWTRSED	FE-ICP	6	SALTWTRSED	FE-ICP
	6	SALTWTRSED	HG-CVAA	6	SALTWTRSED	HG-CVAA	6	SALTWTRSED	HG-CVAA
	6	SALTWTRSED	MN-ICP	6	SALTWTRSED	MN-ICP	6	SALTWTRSED	MN-ICP
	6	SALTWTRSED	NI-ICP	6	SALTWTRSED	NI-ICP	6	SALTWTRSED	NI-ICP
	6	SALTWTRSED	PB-ICP	6	SALTWTRSED	PB-ICP	6	SALTWTRSED	PB-ICP
	6	SALTWTRSED	SE-ICP	6	SALTWTRSED	SE-ICP	6	SALTWTRSED	SE-ICP
	6	SALTWTRSED	TL-ICP	6	SALTWTRSED	TL-ICP	6	SALTWTRSED	TL-ICP
	6	SALTWTRSED	ZN-ICP	6	SALTWTRSED	ZN-ICP	6	SALTWTRSED	ZN-ICP
	7	SALTWTRSED	BNALLFULL	7	SALTWTRSED	BNALLFULL	7	SALTWTRSED	BNALLFULL
	7	SALTWTRSED	PCBLL	7	SALTWTRSED	PCBLL	7	SALTWTRSED	PCBLL

continue ...

NORFOLK 5-YEAR MONITORING, 1999 ON

Project Number: 423056-160 Personnel: _____

Sample Number	P31635-7	P31635-8	
Locator	NFK504	NFK504	
Short Loc. Desc.	NFK504	NFK504	
Locator Desc.	UPRIVER OF CSO AND STORM DRAIN CHA	UPRIVER OF CSO AND STORM DRAIN CHA	
Site	DUWAMISH RIVER	DUWAMISH RIVER	
Start Time			
End Time			
Sample Depth			
Collect Date	5 Apr 04		
Comments	3 - 1/2 Grab Composite, 0 - 2 cm	3 - 1/2 Grab Composite, 0 - 10 cm	
SAMP METH	20032		
SED DEPTH	17 (17)	15 (15)	
SED SAMP RANGE	0-2cm	0-10cm	
SED TYPE	23D20	32D20	
TIDE COND	S	S	
TIDE HT	1.1	1.1	
TIME	1130		
Dept., Matrix, Prod	3 SALTWTRSED PSD	3 SALTWTRSED PSD	
	3 SALTWTRSED TOC	3 SALTWTRSED TOC	
	3 SALTWTRSED TOTS	3 SALTWTRSED TOTS	
	6 SALTWTRSED AG-ICP	6 SALTWTRSED AG-ICP	
	6 SALTWTRSED AL-ICP	6 SALTWTRSED AL-ICP	
	6 SALTWTRSED AS-ICP	6 SALTWTRSED AS-ICP	
	6 SALTWTRSED BE-ICP	6 SALTWTRSED BE-ICP	
	6 SALTWTRSED CD-ICP	6 SALTWTRSED CD-ICP	
	6 SALTWTRSED CR-ICP	6 SALTWTRSED CR-ICP	
	6 SALTWTRSED CU-ICP	6 SALTWTRSED CU-ICP	

unfixed tubes

continue ...

NORFOLK 5-YEAR MONITORING, 1999 ON

roject Number: 423056-160 Personnel: _____

Sample Number	P31635-7			P31635-8		
	6	SALTWTRSED	FE-ICP	6	SALTWTRSED	FE-ICP
	6	SALTWTRSED	HG-CVAA	6	SALTWTRSED	HG-CVAA
	6	SALTWTRSED	MN-ICP	6	SALTWTRSED	MN-ICP
	6	SALTWTRSED	NI-ICP	6	SALTWTRSED	NI-ICP
	6	SALTWTRSED	PB-ICP	6	SALTWTRSED	PB-ICP
	6	SALTWTRSED	SE-ICP	6	SALTWTRSED	SE-ICP
	6	SALTWTRSED	TL-ICP	6	SALTWTRSED	TL-ICP
	6	SALTWTRSED	ZN-ICP	6	SALTWTRSED	ZN-ICP
	7	SALTWTRSED	BNALLFULL	7	SALTWTRSED	BNALLFULL
	7	SALTWTRSED	PCBLL	7	SALTWTRSED	PCBLL

End of Fieldsheet.

LABORATORY WORK ORDER
Chain of Custody

King County Department of Natural Resources
Water and Land Resources Division
Environmental Laboratory
322 West Ewing Street
Seattle, Washington 98119-1507

Project Name: Norfolk Sediments
Project Number: 423056-160
Laboratory Project Manager: Fritz Grothkopp/John Blaine
Telephone Number: 684 2327/2384

Note: Use only one Login No. per sheet. Sample Number	Client Locator	Collect Date	Collect Time	TOC/TOTS	PSD *	BNALL/PCB	Metals -ICP/HG-CVAA	Number of Containers	Comments
L316635-1	NFK501	5 Apr 04		1	1	1	1		Refrigerate PCBs.
L -2	" "			1	2	1	1		Freeze all other samples.
L -3	" 502			1	1	1	1		
L -4	" "			1	2	1	1		
L -5	" 503			1	1	1	1		
L -6	" "			1	2	1	1		
L -7	" 504			1	1	1	1		
L -8	" "			1	2	1	1		
L -									
L -									
L -									

Analyses

Additional Comments:

Total Number of Containers

Sampled By:

* Sub-contracted lab parameters.

Relinquished By:		Received By:	
Signature	John A. Blaine	Signature	Melinda S Kangala
Date	5 Apr. 04	Date	5 Apr 04
Printed Name	John A. Blaine	Printed Name	M. Kangala
Time	1505	Time	1505
Organization	King County Environmental Laboratory	Organization	King County Environmental Laboratory

SOLID SAMPLE RECEIPT RECORD

LOGIN NUMBER(S): 31635-1-28

PROJECT NUMBER: 423056-1600 COLLECT DATE(S): 5 Apr 04 CHANGES: source code for PSD to ELD

SAMPLE RECEIPT CONDITIONS

	ACCEPTABLE?		Comment		ACCEPTABLE?		Comment
LABELS/FIELDSHEETS	(Y)	N		VOLUME	(Y)	N	
CONTAINERS	(Y)	N		HOLDING TIMES	(Y)	N	
TEMPERATURE	(Y)	N		HEADSPACE	(Y)	N	

SAMPLE SUBCONTRACTING

ANALYSES: PSD -2,4,6,8 SOURCE CODE: AmTest

SOLID PRESERVATION

TOTAL SULFIDE ZN ACETATE Y N

OTHER:

SAMPLE CONTAINER DESCRIPTION AND COUNT

#	DESCRIPTION AND SAMPLE NUMBERS	#	DESCRIPTION AND SAMPLE NUMBERS
	CONVENTIONALS		METALS
8	8oz Gcum 1,2,3,4,5,6,7,8	8	p-cup 1,2,3,4,5,6,7,8
12	1 gallon plastic bag 1,3,5,7 (1ea) 2,4,6,8 (2ea)		
			MICROBIOLOGY
	ORGANICS		
8	8oz Gcum 1,2,3,4,5,6,7,8		
			AQUATIC TOXICOLOGY

COMMENTS/NOTIFICATIONS

FORWARDED TO: CONVENTIONALS METALS ORGANICS AQUATOX MICROBIOLOGY

FORM FILLED OUT BY: MK

FORM FILLED OUT ON: 5 Apr 04

SAMPLE RECEIPT TIME AND DATE: 1505

NORFOLK SEDIMENT GRAB COORDS, Apr. 2004

Date/GPS Time of Creation	Comments	Lat	Long	NAD 83 Northing	NAD 83 Easting
4/5/04 9:54	NFK501: cast#1	47 30 42.854 N	122 17 51.138 W	190170	1278587
4/5/04 10:10	NFK501: cast#2	47 30 42.887 N	122 17 51.087 W	190173	1278591
4/5/04 10:18	NFK501: cast#3	47 30 42.797 N	122 17 51.107 W	190164	1278589
4/5/04 10:32	NFK503: cast#1	47 30 43.114 N	122 17 51.792 W	190197	1278543
4/5/04 10:49	NFK503: cast#2	47 30 43.056 N	122 17 51.81 W	190191	1278542
4/5/04 11:07	NFK502: cast#1	47 30 42.681 N	122 17 52.213 W	190154	1278513
4/5/04 11:18	NFK502: cast#2	47 30 42.721 N	122 17 52.167 W	190158	1278516
4/5/04 11:32	NFK504: cast#1	47 30 41.949 N	122 17 50.568 W	190078	1278625
4/5/04 11:54	NFK504: cast#2	47 30 41.971 N	122 17 50.513 W	190080	1278628

CONVENTIONAL ANALYSES QC DATA

King County Environmental Laboratory

WORK GROUP REPORT (wk02)

May 28 2004, 02:37 pm

Work Group: WG74182 (TOC/Norfolk 423056-160) for Department: 3 - Conventionals

Created: 23-APR-04 Due: Operator: DN

Sample	Project Number	Project Description	PKey	C	Product	Matrix	Stat	UA	Workdate	Duedate
L31635-1	423056-160	Norfolk Cleanup Study	SED	S	TOC	SALTWTRSED	DONE	I	05-APR-04	20-MAY-04
L31635-2	423056-160	Norfolk Cleanup Study	SED	S	TOC	SALTWTRSED	DONE	I	05-APR-04	20-MAY-04
L31635-3	423056-160	Norfolk Cleanup Study	SED	S	TOC	SALTWTRSED	DONE	I	05-APR-04	20-MAY-04
L31635-4	423056-160	Norfolk Cleanup Study	SED	S	TOC	SALTWTRSED	DONE	I	05-APR-04	20-MAY-04
L31635-5	423056-160	Norfolk Cleanup Study	SED	S	TOC	SALTWTRSED	DONE	I	05-APR-04	20-MAY-04
L31635-6	423056-160	Norfolk Cleanup Study	SED	S	TOC	SALTWTRSED	DONE	I	05-APR-04	20-MAY-04
L31635-7	423056-160	Norfolk Cleanup Study	SED	S	TOC	SALTWTRSED	DONE	I	05-APR-04	20-MAY-04
L31635-8	423056-160	Norfolk Cleanup Study	SED	S	TOC	SALTWTRSED	DONE	I	05-APR-04	20-MAY-04
WG74182-1	MB			S	TOC	OTHR SOLID	DONE	U	23-APR-04	
WG74182-2	SRM			S	TOC	OTHR SOLID	DONE	U	23-APR-04	
WG74182-3	SB			S	TOC	OTHR SOLID	DONE	U	23-APR-04	
WG74182-4	LD		SED	S	TOC	SALTWTRSED	DONE	U	23-APR-04	
WG74182-5	LT		SED	S	TOC	SALTWTRSED	DONE	U	23-APR-04	
WG74182-6	MS		SED	S	TOC	SALTWTRSED	DONE	U	23-APR-04	

Comments:

L31635-1	3 - 1/2 Grab Composite, 0 - 2 cm
L31635-2	3 - 1/2 Grab Composite, 0 - 10 cm
L31635-3	3 - 1/2 Grab Composite, 0 - 2 cm
L31635-4	3 - 1/2 Grab Composite, 0 - 10 cm
L31635-5	3 - 1/2 Grab Composite, 0 - 2 cm
L31635-6	3 - 1/2 Grab Composite, 0 - 10 cm
L31635-7	3 - 1/2 Grab Composite, 0 - 2 cm
L31635-8	3 - 1/2 Grab Composite, 0 - 10 cm
WG74182-1	MB1 042304
WG74182-2	HICONC
WG74182-3	WG74182-1
WG74182-4	L31635-2
WG74182-5	WG74182-4 L31635-2
WG74182-6	L31635-2

KING COUNTY METRO ENVIRONMENTAL LABORATORY
Lab QC Report - 05/28/04 02:38
Run ID: R100638 Workgroup: WG74182 (TOC/Norfolk 423056-160)

MB:WG74182-1 Matrix: OTHR SOLID Listtype: CVTOC Method: EPA9060-PSEP96 (03-04-002-002) Project: Pkey: SED
(Method Blank)

Parameter	Mdl	Rdl	Units	MB Value	Qual
Total Organic Carbon	500	1000	mg/Kg	<MDL	

SRM:WG74182-2 Matrix: OTHR SOLID Listtype: CVTOC Method: EPA9060-PSEP96 (03-04-002-002) Project: Pkey: SED
(Std Reference Material)

Parameter	Mdl	Rdl	Units	Truevalue	SRM Value	% Rec.	Qual	LabLimit
Total Organic Carbon	2500	4900	mg/Kg	36900	33900	92		80-120

SB:WG74182-3 MB:WG74182-1 Matrix: OTHR SOLID Listtype: CVTOC Method: EPA9060-PSEP96 (03-04-002-002) Project: Pkey: SED
(Spike Blank, Method Blank)

Parameter	Mdl	Rdl	Units	MB Value	Truevalue	SB Value	% Rec.	Qual	LabLimit
Total Organic Carbon	500	1000	mg/Kg	<MDL	2500	2620	105		80-120

LT:WG74182-5 LD:WG74182-4 L31635-2 Matrix: SALTWTRSED Listtype: CVTOC Method: EPA9060-PSEP96 (03-04-002-002) Project: 423056-160 Pkey: SED
(Lab Triplicate, Lab Duplicate)

Parameter	Mdl	Rdl	Units	SampValue	LD Value	LT Value	RSD	Qual	LabLimit
Total Organic Carbon	760	1520	mg/Kg	2440	2290	2540	5		20

MS:WG74182-6 L31635-2 Matrix: SALTWTRSED Listtype: CVTOC Method: EPA9060-PSEP96 (03-04-002-002) Project: 423056-160 Pkey: SED
(Matrix Spike)

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	MS Value	% Rec.	Qual	LabLimit
Total Organic Carbon	830	1660	mg/Kg	2440	4152	6720	103		75-125

King County Environmental Laboratory

WORK GROUP REPORT (wk02)

May 28 2004, 02:37 pm

Work Group: WG74159 (TOTS/423056-160 Norfolk) for Department: 3 - Conventionals

Created: 21-APR-04 Due: Operator: DN

Sample	Project Number	Project Description	PKey	C	Product	Matrix	Stat	UA	Workdate	Duedate
L31635-1	423056-160	Norfolk Cleanup Study	SED	S	TOTS	SALTWTRSED	DONE	I	05-APR-04	20-MAY-04
L31635-2	423056-160	Norfolk Cleanup Study	SED	S	TOTS	SALTWTRSED	DONE	I	05-APR-04	20-MAY-04
L31635-3	423056-160	Norfolk Cleanup Study	SED	S	TOTS	SALTWTRSED	DONE	I	05-APR-04	20-MAY-04
L31635-4	423056-160	Norfolk Cleanup Study	SED	S	TOTS	SALTWTRSED	DONE	I	05-APR-04	20-MAY-04
L31635-5	423056-160	Norfolk Cleanup Study	SED	S	TOTS	SALTWTRSED	DONE	I	05-APR-04	20-MAY-04
L31635-6	423056-160	Norfolk Cleanup Study	SED	S	TOTS	SALTWTRSED	DONE	I	05-APR-04	20-MAY-04
L31635-7	423056-160	Norfolk Cleanup Study	SED	S	TOTS	SALTWTRSED	DONE	I	05-APR-04	20-MAY-04
L31635-8	423056-160	Norfolk Cleanup Study	SED	S	TOTS	SALTWTRSED	DONE	I	05-APR-04	20-MAY-04
WG74159-1	MB			S	TOTS	OTHR SOLID	DONE	U	21-APR-04	
WG74159-2	LD		SED	S	TOTS	SALTWTRSED	DONE	U	21-APR-04	
WG74159-3	LT		SED	S	TOTS	SALTWTRSED	DONE	U	21-APR-04	

Comments:

L31635-1	3 - 1/2 Grab Composite, 0 - 2 cm
L31635-2	3 - 1/2 Grab Composite, 0 - 10 cm
L31635-3	3 - 1/2 Grab Composite, 0 - 2 cm
L31635-4	3 - 1/2 Grab Composite, 0 - 10 cm
L31635-5	3 - 1/2 Grab Composite, 0 - 2 cm
L31635-6	3 - 1/2 Grab Composite, 0 - 10 cm
L31635-7	3 - 1/2 Grab Composite, 0 - 2 cm
L31635-8	3 - 1/2 Grab Composite, 0 - 10 cm
WG74159-1	MB1 040421
WG74159-2	L31635-8
WG74159-3	WG74159-2 L31635-8

KING COUNTY METRO ENVIRONMENTAL LABORATORY
Lab QC Report - 05/28/04 02:38
Run ID: R100522 Workgroup: WG74159 (TOTS/423056-160 Norfolk)

MB:WG74159-1 Matrix: OTHR SOLID Listtype: CVTOTS Method: SM2540-G (03-01-007-002) Project: Pkey: SED
(Method Blank)

Parameter	Mdl	Rdl	Units	MB Value	Qual
Total Solids	.005	.01	%	<MDL	

LT:WG74159-3 LD:WG74159-2 L31635-8 Matrix: SALTWTRSED Listtype: CVTOTS Method: SM2540-G (03-01-007-002) Project: 423056-160 Pkey: SED
(Lab Triplicate, Lab Duplicate)

Parameter	Mdl	Rdl	Units	SampValue	LD Value	LT Value	RSD	Qual	LabLimit
Total Solids	.005	.01	%	74.9	74.6	74.5	0		20

King County Environmental Laboratory

WORK GROUP REPORT (wk02)

May 28 2004, 02:37 pm

Work Group: WG74422 (PSD for Norfolk) for Department: 3 - Conventionals

Created: 11-MAY-04 Due: Operator: SVM

Sample	Project Number	Project Description	PKey	C	Product	Matrix	Stat	UA	Workdate	Duedate
L31635-1	423056-160	Norfolk Cleanup Study	SED	S	PSD	SALTWTRSED	DONE	I	05-APR-04	20-MAY-04
L31635-2	423056-160	Norfolk Cleanup Study	SED	S	PSD	SALTWTRSED	DONE	I	05-APR-04	20-MAY-04
L31635-3	423056-160	Norfolk Cleanup Study	SED	S	PSD	SALTWTRSED	DONE	I	05-APR-04	20-MAY-04
L31635-4	423056-160	Norfolk Cleanup Study	SED	S	PSD	SALTWTRSED	DONE	I	05-APR-04	20-MAY-04
L31635-5	423056-160	Norfolk Cleanup Study	SED	S	PSD	SALTWTRSED	DONE	I	05-APR-04	20-MAY-04
L31635-6	423056-160	Norfolk Cleanup Study	SED	S	PSD	SALTWTRSED	DONE	I	05-APR-04	20-MAY-04
L31635-7	423056-160	Norfolk Cleanup Study	SED	S	PSD	SALTWTRSED	DONE	I	05-APR-04	20-MAY-04
L31635-8	423056-160	Norfolk Cleanup Study	SED	S	PSD	SALTWTRSED	DONE	I	05-APR-04	20-MAY-04
WG74422-1	LD		SED	S	PSD	SALTWTRSED	DONE	U	17-MAY-04	
WG74422-2	LT		SED	S	PSD	SALTWTRSED	DONE	U	17-MAY-04	

Comments:

L31635-1	3 - 1/2 Grab Composite, 0 - 2 cm
L31635-2	3 - 1/2 Grab Composite, 0 - 10 cm
L31635-3	3 - 1/2 Grab Composite, 0 - 2 cm
L31635-4	3 - 1/2 Grab Composite, 0 - 10 cm
L31635-5	3 - 1/2 Grab Composite, 0 - 2 cm
L31635-6	3 - 1/2 Grab Composite, 0 - 10 cm
L31635-7	3 - 1/2 Grab Composite, 0 - 2 cm
L31635-8	3 - 1/2 Grab Composite, 0 - 10 cm
WG74422-1	L31635-1
WG74422-2	WG74422-1 L31635-1

KING COUNTY METRO ENVIRONMENTAL LABORATORY
Lab QC Report - 05/28/04 02:38
Run ID: R100846 Workgroup: WG74422 (PSD for Norfolk)

LT:WG74422-2 LD:WG74422-1 L31635-1 Matrix: SALTWTRSED Listtype: CVPSD Method: ASTM D422(03-02-005-001) Project: 423056-160 Pkey: SED
(Lab Triplicate, Lab Duplicate)

Parameter	Mdl	Rdl	Units	SampValue	LD Value	LT Value	RSD	Qual	LabLimit
Gravel	.1	1	%	2	5	3	51	E	20
Sand	.1	1	%	48.1	46.1	47.1	2		20
Silt	.5	1	%	35.5	40.6	36.8	7		20
Clay	.5	1	%	11.5	9	10.4	13		20

METAL CHEMISTRY QC DATA

King County Environmental Laboratory

WORK GROUP REPORT (wk02)

May 06 2004, 07:58 am

Work Group: WG74152 (4/21/04 Norfolk Sediments) for Department: 6 - Metals, Trace

Created: 21-APR-04 Due: Operator: E. Prentice

Sample	Project Number	Project Description	PKey	C	Product	Matrix	Stat	UA	Workdate	Duedate
L31635-1	423056-160	Norfolk Cleanup Study	SED	S	ZN-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-1	423056-160	Norfolk Cleanup Study	SED	S	TL-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-1	423056-160	Norfolk Cleanup Study	SED	S	AG-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-1	423056-160	Norfolk Cleanup Study	SED	S	AL-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-1	423056-160	Norfolk Cleanup Study	SED	S	AS-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-1	423056-160	Norfolk Cleanup Study	SED	S	BE-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-1	423056-160	Norfolk Cleanup Study	SED	S	CD-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-1	423056-160	Norfolk Cleanup Study	SED	S	CR-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-1	423056-160	Norfolk Cleanup Study	SED	S	CU-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-1	423056-160	Norfolk Cleanup Study	SED	S	FE-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-1	423056-160	Norfolk Cleanup Study	SED	S	MN-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-1	423056-160	Norfolk Cleanup Study	SED	S	NI-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-1	423056-160	Norfolk Cleanup Study	SED	S	PB-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-1	423056-160	Norfolk Cleanup Study	SED	S	SE-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-2	423056-160	Norfolk Cleanup Study	SED	S	AG-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-2	423056-160	Norfolk Cleanup Study	SED	S	AL-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-2	423056-160	Norfolk Cleanup Study	SED	S	AS-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-2	423056-160	Norfolk Cleanup Study	SED	S	BE-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-2	423056-160	Norfolk Cleanup Study	SED	S	CD-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-2	423056-160	Norfolk Cleanup Study	SED	S	CR-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-2	423056-160	Norfolk Cleanup Study	SED	S	CU-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-2	423056-160	Norfolk Cleanup Study	SED	S	FE-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-2	423056-160	Norfolk Cleanup Study	SED	S	MN-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-2	423056-160	Norfolk Cleanup Study	SED	S	NI-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-2	423056-160	Norfolk Cleanup Study	SED	S	PB-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-2	423056-160	Norfolk Cleanup Study	SED	S	SE-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-2	423056-160	Norfolk Cleanup Study	SED	S	TL-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-2	423056-160	Norfolk Cleanup Study	SED	S	ZN-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-3	423056-160	Norfolk Cleanup Study	SED	S	AG-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-3	423056-160	Norfolk Cleanup Study	SED	S	AL-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-3	423056-160	Norfolk Cleanup Study	SED	S	AS-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-3	423056-160	Norfolk Cleanup Study	SED	S	BE-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-3	423056-160	Norfolk Cleanup Study	SED	S	CD-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-3	423056-160	Norfolk Cleanup Study	SED	S	CR-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-3	423056-160	Norfolk Cleanup Study	SED	S	CU-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-3	423056-160	Norfolk Cleanup Study	SED	S	FE-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-3	423056-160	Norfolk Cleanup Study	SED	S	MN-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-3	423056-160	Norfolk Cleanup Study	SED	S	NI-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-3	423056-160	Norfolk Cleanup Study	SED	S	PB-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-3	423056-160	Norfolk Cleanup Study	SED	S	SE-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-3	423056-160	Norfolk Cleanup Study	SED	S	TL-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-3	423056-160	Norfolk Cleanup Study	SED	S	ZN-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-4	423056-160	Norfolk Cleanup Study	SED	S	AG-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-4	423056-160	Norfolk Cleanup Study	SED	S	AL-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-4	423056-160	Norfolk Cleanup Study	SED	S	AS-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-4	423056-160	Norfolk Cleanup Study	SED	S	BE-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-4	423056-160	Norfolk Cleanup Study	SED	S	CD-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-4	423056-160	Norfolk Cleanup Study	SED	S	CR-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-4	423056-160	Norfolk Cleanup Study	SED	S	CU-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-4	423056-160	Norfolk Cleanup Study	SED	S	FE-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-4	423056-160	Norfolk Cleanup Study	SED	S	MN-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-4	423056-160	Norfolk Cleanup Study	SED	S	NI-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-4	423056-160	Norfolk Cleanup Study	SED	S	PB-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-4	423056-160	Norfolk Cleanup Study	SED	S	SE-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-4	423056-160	Norfolk Cleanup Study	SED	S	TL-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-4	423056-160	Norfolk Cleanup Study	SED	S	ZN-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-5	423056-160	Norfolk Cleanup Study	SED	S	CD-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-5	423056-160	Norfolk Cleanup Study	SED	S	CR-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-5	423056-160	Norfolk Cleanup Study	SED	S	CU-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-5	423056-160	Norfolk Cleanup Study	SED	S	FE-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-5	423056-160	Norfolk Cleanup Study	SED	S	MN-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04

King County Environmental Laboratory

WORK GROUP REPORT (wk02)

May 06 2004, 07:58 am

Work Group: WG74152 (4/21/04 Norfolk Sediments) for Department: 6 - Metals, Trace

Created: 21-APR-04 Due: Operator: E. Prentice

Sample	Project Number	Project Description	PKey	C	Product	Matrix	Stat	UA	Workdate	Duedate
L31635-5	423056-160	Norfolk Cleanup Study	SED	S	NI-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-5	423056-160	Norfolk Cleanup Study	SED	S	PB-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-5	423056-160	Norfolk Cleanup Study	SED	S	SE-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-5	423056-160	Norfolk Cleanup Study	SED	S	TL-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-5	423056-160	Norfolk Cleanup Study	SED	S	ZN-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-5	423056-160	Norfolk Cleanup Study	SED	S	AL-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-5	423056-160	Norfolk Cleanup Study	SED	S	AG-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-5	423056-160	Norfolk Cleanup Study	SED	S	AS-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-5	423056-160	Norfolk Cleanup Study	SED	S	BE-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-6	423056-160	Norfolk Cleanup Study	SED	S	BE-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-6	423056-160	Norfolk Cleanup Study	SED	S	CD-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-6	423056-160	Norfolk Cleanup Study	SED	S	CR-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-6	423056-160	Norfolk Cleanup Study	SED	S	CU-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-6	423056-160	Norfolk Cleanup Study	SED	S	FE-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-6	423056-160	Norfolk Cleanup Study	SED	S	MN-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-6	423056-160	Norfolk Cleanup Study	SED	S	NI-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-6	423056-160	Norfolk Cleanup Study	SED	S	PB-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-6	423056-160	Norfolk Cleanup Study	SED	S	SE-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-6	423056-160	Norfolk Cleanup Study	SED	S	TL-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-6	423056-160	Norfolk Cleanup Study	SED	S	ZN-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-6	423056-160	Norfolk Cleanup Study	SED	S	AG-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-6	423056-160	Norfolk Cleanup Study	SED	S	AL-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-6	423056-160	Norfolk Cleanup Study	SED	S	AS-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-7	423056-160	Norfolk Cleanup Study	SED	S	AG-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-7	423056-160	Norfolk Cleanup Study	SED	S	AL-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-7	423056-160	Norfolk Cleanup Study	SED	S	AS-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-7	423056-160	Norfolk Cleanup Study	SED	S	BE-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-7	423056-160	Norfolk Cleanup Study	SED	S	CD-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-7	423056-160	Norfolk Cleanup Study	SED	S	CR-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-7	423056-160	Norfolk Cleanup Study	SED	S	CU-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-7	423056-160	Norfolk Cleanup Study	SED	S	ZN-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-7	423056-160	Norfolk Cleanup Study	SED	S	FE-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-7	423056-160	Norfolk Cleanup Study	SED	S	MN-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-7	423056-160	Norfolk Cleanup Study	SED	S	NI-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-7	423056-160	Norfolk Cleanup Study	SED	S	PB-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-7	423056-160	Norfolk Cleanup Study	SED	S	SE-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-7	423056-160	Norfolk Cleanup Study	SED	S	TL-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-8	423056-160	Norfolk Cleanup Study	SED	S	AG-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-8	423056-160	Norfolk Cleanup Study	SED	S	AL-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-8	423056-160	Norfolk Cleanup Study	SED	S	AS-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-8	423056-160	Norfolk Cleanup Study	SED	S	BE-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-8	423056-160	Norfolk Cleanup Study	SED	S	CD-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-8	423056-160	Norfolk Cleanup Study	SED	S	CR-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-8	423056-160	Norfolk Cleanup Study	SED	S	CU-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-8	423056-160	Norfolk Cleanup Study	SED	S	FE-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-8	423056-160	Norfolk Cleanup Study	SED	S	MN-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-8	423056-160	Norfolk Cleanup Study	SED	S	NI-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-8	423056-160	Norfolk Cleanup Study	SED	S	PB-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-8	423056-160	Norfolk Cleanup Study	SED	S	SE-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-8	423056-160	Norfolk Cleanup Study	SED	S	TL-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
L31635-8	423056-160	Norfolk Cleanup Study	SED	S	ZN-ICP	SALTWTRSED	WKGP	U	20-MAY-04	20-MAY-04
WG74152-1	SB			S	ROUTINE ICP	BLANK WTR	WKGP	U	21-APR-04	
WG74152-2	MB			S	ROUTINE ICP	BLANK WTR	WKGP	U	21-APR-04	
WG74152-3	LCS			S	ROUTINE ICP	SOIL	WKGP	U	21-APR-04	
WG74152-4	SRM		SED	S	ROUTINE ICP	SALTWTRSED	WKGP	U	21-APR-04	
WG74152-5	LD		SED	S	ROUTINE ICP	SALTWTRSED	WKGP	U	21-APR-04	
WG74152-6	MS		SED	S	ROUTINE ICP	SALTWTRSED	WKGP	U	21-APR-04	
WG74152-7	SDIL		SED	S	ROUTINE ICP	SALTWTRSED	WKGP	U	21-APR-04	

Comments:

King County Environmental Laboratory

WORK GROUP REPORT (wk02)

May 06 2004, 07:58 am

Work Group: WG74152 (4/21/04 Norfolk Sediments) for Department: 6 - Metals, Trace

Created: 21-APR-04 Due: Operator: E. Prentice

Sample	Project Number	Project Description	PKey	C	Product	Matrix	Stat	UA	Workdate	Duedate
L31635-1		3 - 1/2 Grab Composite, 0 - 2 cm								
L31635-2		3 - 1/2 Grab Composite, 0 - 10 cm								
L31635-3		3 - 1/2 Grab Composite, 0 - 2 cm								
L31635-4		3 - 1/2 Grab Composite, 0 - 10 cm								
L31635-5		3 - 1/2 Grab Composite, 0 - 2 cm								
L31635-6		3 - 1/2 Grab Composite, 0 - 10 cm								
L31635-7		3 - 1/2 Grab Composite, 0 - 2 cm								
L31635-8		3 - 1/2 Grab Composite, 0 - 10 cm								
WG74152-1		WG74152-2 ICP200								
WG74152-2		MB								
WG74152-3		ERASOIL								
WG74152-4		PACS2								
WG74152-5		L31635-2 RPD-SOL								
WG74152-6		L31635-2 ICP200								
WG74152-7		L31635-2 5X								

Corrective Action Form (Metals)

Date Recognized 4/22/04 WG# 74152
Date Occurred 4/21/04 Prep Date 4/21/04
Reported By E. Prentice Project 423056-120
Sample ID L31635-(1-8) Sample type SF, Saltwater Sediment

Method:
- ☐ Mercury (CVAA)
- ☐ ICP-MS (200.8)
- ☒ Other 3050
- ☐ ICP (200.7)

Type of Occurrence:

- ☐ Method Blank > MDL
- ☒ MS outside limits
- ☐ Lab Dup. RPD > limit
- ☐ Holding time exceeded by _____ days/hours.
- ☐ Insufficient sample amount / inappropriate container or storage
- ☐ Sample or Analysis Anomalies
- ☒ LCS/SB outside limits
- ☒ SRM outside limits

Explanation (analytes and samples effected, etc.):
1. In sample WG74167-3, ERA Soil Lot#249 LCS, Al=79% is outside the acceptance limits of 80-120%.
2. In sample WG74167-4, PACS-2 SRM, Ag=173%, As=71%, Be=40%, Cr=51%, Mn=57% and Ni=71% all exceed the acceptance limits of 80-120%. Se <MDL
3. In sample WG74167-6, the matrix spike, Al=307% is outside the acceptance limits of 75-125%.

Corrective Action:
- ☒ Results reported "As Is" and explain below (Send copy of this form to LPM)
- ☐ Sample(s) repreped and analyzed with similar unacceptable results (Send copy to LPM)
- ☐ Sample repreped and analyzed, QC problems corrected.

Explanation:
1. An Al recovery of 79% is consistant with historical data for ERA Soil Lot#249 therefore the Al value for WG74167-3 is flagged with an "*" and no further action taken.
2. The certified values for the PACS-2 SRM were obtained using a total acid digestion and in this preparation method 3050 was used which is a strong acid digestion. Recoveries are being monitored to generate control limits based on the method 3050 digestion. All results will be reported "As Is" and Ag will be flagged with an "L."
3. The native concentration of Al in this sample is four times greater than the spike value. Al results will be flagged with an "L."

Signatures:
Analyst: L. A. Prentice
Reviewer: [illegible]
Supervisor:

KING COUNTY METRO ENVIRONMENTAL LABORATORY
Lab QC Report - 05/06/04 08:03
Run ID: R100533 Workgroup: WG74152 (4/21/04 Norfolk Sediments)

SB:WG74152-1 MB:WG74152-2 Matrix: BLANK WTR Listtype: MTICP-SED Method: EPA3050A/6010B (06-02-004-002) Project: Pkey: SED
(Spike Blank, Method Blank)

Parameter	Mdl	Rdl	Units	MB Value	Truevalue	SB Value	% Rec.	Qual	LabLimit
Silver, Total, ICP	.004	.02	mg/L	<MDL	1.2	1.19	99		85-115
Aluminum, Total, ICP	.1	.5	mg/L	<MDL	12	11.9	100		85-115
Arsenic, Total, ICP	.05	.25	mg/L	<MDL	4	3.97	99		85-115
Beryllium, Total, ICP	.001	.005	mg/L	<MDL	.4	.403	101		85-115
Cadmium, Total, ICP	.003	.015	mg/L	<MDL	1.2	1.18	99		85-115
Chromium, Total, ICP	.005	.025	mg/L	<MDL	1.2	1.2	100		85-115
Copper, Total, ICP	.004	.02	mg/L	<MDL	1.2	1.21	101		85-115
Iron, Total, ICP	.05	.25	mg/L	<MDL	50	49.4	99		85-115
Manganese, Total, ICP	.002	.01	mg/L	<MDL	5	5.27	105		85-115
Nickel, Total, ICP	.02	.1	mg/L	<MDL	1.2	1.19	99		85-115
Lead, Total, ICP	.03	.15	mg/L	<MDL	4	3.93	98		85-115
Selenium, Total, ICP	.05	.25	mg/L	<MDL	2	2	100		85-115
Thallium, Total, ICP	.2	1	mg/L	<MDL	4	3.92	98		85-115
Zinc, Total, ICP	.005	.025	mg/L	<MDL	5	4.92	98		85-115

MB:WG74152-2 Matrix: BLANK WTR Listtype: MTICP-SED Method: EPA3050A/6010B (06-02-004-002) Project: Pkey: SED
(Method Blank)

Parameter	Mdl	Rdl	Units	MB Value	Qual
Silver, Total, ICP	.004	.02	mg/L	<MDL	
Aluminum, Total, ICP	.1	.5	mg/L	<MDL	
Arsenic, Total, ICP	.05	.25	mg/L	<MDL	
Beryllium, Total, ICP	.001	.005	mg/L	<MDL	
Cadmium, Total, ICP	.003	.015	mg/L	<MDL	
Chromium, Total, ICP	.005	.025	mg/L	<MDL	
Copper, Total, ICP	.004	.02	mg/L	<MDL	
Iron, Total, ICP	.05	.25	mg/L	<MDL	
Manganese, Total, ICP	.002	.01	mg/L	<MDL	
Nickel, Total, ICP	.02	.1	mg/L	<MDL	
Lead, Total, ICP	.03	.15	mg/L	<MDL	
Selenium, Total, ICP	.05	.25	mg/L	<MDL	
Thallium, Total, ICP	.2	1	mg/L	<MDL	
Zinc, Total, ICP	.005	.025	mg/L	<MDL	

LCS:WG74152-3 Matrix: SOIL Listtype: MTICP-SED Method: EPA3050A/6010B (06-02-004-002) Project: Pkey: SED
(Lab Control Sample)

Parameter	Mdl	Rdl	Units	Truevalue	LCS Value	% Rec.	Qual	LabLimit
Silver, Total, ICP	.79	3.94	mg/Kg	125	148	118		80-120
Aluminum, Total, ICP	20	98.4	mg/Kg	9350	7370	79	*	80-120
Arsenic, Total, ICP	9.8	49.2	mg/Kg	132	134	101		80-120
Beryllium, Total, ICP	.2	.984	mg/Kg	90.1	101	112		80-120
Cadmium, Total, ICP	.59	2.95	mg/Kg	51.5	55.8	108		80-120
Chromium, Total, ICP	.98	4.92	mg/Kg	142	152	107		80-120
Copper, Total, ICP	.79	3.94	mg/Kg	152	164	108		80-120
Iron, Total, ICP	9.8	49.2	mg/Kg	14400	11700	82		80-120
Manganese, Total, ICP	.39	1.97	mg/Kg	468	478	102		80-120
Nickel, Total, ICP	3.9	19.7	mg/Kg	55.4	58.3	105		80-120
Lead, Total, ICP	5.9	29.5	mg/Kg	52.9	51.9	98		80-120

KING COUNTY METRO ENVIRONMENTAL LABORATORY
Lab QC Report - 05/06/04 08:03
Run ID: R100533 Workgroup: WG74152 (4/21/04 Norfolk Sediments)

LCS:WG74152-3 Matrix: SOIL Listtype: MTICP-SED Method: EPA3050A/6010B (06-02-004-002) Project: Pkey: SED
(Lab Control Sample)

Parameter	Mdl	Rdl	Units	Truevalue	LCS Value	% Rec.	Qual	LabLimit
Selenium, Total, ICP	9.8	49.2	mg/Kg	60.9	72.2	119		80-120
Thallium, Total, ICP	39	197	mg/Kg	108	120	114		80-120
Zinc, Total, ICP	.98	4.92	mg/Kg	587	635	108		80-120

SRM:WG74152-4 Matrix: SALTWTRSED Listtype: MTICP-SED Method: EPA3050A/6010B (06-02-004-002) Project: Pkey: SED
(Std Reference Material)

Parameter	Mdl	Rdl	Units	Truevalue	SRM Value	% Rec.	Qual	LabLimit
Silver, Total, ICP	.79	3.97	mg/Kg	1.22	2.1	173	L	120
Arsenic, Total, ICP	9.9	49.7	mg/Kg	26.2	19	71		120
Beryllium, Total, ICP	.2	.994	mg/Kg	1	.4	40		120
Cadmium, Total, ICP	.6	2.98	mg/Kg	2.11	2.3	107		120
Chromium, Total, ICP	.99	4.97	mg/Kg	90.7	46.4	51		120
Copper, Total, ICP	.79	3.97	mg/Kg	310	320	103		120
Manganese, Total, ICP	.4	1.99	mg/Kg	440	251	57		120
Nickel, Total, ICP	4	19.9	mg/Kg	39.5	28.2	71		120
Lead, Total, ICP	6	29.8	mg/Kg	183	173	94		120
Selenium, Total, ICP	9.9	49.7	mg/Kg	.92	<MDL	0		120
Zinc, Total, ICP	.99	4.97	mg/Kg	364	345	95		120

LD:WG74152-5 L31635-2 Matrix: SALTWTRSED Listtype: MTICP-SED Method: EPA3050A/6010B (06-02-004-002) Project: 423056-160 Pkey: SED
(Lab Duplicate)

Parameter	Mdl	Rdl	Units	SampValue	LD Value	RPD	Qual	LabLimit
Silver, Total, ICP	.21	1.05	mg/Kg	.36	.4			20
Aluminum, Total, ICP	5.2	26.2	mg/Kg	6760	6840	1		20
Arsenic, Total, ICP	2.6	13.1	mg/Kg	<MDL	<MDL			20
Beryllium, Total, ICP	.052	.262	mg/Kg	.15	.16			20
Cadmium, Total, ICP	.16	.787	mg/Kg	<MDL	<MDL			20
Chromium, Total, ICP	.26	1.31	mg/Kg	9.3	10.5	12		20
Copper, Total, ICP	.21	1.05	mg/Kg	9.28	10	8		20
Iron, Total, ICP	2.6	13.1	mg/Kg	12700	12800	0		20
Manganese, Total, ICP	.1	.525	mg/Kg	184	185	0		20
Nickel, Total, ICP	1	5.25	mg/Kg	10.2	11.1	9		20
Lead, Total, ICP	1.6	7.87	mg/Kg	3.2	3.2			20
Selenium, Total, ICP	2.6	13.1	mg/Kg	<MDL	<MDL			20
Thallium, Total, ICP	10	52.5	mg/Kg	9.6	<MDL			20
Zinc, Total, ICP	.26	1.31	mg/Kg	30.3	30.7	2		20

MS:WG74152-6 L31635-2 Matrix: SALTWTRSED Listtype: MTICP-SED Method: EPA3050A/6010B (06-02-004-002) Project: 423056-160 Pkey: SED
(Matrix Spike)

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	MS Value	% Rec.	Qual	LabLimit
Silver, Total, ICP	.2	.992	mg/Kg	.36	59.5	61	102		75-125
Aluminum, Total, ICP	5	24.8	mg/Kg	6760	595.	8590	307	L	75-125
Arsenic, Total, ICP	2.5	12.4	mg/Kg	<MDL	198.	198	100		75-125
Beryllium, Total, ICP	.05	.248	mg/Kg	.15	19.8	20.2	101		75-125
Cadmium, Total, ICP	.15	.744	mg/Kg	<MDL	59.5	60.2	101		75-125
Chromium, Total, ICP	.25	1.24	mg/Kg	9.3	59.5	72.6	106		75-125

MS:WG74152-6 L31635-2 Matrix: SALTWTRSED Listtype: MTICP-SED Method: EPA3050A/6010B (06-02-004-002) Project: 423056-160 Pkey: SED
(Matrix Spike)

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	MS Value	% Rec.	Qual	LabLimit
Copper, Total, ICP	.2	.992	mg/Kg	9.28	59.5	71.7	105		75-125
Iron, Total, ICP	2.5	12.4	mg/Kg	12700	2480	15400	109		75-125
Manganese, Total, ICP	.099	.496	mg/Kg	184	248.	450	107		75-125
Nickel, Total, ICP	.99	4.96	mg/Kg	10.2	59.5	70.8	102		75-125
Lead, Total, ICP	1.5	7.44	mg/Kg	3.2	198.	200	99		75-125
Selenium, Total, ICP	2.5	12.4	mg/Kg	<MDL	99.2	98.6	99		75-125
Thallium, Total, ICP	9.9	49.6	mg/Kg	9.6	198.	206	99		75-125
Zinc, Total, ICP	.25	1.24	mg/Kg	30.3	248.	276	99		75-125

SDIL:WG74152-7 Matrix: SALTWTRSED Listtype: MTICP-SED Method: EPA3050A/6010B (06-02-004-002) Project: Pkey: SED
(Serial Dilution)

Parameter	Mdl	Rdl	Units	Value	Truevalue	SDIL Value	% Rec.	Qual	LabLimit

King County Environmental Laboratory

WORK GROUP REPORT (wk02)

Apr 21 2004, 01:56 pm

Work Group: WG74117 (Hg-CVAA Norfolk Seds.) for Department: 6 - Metals, Trace

Created: 19-APR-04 Due: Operator: BDM/SH

Sample	Project Number	Project Description	PKey	C	Product	Matrix	Stat	UA	Workdate	Duedate
L31635-1	423056-160	Norfolk Cleanup Study	SED	S	HG-CVAA	SALTWTRSED	WKGP	U	03-MAY-04	20-MAY-04
L31635-2	423056-160	Norfolk Cleanup Study	SED	S	HG-CVAA	SALTWTRSED	WKGP	U	03-MAY-04	20-MAY-04
L31635-3	423056-160	Norfolk Cleanup Study	SED	S	HG-CVAA	SALTWTRSED	WKGP	U	03-MAY-04	20-MAY-04
L31635-4	423056-160	Norfolk Cleanup Study	SED	S	HG-CVAA	SALTWTRSED	WKGP	U	03-MAY-04	20-MAY-04
L31635-5	423056-160	Norfolk Cleanup Study	SED	S	HG-CVAA	SALTWTRSED	WKGP	U	03-MAY-04	20-MAY-04
L31635-6	423056-160	Norfolk Cleanup Study	SED	S	HG-CVAA	SALTWTRSED	WKGP	U	03-MAY-04	20-MAY-04
L31635-7	423056-160	Norfolk Cleanup Study	SED	S	HG-CVAA	SALTWTRSED	WKGP	U	03-MAY-04	20-MAY-04
L31635-8	423056-160	Norfolk Cleanup Study	SED	S	HG-CVAA	SALTWTRSED	WKGP	U	03-MAY-04	20-MAY-04
WG74117-1	SRM		SED	S	HG-CVAA	SALTWTRSED	WKGP	U	19-APR-04	
WG74117-2	MB			S	HG-CVAA	BLANK WTR	WKGP	U	19-APR-04	
WG74117-3	SB			S	HG-CVAA	BLANK WTR	WKGP	U	19-APR-04	
WG74117-4	LD		SED	S	HG-CVAA	SALTWTRSED	WKGP	U	19-APR-04	
WG74117-5	MS		SED	S	HG-CVAA	SALTWTRSED	WKGP	U	19-APR-04	
WG74117-6	MSD		SED	S	HG-CVAA	SALTWTRSED	WKGP	U	20-APR-04	
WG74117-7	SRM		SED	S	HG-CVAA	SALTWTRSED	WKGP	U	21-APR-04	
WG74117-8	SRM		SED	S	HG-CVAA	SALTWTRSED	WKGP	U	21-APR-04	
WG74117-9	SRM		SED	S	HG-CVAA	SALTWTRSED	WKGP	U	21-APR-04	

Comments:

L31635-1	3 - 1/2 Grab Composite, 0 - 2 cm
L31635-2	3 - 1/2 Grab Composite, 0 - 10 cm
L31635-3	3 - 1/2 Grab Composite, 0 - 2 cm
L31635-4	3 - 1/2 Grab Composite, 0 - 10 cm
L31635-5	3 - 1/2 Grab Composite, 0 - 2 cm
L31635-6	3 - 1/2 Grab Composite, 0 - 10 cm
L31635-7	3 - 1/2 Grab Composite, 0 - 2 cm
L31635-8	3 - 1/2 Grab Composite, 0 - 10 cm
WG74117-1	PACS2
WG74117-2	DIGESTED METHOD BLANK
WG74117-3	WG74117-2 HG-SOL
WG74117-4	L31635-2 RPD-SOL LAB DUPLICATE
WG74117-5	L31635-2 HG-SOL MATRIX SPIKE
WG74117-6	WG74117-5 L31635-2 HG-SOL-MSD MATRIX SPIKE DUPLICATE
WG74117-7	PACS2
WG74117-8	PACS2
WG74117-9	PACS2

Corrective Action Form (Metals)

Date Recognized 4/19/04 WG# WG74117
Date Occurred 4/19/04 Prep Date 4/16/04
Reported By BM Project Norfolk 423056-160
Sample ID WG74117-5 Sample type Saltwater Sediment

Method:
- [x] Mercury (CVAA)
- [ ] ICP (200.7)
- [ ] ICP-MS (200.8)
- [ ] Other _____

Type of Occurrence:

- [ ] Method Blank > MDL
- [ ] LCS/SB outside limits
- [x] MS outside limits
- [ ] SRM outside limits
- [ ] Lab Dup. RPD > limit
- [ ] Holding time exceeded by _____ days/hours.
- [ ] Insufficient sample amount / inappropriate container or storage
- [ ] Sample or Analysis Anomalies

Explanation (analytes and samples effected, etc.):
Matrix Spike WG74117-5 % recovery = 214%

Corrective Action:
- [ ] Results reported "As Is" and explain below (Send copy of this form to LPM)
- [ ] Sample(s) repreped and analyzed with similar unacceptable results (Send copy to LPM)
- [x] Sample repreped and analyzed, QC problems corrected.

Explanation:
The original matrix spike from prep date 4/16/04 appeared to have been spiked twice. After consulting with the QA officer, the background sample was re-prepped with an additional matrix spike and matrix spike duplicate. The resulting data resembled the original sample results of the background, lab duplicate and matrix spike duplicate. It was deamed appropriate to substitute the the re-run sample results of the background, matrix spike and matrix spike duplicate with the original sample results of the background, matrix spike and matrix spike duplicate.

Signatures:
Analyst: Brian Majdowski
Reviewer: L. A. Pelutier
Supervisor: _____

KING COUNTY METRO ENVIRONMENTAL LABORATORY
Lab QC Report - 04/28/04 08:46
Run ID: R100437 Workgroup: WG74117 (Hg-CVAA Norfolk Seds.)

SRM:WG74117-1 Matrix: SALTWTRSED Listtype: MTHG-SED Method: EPA245.5/245.2 (06-01-004-003) Project: Pkey: SED
(Std Reference Material)

Parameter	Mdl	Rdl	Units	Truevalue	SRM Value	% Rec.	Qual	LabLimit
Mercury, Total, CVAA	.1	.995	mg/Kg	3.04	2.89	95		120

MB:WG74117-2 Matrix: BLANK WTR Listtype: MTHG-SED Method: EPA245.5/245.2 (06-01-004-003) Project: Pkey: SED
(Method Blank)

Parameter	Mdl	Rdl	Units	MB Value	Qual
Mercury, Total, CVAA	.0002	.002	mg/L	<MDL	

SB:WG74117-3 MB:WG74117-2 Matrix: BLANK WTR Listtype: MTHG-SED Method: EPA245.5/245.2 (06-01-004-003) Project: Pkey: SED
(Spike Blank, Method Blank)

Parameter	Mdl	Rdl	Units	MB Value	Truevalue	SB Value	% Rec.	Qual	LabLimit
Mercury, Total, CVAA	.0002	.002	mg/L	<MDL	.005	.00511	102		85-115

LD:WG74117-4 L31635-2 Matrix: SALTWTRSED Listtype: MTHG-SED Method: EPA245.5/245.2 (06-01-004-003) Project: 423056-160 Pkey: SED
(Lab Duplicate)

Parameter	Mdl	Rdl	Units	SampValue	LD Value	RPD	Qual	LabLimit
Mercury, Total, CVAA	.02	.201	mg/Kg	<MDL	<MDL			20

MSD:WG74117-6 MS:WG74117-5 L31635-2 Matrix: SALTWTRSED Listtype: MTHG-SED Method: EPA245.5/245.2 (06-01-004-003) Project: 423056-160 Pkey: SED
(Matrix Spike Duplicate, Matrix Spike)

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	MS Value	% Rec.	Qual	LabLimit	Truevalue	MSD Value	% Rec.	Qual	LabLimit	RPD
Mercury, Total, CVAA	.02	.196	mg/Kg	<MDL	0.489	.518	106		75-125	0.487	.501	103		75-125	3

SRM:WG74117-7 Matrix: SALTWTRSED Listtype: MTHG-SED Method: EPA245.5/245.2 (06-01-004-003) Project: Pkey: SED
(Std Reference Material)

Parameter	Mdl	Rdl	Units	Truevalue	SRM Value	% Rec.	Qual	LabLimit
Mercury, Total, CVAA	.1	1.01	mg/Kg	3.04	2.89	95		120

SRM:WG74117-8 Matrix: SALTWTRSED Listtype: MTHG-SED Method: EPA245.5/245.2 (06-01-004-003) Project: Pkey: SED
(Std Reference Material)

Parameter	Mdl	Rdl	Units	Truevalue	SRM Value	% Rec.	Qual	LabLimit
Mercury, Total, CVAA	.1	1.01	mg/Kg	3.04	2.97	98		120

SRM:WG74117-9 Matrix: SALTWTRSED Listtype: MTHG-SED Method: EPA245.5/245.2 (06-01-004-003) Project: Pkey: SED
(Std Reference Material)

Parameter	Mdl	Rdl	Units	Truevalue	SRM Value	% Rec.	Qual	LabLimit
Mercury, Total, CVAA	.1	1	mg/Kg	3.04	2.86	94		120

ORGANIC CHEMISTRY QC DATA

N/M
5/17/04
MMO

King County Environmental Laboratory

WORK GROUP REPORT (wk02)

Apr 14 2004, 10:07 am

Work Group: WG74021 (BS#153-bnallfull) for Department: 7 - Organics, Trace

Created: 08-APR-04 Due: Operator: lm/km

Sample	Project Number	Project Description	PKey	C	Product	Matrix	Stat	UA	Workdate	Duedate
L31635-1	423056-160	Norfolk Cleanup Study	SED	S	BNALLFULL	SALTWTRSED	PREP	U	19-APR-04	20-MAY-04
L31635-2	423056-160	Norfolk Cleanup Study	SED	S	BNALLFULL	SALTWTRSED	PREP	U	19-APR-04	20-MAY-04
L31635-3	423056-160	Norfolk Cleanup Study	SED	S	BNALLFULL	SALTWTRSED	PREP	U	19-APR-04	20-MAY-04
L31635-4	423056-160	Norfolk Cleanup Study	SED	S	BNALLFULL	SALTWTRSED	PREP	U	19-APR-04	20-MAY-04
L31635-5	423056-160	Norfolk Cleanup Study	SED	S	BNALLFULL	SALTWTRSED	PREP	U	19-APR-04	20-MAY-04
L31635-6	423056-160	Norfolk Cleanup Study	SED	S	BNALLFULL	SALTWTRSED	PREP	U	19-APR-04	20-MAY-04
L31635-7	423056-160	Norfolk Cleanup Study	SED	S	BNALLFULL	SALTWTRSED	PREP	U	19-APR-04	20-MAY-04
L31635-8	423056-160	Norfolk Cleanup Study	SED	S	BNALLFULL	SALTWTRSED	PREP	U	19-APR-04	20-MAY-04
WG74021-1	MB			S	BNALLFULL	OTHR SOLID	PREP	U	08-APR-04	
WG74021-2	SB			S	BNALLFULL	OTHR SOLID	PREP	U	08-APR-04	
WG74021-3	MS		SED	S	BNALLFULL	SALTWTRSED	PREP	U	08-APR-04	
WG74021-4	MSD		SED	S	BNALLFULL	SALTWTRSED	PREP	U	08-APR-04	
WG74021-5	SRM			S	BNALLFULL	OTHR SOLID	PREP	U	08-APR-04	
WG74021-6	LD		SED	S	BNALLFULL	SALTWTRSED	PREP	U	08-APR-04	

Comments:

L31635-1	3 - 1/2 Grab Composite, 0 - 2 cm
L31635-2	3 - 1/2 Grab Composite, 0 - 10 cm
L31635-3	3 - 1/2 Grab Composite, 0 - 2 cm
L31635-4	3 - 1/2 Grab Composite, 0 - 10 cm
L31635-5	3 - 1/2 Grab Composite, 0 - 2 cm
L31635-6	3 - 1/2 Grab Composite, 0 - 10 cm
L31635-7	3 - 1/2 Grab Composite, 0 - 2 cm
L31635-8	3 - 1/2 Grab Composite, 0 - 10 cm
WG74021-1	MB040409
WG74021-2	WG74021-1
WG74021-3	L31635-4
WG74021-4	WG74021-3 L31635-4
WG74021-5	1944
WG74021-6	L31635-2

SOLID AND TISSUE SAMPLE EXTRACTION RECORD FOR BNA ANALYSIS
TRACE ORGANICS LABORATORY

852 A S

QC BATCH NO.: BS 153 1:1 Acetone:MeCl2 WORKGROUP NO.: WG-74021

EPA SW-846 EXTRACTION METHOD: BNALLfuLL BNA SURROGATE SPIKE I.D.#: 888 Coprostanol:

SONICATION EPA 3550 SOXHLET EPA 3540 BNA MATRIX SPIKE I.D.#: 911 A has surr + Caffeine:

Date/ Analyst	Sample Number	Project Number	Sample Description	coc	Init. Amt (g)	Spike Amount (uL)	Vf (mL)	Clean ups (GPC)	Conc. Anal.	Turn Over Date	Comments
KM/KM 4/9/04	WG-74021-1	QC	MB		30.0	888-100ul	0.5		KM	4/14/04	
	-2		SB			911A-100ul					
	-3		MS(L31635-4)								
	-4		MSD (L31635-4)								
	-5		SRM 1944		3.0	852-100ul	5.0				
	-6		LD (L31635-2)		30.0	888-100ul	0.5				
	L31635-1	423056-160	Norfolk Cleanup Study								
	-2										
	-3										
	-4										
	-5										
	-6										
	-7										
	-8										

KING COUNTY METRO ENVIRONMENTAL LABORATORY
Lab QC Report - 04/29/04 10:10
Run ID: R100631 Workgroup: WG74021 (BS#153-bnallfull)

A/M 5/12/04 JWS

MB:WG74021-1 Matrix: OTHR SOLID Listtype: ORBNALLFULL Method: EPA 3550B/8270C (7-3-01-004) Project: 423056-160 Pkey: SED
(Method Blank)

Parameter	Mdl	Rdl	Units	MB Value	Qual
N-Nitrosodimethylamine	27	53.3	ug/Kg	<MDL	
Phenol	9	18	ug/Kg	<MDL	
Bis(2-Chloroethyl)Ether	15	30	ug/Kg	<MDL	
2-Chlorophenol	8	16	ug/Kg	<MDL	
1,3-Dichlorobenzene	.26	.53	ug/Kg	<MDL	
1,4-Dichlorobenzene	.13	.264	ug/Kg	<MDL	
1,2-Dichlorobenzene	.26	.53	ug/Kg	<MDL	
Bis(2-Chloroisopropyl)Ether	15	30	ug/Kg	<MDL	
N-Nitrosodi-N-Propylamine	9	18	ug/Kg	<MDL	
Hexachloroethane	15	30	ug/Kg	<MDL	
Nitrobenzene	16	32	ug/Kg	<MDL	
Isophorone	19	38	ug/Kg	<MDL	
2-Nitrophenol	15	30	ug/Kg	<MDL	
2,4-Dimethylphenol	7	14	ug/Kg	<MDL	
Bis(2-Chloroethoxy)Methane	17	34	ug/Kg	<MDL	
2,4-Dichlorophenol	16	32	ug/Kg	<MDL	
1,2,4-Trichlorobenzene	.26	.53	ug/Kg	<MDL	
Naphthalene	14	28	ug/Kg	<MDL	
Hexachlorobutadiene	.75	1.5	ug/Kg	<MDL	
4-Chloro-3-Methylphenol	13	26.7	ug/Kg	<MDL	
Hexachlorocyclopentadiene	27	133	ug/Kg	<MDL	
2,4,6-Trichlorophenol	13	26	ug/Kg	<MDL	
2-Chloronaphthalene	16	32	ug/Kg	<MDL	
Acenaphthylene	15	30	ug/Kg	<MDL	
Dimethyl Phthalate	6	22	ug/Kg	<MDL	
2,6-Dinitrotoluene	10	20	ug/Kg	<MDL	
Acenaphthene	7	14	ug/Kg	<MDL	
2,4-Dinitrophenol	13	26.7	ug/Kg	<MDL	
4-Nitrophenol	13	26.7	ug/Kg	<MDL	
2,4-Dinitrotoluene	3	6	ug/Kg	<MDL	
Fluorene	13	26	ug/Kg	<MDL	
Diethyl Phthalate	6	12	ug/Kg	<MDL	
4-Chlorophenyl Phenyl Ether	13	26	ug/Kg	<MDL	
4,6-Dinitro-O-Cresol	13	26.7	ug/Kg	<MDL	
N-Nitrosodiphenylamine	6	40	ug/Kg	<MDL	
1,2-Diphenylhydrazine	10	20	ug/Kg	<MDL	
4-Bromophenyl Phenyl Ether	9	18	ug/Kg	<MDL	
Hexachlorobenzene	.66	1.33	ug/Kg	<MDL	
Pentachlorophenol	5	10	ug/Kg	<MDL	
Phenanthrene	4	8	ug/Kg	<MDL	
Anthracene	4	8	ug/Kg	<MDL	
Di-N-Butyl Phthalate	5	10	ug/Kg	<MDL	
Fluoranthene	8	16	ug/Kg	<MDL	
Pyrene	4	8	ug/Kg	<MDL	
Benzyl Butyl Phthalate	6	12	ug/Kg	<MDL	
Benzo(a)anthracene	2	4	ug/Kg	<MDL	
Chrysene	4	8	ug/Kg	<MDL	
3,3'-Dichlorobenzidine	13	26.7	ug/Kg	<MDL	
Bis(2-Ethylhexyl)Phthalate	6.7	14	ug/Kg	7	B
Di-N-Octyl Phthalate	8	16	ug/Kg	<MDL	
Benzo(b)fluoranthene	3	6	ug/Kg	<MDL	

KING COUNTY METRO ENVIRONMENTAL LABORATORY
Lab QC Report - 04/29/04 10:10
Run ID: R100631 Workgroup: WG74021 (BS#153-bnallfull)

MB:WG74021-1 Matrix: OTHR SOLID Listtype: ORBNALLFULL Method: EPA 3550B/8270C (7-3-01-004) Project: 423056-160 Pkey: SED
(Method Blank)

Parameter	Mdl	Rdl	Units	MB Value	Qual
Benzo(k)fluoranthene	3	6	ug/Kg	<MDL	
Benzo(a)pyrene	3	6	ug/Kg	<MDL	
Indeno(1,2,3-Cd)Pyrene	9	18	ug/Kg	<MDL	
Dibenzo(a,h)anthracene	7	14	ug/Kg	<MDL	
Benzo(g,h,i)perylene	8	16	ug/Kg	<MDL	
Aniline	130	267	ug/Kg	<MDL	
Benzyl Alcohol	6	12	ug/Kg	<MDL	
2-Methylphenol	16	38	ug/Kg	<MDL	
4-Methylphenol	16	32	ug/Kg	<MDL	
4-Chloroaniline	2.7	5.33	ug/Kg	<MDL	
Benzoic Acid	13	66.7	ug/Kg	43	B
2-Methylnaphthalene	14	28	ug/Kg	<MDL	
2,4,5-Trichlorophenol	12	24	ug/Kg	<MDL	
2-Nitroaniline	13	26.7	ug/Kg	<MDL	
3-Nitroaniline	13	26.7	ug/Kg	<MDL	
Dibenzofuran	14	28	ug/Kg	<MDL	
4-Nitroaniline	13	26.7	ug/Kg	<MDL	
Carbazole	7	14	ug/Kg	<MDL	
Coprostanol	14	28	ug/Kg	<MDL	
Caffeine	6	12	ug/Kg	<MDL	
Pyridine	27	53.3	ug/Kg	<MDL	

SB:WG74021-2 MB:WG74021-1 Matrix: OTHR SOLID Listtype: ORBNALLFULL Method: EPA 3550B/8270C (7-3-01-004) Project: 423056-160 Pkey: SED
(Spike Blank, Method Blank)

Parameter	Mdl	Rdl	Units	MB Value	Truevalue	SB Value	% Rec.	Qual	LabLimit
N-Nitrosodimethylamine	27	53.3	ug/Kg	<MDL	133.	50	37		14-101
Phenol	9	18	ug/Kg	<MDL	133.	76.5	57		10-107
Bis(2-Chloroethyl)Ether	15	30	ug/Kg	<MDL	133.	58.3	44		18-82
2-Chlorophenol	8	16	ug/Kg	<MDL	133.	64.9	49		10-102
1,3-Dichlorobenzene	.26	.53	ug/Kg	<MDL	133.	57.9	43		18-95
1,4-Dichlorobenzene	.13	.264	ug/Kg	<MDL	133.	58.6	44		21-99
1,2-Dichlorobenzene	.26	.53	ug/Kg	<MDL	133.	60	45		10-116
Bis(2-Chloroisopropyl)Ether	15	30	ug/Kg	<MDL	133.	59	44		10-104
N-Nitrosodi-N-Propylamine	9	18	ug/Kg	<MDL	133.	95.8	72		10-146
Hexachloroethane	15	30	ug/Kg	<MDL	133.	57.3	43		17-92
Nitrobenzene	16	32	ug/Kg	<MDL	133.	67.5	51		10-112
Isophorone	19	38	ug/Kg	<MDL	133.	73.8	55		10-131
2-Nitrophenol	15	30	ug/Kg	<MDL	133.	61.8	46		21-98
2,4-Dimethylphenol	7	14	ug/Kg	<MDL	133.	<MDL	0	*	10-81
Bis(2-Chloroethoxy)Methane	17	34	ug/Kg	<MDL	133.	66.8	50		19-103
2,4-Dichlorophenol	16	32	ug/Kg	<MDL	133.	65.8	49		24-103
1,2,4-Trichlorobenzene	.26	.53	ug/Kg	<MDL	133.	58.6	44		13-110
Naphthalene	14	28	ug/Kg	<MDL	133.	60.7	46		17-94
Hexachlorobutadiene	.75	1.5	ug/Kg	<MDL	133.	57.7	43		10-97
4-Chloro-3-Methylphenol	13	26.7	ug/Kg	<MDL	133.	81.4	61		50-105
Hexachlorocyclopentadiene	27	133	ug/Kg	<MDL	133.	59	44		10-109
2,4,6-Trichlorophenol	13	26	ug/Kg	<MDL	133.	68.3	51		27-98
2-Chloronaphthalene	16	32	ug/Kg	<MDL	133.	69.7	52		25-96
Acenaphthylene	15	30	ug/Kg	<MDL	133.	75.6	57		31-101
Dimethyl Phthalate	6	22	ug/Kg	<MDL	133.	91.8	69		38-114

SB:WG74021-2 MB:WG74021-1 Matrix: OTHR SOLID Listtype: ORBNALLFULL Method: EPA 3550B/8270C (7-3-01-004) Project: 423056-160 Pkey: SED
(Spike Blank, Method Blank)

Parameter	Mdl	Rdl	Units	MB Value	Truevalue	SB Value	% Rec.	Qual	LabLimit
2,6-Dinitrotoluene	10	20	ug/Kg	<MDL	133.	83	62		46-110
Acenaphthene	7	14	ug/Kg	<MDL	133.	69.1	52		29-102
2,4-Dinitrophenol	13	26.7	ug/Kg	<MDL	133.	81.3	61		10-149
4-Nitrophenol	13	26.7	ug/Kg	<MDL	133.	86.5	65		40-170
2,4-Dinitrotoluene	3	6	ug/Kg	<MDL	133.	90.3	68		35-148
Fluorene	13	26	ug/Kg	<MDL	133.	90.1	68		39-106
Diethyl Phthalate	6	12	ug/Kg	<MDL	133.	105	79		51-118
4-Chlorophenyl Phenyl Ether	13	26	ug/Kg	<MDL	133.	85.8	64		39-101
4,6-Dinitro-O-Cresol	13	26.7	ug/Kg	<MDL	133.	83.8	63		18-157
N-Nitrosodiphenylamine	6	40	ug/Kg	<MDL	133.	<MDL	0	*	11-148
1,2-Diphenylhydrazine	10	20	ug/Kg	<MDL	133.	80.7	61		32-125
4-Bromophenyl Phenyl Ether	9	18	ug/Kg	<MDL	133.	95	71		47-113
Hexachlorobenzene	.66	1.33	ug/Kg	<MDL	133.	88.8	67		40-111
Pentachlorophenol	5	10	ug/Kg	<MDL	133.	93.9	70		38-124
Phenanthrene	4	8	ug/Kg	<MDL	133.	87.4	66		57-104
Anthracene	4	8	ug/Kg	<MDL	133.	74.6	56		45-114
Di-N-Butyl Phthalate	5	10	ug/Kg	<MDL	133.	104	78		17-180
Fluoranthene	8	16	ug/Kg	<MDL	133.	103	78		55-132
Pyrene	4	8	ug/Kg	<MDL	133.	96.1	72		48-132
Benzyl Butyl Phthalate	6	12	ug/Kg	<MDL	133.	105	78		15-183
Benzo(a)anthracene	2	4	ug/Kg	<MDL	133.	104	78		69-117
Chrysene	4	8	ug/Kg	<MDL	133.	89.4	67	*	69-111
3,3'-Dichlorobenzidine	13	26.7	ug/Kg	<MDL	133.	<MDL	0	*	18-86
Bis(2-Ethylhexyl)Phthalate	6.7	14	ug/Kg	7	133.	107	75		10-182
Di-N-Octyl Phthalate	8	16	ug/Kg	<MDL	133.	113	85		10-200
Benzo(b)fluoranthene	3	6	ug/Kg	<MDL	133.	97.1	73		50-121
Benzo(k)fluoranthene	3	6	ug/Kg	<MDL	133.	110	82		58-128
Benzo(a)pyrene	3	6	ug/Kg	<MDL	133.	43.5	33		15-137
Indeno(1,2,3-Cd)Pyrene	9	18	ug/Kg	<MDL	133.	106	79		51-132
Dibenzo(a,h)anthracene	7	14	ug/Kg	<MDL	133.	107	80		53-129
Benzo(g,h,i)perylene	8	16	ug/Kg	<MDL	133.	106	79		46-126
Aniline	130	267	ug/Kg	<MDL	133.	<MDL	0	*	10-102
Benzyl Alcohol	6	12	ug/Kg	<MDL	133.	62.4	47		10-119
2-Methylphenol	16	38	ug/Kg	<MDL	133.	40.4	30		16-91
4-Methylphenol	16	32	ug/Kg	<MDL	133.	45.9	34		10-125
4-Chloroaniline	2.7	5.33	ug/Kg	<MDL	133.	<MDL	0	*	10-57
Benzoic Acid	13	66.7	ug/Kg	43	133.	59	12		10-170
2-Methylnaphthalene	14	28	ug/Kg	<MDL	133.	69.4	52		22-99
2,4,5-Trichlorophenol	12	24	ug/Kg	<MDL	133.	79.1	59		33-113
2-Nitroaniline	13	26.7	ug/Kg	<MDL	133.	80.2	60		57-95
3-Nitroaniline	13	26.7	ug/Kg	<MDL	133.	<MDL	0	*	34-72
Dibenzofuran	14	28	ug/Kg	<MDL	133.	77.6	58		37-97
4-Nitroaniline	13	26.7	ug/Kg	<MDL	133.	21	16	*	45-130
Carbazole	7	14	ug/Kg	<MDL	133.	86.6	65		44-179
Coprostanol	14	28	ug/Kg	<MDL	1330	739	55		10-159
Caffeine	6	12	ug/Kg	<MDL	133.	97.9	73		45-159
Pyridine	27	53.3	ug/Kg	<MDL	133.	<MDL	0	*	10-100

KING COUNTY METRO ENVIRONMENTAL LABORATORY
Lab QC Report - 04/29/04 10:10
Run ID: R100631 Workgroup: WG74021 (BS#153-bnallfull)

Matrix Spike Report
MS:WG74021-3 L31635-4 Matrix: SALTWTRSED Listtype: ORBNALLFULL Method: EPA 3550B/8270C (7-3-01-004) Project: 423056-160 Pkey: SED
(Matrix Spike)

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	MS Value	% Rec.	Qual	QA1Limit
N-Nitrosodimethylamine	27	53.3	ug/Kg	<MDL	133.	43	32	G	50-150
Phenol	9	18	ug/Kg	<MDL	133.	65.7	49	G	50-150
Bis(2-Chloroethyl)Ether	15	30	ug/Kg	<MDL	133.	47.4	36	G	50-150
2-Chlorophenol	8	16	ug/Kg	<MDL	133.	55.7	42	G	50-150
1,3-Dichlorobenzene	.26	.53	ug/Kg	<MDL	133.	47.9	36	G	50-150
1,4-Dichlorobenzene	.13	.264	ug/Kg	<MDL	133.	47.5	36	G	50-150
1,2-Dichlorobenzene	.26	.53	ug/Kg	<MDL	133.	49.2	37	G	50-150
Bis(2-Chloroisopropyl)Ether	15	30	ug/Kg	<MDL	133.	50.9	38	G	50-150
N-Nitrosodi-N-Propylamine	9	18	ug/Kg	<MDL	133.	80.6	60		50-150
Hexachloroethane	15	30	ug/Kg	<MDL	133.	47.8	36	G	50-150
Nitrobenzene	16	32	ug/Kg	<MDL	133.	54.1	41	G	50-150
Isophorone	19	38	ug/Kg	<MDL	133.	65.2	49	G	50-150
2-Nitrophenol	15	30	ug/Kg	<MDL	133.	52.2	39	G	50-150
2,4-Dimethylphenol	2.7	14	ug/Kg	<MDL	133.	3.4	3	X	50-150
Bis(2-Chloroethoxy)Methane	17	34	ug/Kg	<MDL	133.	60.8	46	G	50-150
2,4-Dichlorophenol	16	32	ug/Kg	<MDL	133.	65.2	49	G	50-150
1,2,4-Trichlorobenzene	.26	.53	ug/Kg	<MDL	133.	50.1	38	G	50-150
Naphthalene	14	28	ug/Kg	<MDL	133.	52.6	39	G	50-150
Hexachlorobutadiene	.75	1.5	ug/Kg	<MDL	133.	50.3	38	G	50-150
4-Chloro-3-Methylphenol	13	26.7	ug/Kg	<MDL	133.	82.8	62		50-150
Hexachlorocyclopentadiene	27	133	ug/Kg	<MDL	133.	40	30	G	50-150
2,4,6-Trichlorophenol	13	26	ug/Kg	<MDL	133.	75.5	57		50-150
2-Chloronaphthalene	16	32	ug/Kg	<MDL	133.	67.1	50		50-150
Acenaphthylene	15	30	ug/Kg	<MDL	133.	73.9	55		50-150
Dimethyl Phthalate	6	22	ug/Kg	<MDL	133.	87.9	66		50-150
2,6-Dinitrotoluene	10	20	ug/Kg	<MDL	133.	78.6	59		50-150
Acenaphthene	7	14	ug/Kg	<MDL	133.	68.5	51		50-150
2,4-Dinitrophenol	13	26.7	ug/Kg	<MDL	133.	60.8	46	G	50-150
4-Nitrophenol	13	26.7	ug/Kg	<MDL	133.	71.9	54		50-150
2,4-Dinitrotoluene	3	6	ug/Kg	<MDL	133.	81.2	61		50-150
Fluorene	13	26	ug/Kg	<MDL	133.	87.7	66		50-150
Diethyl Phthalate	6	12	ug/Kg	<MDL	133.	101	75		50-150
4-Chlorophenyl Phenyl Ether	13	26	ug/Kg	<MDL	133.	84	63		50-150
4,6-Dinitro-O-Cresol	13	26.7	ug/Kg	<MDL	133.	58.5	44	G	50-150
N-Nitrosodiphenylamine	6	40	ug/Kg	<MDL	133.	50.1	38	G	50-150
1,2-Diphenylhydrazine	10	20	ug/Kg	<MDL	133.	83.3	62		50-150
4-Bromophenyl Phenyl Ether	9	18	ug/Kg	<MDL	133.	92.8	70		50-150
Hexachlorobenzene	.66	1.33	ug/Kg	<MDL	133.	86.8	65		50-150
Pentachlorophenol	5	10	ug/Kg	<MDL	133.	91.1	68		50-150
Phenanthrene	4	8	ug/Kg	<MDL	133.	88.6	66		50-150
Anthracene	4	8	ug/Kg	<MDL	133.	87.5	66		50-150
Di-N-Butyl Phthalate	5	10	ug/Kg	<MDL	133.	106	79		50-150
Fluoranthene	8	16	ug/Kg	<MDL	133.	128	96		50-150
Pyrene	4	8	ug/Kg	5.8	133.	130	93		50-150
Benzyl Butyl Phthalate	6	12	ug/Kg	<MDL	133.	110	83		50-150
Benzo(a)anthracene	2	4	ug/Kg	2.9	133.	106	77		50-150
Chrysene	4	8	ug/Kg	<MDL	133.	90	68		50-150
3,3'-Dichlorobenzidine	13	26.7	ug/Kg	<MDL	133.	<MDL	0	X	50-150
Bis(2-Ethylhexyl)Phthalate	6.7	14	ug/Kg	15.4	133.	120	78		50-150
Di-N-Octyl Phthalate	8	16	ug/Kg	<MDL	133.	123	92		50-150

Matrix Spike Report
MS:WG74021-3 L31635-4 Matrix: SALTWTRSED Listtype: ORBNALLFULL Method: EPA 3550B/8270C (7-3-01-004) Project: 423056-160 Pkey: SED
(Matrix Spike)

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	MS Value	% Rec.	Qual	QAlLimit
Benzo(b)fluoranthene	3	6	ug/Kg	3.7	133.	97.4	70		50-150
Benzo(k)fluoranthene	3	6	ug/Kg	<MDL	133.	102	77		50-150
Benzo(a)pyrene	3	6	ug/Kg	4.6	133.	88.3	63		50-150
Indeno(1,2,3-Cd)Pyrene	9	18	ug/Kg	<MDL	133.	97.4	73		50-150
Dibenzo(a,h)anthracene	7	14	ug/Kg	<MDL	133.	96.4	72		50-150
Benzo(g,h,i)perylene	8	16	ug/Kg	<MDL	133.	97	73		50-150
Aniline	130	267	ug/Kg	<MDL	133.	<MDL	0	X	50-150
Benzyl Alcohol	6	12	ug/Kg	<MDL	133.	54.1	41	G	50-150
2-Methylphenol	16	38	ug/Kg	<MDL	133.	42.5	32	G	50-150
4-Methylphenol	16	32	ug/Kg	<MDL	133.	46.2	35	G	50-150
4-Chloroaniline	2.7	5.33	ug/Kg	<MDL	133.	<MDL	0	X	50-150
Benzoic Acid	13	66.7	ug/Kg	<MDL	133.	93.3	70		50-150
2-Methylnaphthalene	14	28	ug/Kg	<MDL	133.	65.8	49	G	50-150
2,4,5-Trichlorophenol	12	24	ug/Kg	<MDL	133.	84.1	63		50-150
2-Nitroaniline	13	26.7	ug/Kg	<MDL	133.	70.8	53		50-150
3-Nitroaniline	13	26.7	ug/Kg	<MDL	133.	<MDL	0	X	50-150
Dibenzofuran	14	28	ug/Kg	<MDL	133.	75.8	57		50-150
4-Nitroaniline	13	26.7	ug/Kg	<MDL	133.	17	13	G	50-150
Carbazole	7	14	ug/Kg	<MDL	133.	83.3	62		50-150
Coprostanol	14	28	ug/Kg	<MDL	1330	865	65		50-150
Caffeine	6	12	ug/Kg	<MDL	133.	86.2	65		50-150
Pyridine	27	53.3	ug/Kg	<MDL	133.	<MDL	0	X	50-150

Matrix Spike Duplicate Report
MSD:WG74021-4 MS:WG74021-3 L31635-4 Matrix: SALTWTRSED Listtype: ORBNALLFULL Method: EPA 3550B/8270C (7-3-01-004) Project: 423056-160 Pkey: SED
(Matrix Spike Duplicate, Matrix Spike)

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	MS Value	% Rec.	Qual	LabLimit	Truevalue	MSD Value	% Rec.	Qual	LabLimit	RPD
N-Nitrosodimethylamine	27	53.3	ug/Kg	<MDL	133.	43	32		10-119	133.	72.4	54		10-119	51
Phenol	9	18	ug/Kg	<MDL	133.	65.7	49		10-127	133.	70.6	53		10-127	8
Bis(2-Chloroethyl)Ether	15	30	ug/Kg	<MDL	133.	47.4	36		10-80	133.	62.7	47		10-80	27
2-Chlorophenol	8	16	ug/Kg	<MDL	133.	55.7	42		10-112	133.	65.9	49		10-112	15
1,3-Dichlorobenzene	.26	.53	ug/Kg	<MDL	133.	47.9	36		10-103	133.	63.7	48		10-103	29
1,4-Dichlorobenzene	.13	.264	ug/Kg	<MDL	133.	47.5	36		10-104	133.	61.9	46		10-104	24
1,2-Dichlorobenzene	.26	.53	ug/Kg	<MDL	133.	49.2	37		10-105	133.	64.1	48		10-105	26
Bis(2-Chloroisopropyl)Ether	15	30	ug/Kg	<MDL	133.	50.9	38		10-142	133.	64.8	49		10-142	25
N-Nitrosodi-N-Propylamine	9	18	ug/Kg	<MDL	133.	80.6	60		10-176	133.	69.7	52		10-176	14
Hexachloroethane	15	30	ug/Kg	<MDL	133.	47.8	36		10-89	133.	60.5	45		10-89	22
Nitrobenzene	16	32	ug/Kg	<MDL	133.	54.1	41		10-105	133.	74.6	56		10-105	31
Isophorone	19	38	ug/Kg	<MDL	133.	65.2	49		16-130	133.	77.9	58		16-130	17
2-Nitrophenol	15	30	ug/Kg	<MDL	133.	52.2	39		20-107	133.	66.3	50		20-107	25
2,4-Dimethylphenol	2.7	14	ug/Kg	<MDL	133.	3.4	3	*	10-150	133.	3.3	2	*	10-150	40
Bis(2-Chloroethoxy)Methane	17	34	ug/Kg	<MDL	133.	60.8	46		23-103	133.	73.1	55		23-103	18
2,4-Dichlorophenol	16	32	ug/Kg	<MDL	133.	65.2	49		24-142	133.	65.6	49		24-142	0
1,2,4-Trichlorobenzene	.26	.53	ug/Kg	<MDL	133.	50.1	38		10-115	133.	67	50		10-115	27
Naphthalene	14	28	ug/Kg	<MDL	133.	52.6	39		12-97	133.	68.6	51		12-97	27
Hexachlorobutadiene	.75	1.5	ug/Kg	<MDL	133.	50.3	38		10-97	133.	68	51		10-97	29
4-Chloro-3-Methylphenol	13	26.7	ug/Kg	<MDL	133.	82.8	62		48-132	133.	78.3	59		48-132	5
Hexachlorocyclopentadiene	27	133	ug/Kg	<MDL	133.	40	30		10-117	133.	44	33		10-117	10

Matrix Spike Duplicate Report
MSD:WG74021-4 MS:WG74021-3 L31635-4 Matrix: SALTWTRSED Listtype: ORBNALLFULL Method: EPA 3550B/8270C (7-3-01-004) Project: 423056-160 Pkey: SED
(Matrix Spike Duplicate, Matrix Spike)

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	MS Value	% Rec.	Qual	LabLimit	Truevalue	MSD Value	% Rec.	Qual	LabLimit	RPD
2,4,6-Trichlorophenol	13	26	ug/Kg	<MDL	133.	75.5	57		26-153	133.	73.9	55		26-153	4
2-Chloronaphthalene	16	32	ug/Kg	<MDL	133.	67.1	50		26-111	133.	75.6	57		26-111	13
Acenaphthylene	15	30	ug/Kg	<MDL	133.	73.9	55		27-132	133.	81.4	61		27-132	10
Dimethyl Phthalate	6	22	ug/Kg	<MDL	133.	87.9	66		13-162	133.	92.8	70		13-162	6
2,6-Dinitrotoluene	10	20	ug/Kg	<MDL	133.	78.6	59		10-183	133.	81.1	61		10-183	3
Acenaphthene	7	14	ug/Kg	<MDL	133.	68.5	51		25-130	133.	77.1	58		25-130	13
2,4-Dinitrophenol	13	26.7	ug/Kg	<MDL	133.	60.8	46		18-134	133.	45.8	34		18-134	30
4-Nitrophenol	13	26.7	ug/Kg	<MDL	133.	71.9	54		45-153	133.	57.7	43	*	45-153	23
2,4-Dinitrotoluene	3	6	ug/Kg	<MDL	133.	81.2	61		27-166	133.	78	58		27-166	5
Fluorene	13	26	ug/Kg	<MDL	133.	87.7	66		22-147	133.	94.2	71		22-147	7
Diethyl Phthalate	6	12	ug/Kg	<MDL	133.	101	75		31-150	133.	101	76		31-150	1
4-Chlorophenyl Phenyl Ether	13	26	ug/Kg	<MDL	133.	84	63		25-139	133.	89.3	67		25-139	6
4,6-Dinitro-O-Cresol	13	26.7	ug/Kg	<MDL	133.	58.5	44		40-145	133.	42.5	32	*	40-145	32
N-Nitrosodiphenylamine	6	40	ug/Kg	<MDL	133.	50.1	38		10-169	133.	9.9	7	*	10-169	138
1,2-Diphenylhydrazine	10	20	ug/Kg	<MDL	133.	83.3	62		16-162	133.	86.6	65		16-162	5
4-Bromophenyl Phenyl Ether	9	18	ug/Kg	<MDL	133.	92.8	70		30-146	133.	96.7	73		30-146	4
Hexachlorobenzene	.66	1.33	ug/Kg	<MDL	133.	86.8	65		18-151	133.	90.9	68		18-151	5
Pentachlorophenol	5	10	ug/Kg	<MDL	133.	91.1	68		17-170	133.	77.2	58		17-170	16
Phenanthrene	4	8	ug/Kg	<MDL	133.	88.6	66		10-200	133.	87.4	66		10-200	0
Anthracene	4	8	ug/Kg	<MDL	133.	87.5	66		10-181	133.	92.7	70		10-181	6
Di-N-Butyl Phthalate	5	10	ug/Kg	<MDL	133.	106	79		10-194	133.	100	75		10-194	5
Fluoranthene	8	16	ug/Kg	<MDL	133.	128	96		12-188	133.	104	78		12-188	21
Pyrene	4	8	ug/Kg	5.8	133.	130	93		20-174	133.	105	75		20-174	21
Benzyl Butyl Phthalate	6	12	ug/Kg	<MDL	133.	110	83		41-145	133.	105	79		41-145	5
Benzo(a)anthracene	2	4	ug/Kg	2.9	133.	106	77		32-168	133.	104	76		32-168	1
Chrysene	4	8	ug/Kg	<MDL	133.	90	68		14-184	133.	85.2	64		14-184	6
3,3'-Dichlorobenzidine	13	26.7	ug/Kg	<MDL	133.	<MDL	0	*	10-43	133.	<MDL	0	*	10-43	
Bis(2-Ethylhexyl)Phthalate	6.7	14	ug/Kg	15.4	133.	120	78		10-189	133.	118	77		10-189	1
Di-N-Octyl Phthalate	8	16	ug/Kg	<MDL	133.	123	92		52-151	133.	116	87		52-151	6
Benzo(b)fluoranthene	3	6	ug/Kg	3.7	133.	97.4	70		10-199	133.	89.4	64		10-199	9
Benzo(k)fluoranthene	3	6	ug/Kg	<MDL	133.	102	77		10-192	133.	106	79		10-192	3
Benzo(a)pyrene	3	6	ug/Kg	4.6	133.	88.3	63		10-200	133.	79.5	56		10-200	12
Indeno(1,2,3-Cd)Pyrene	9	18	ug/Kg	<MDL	133.	97.4	73		10-177	133.	85.2	64		10-177	13
Dibenzo(a,h)anthracene	7	14	ug/Kg	<MDL	133.	96.4	72		10-166	133.	81.9	61		10-166	17
Benzo(g,h,i)perylene	8	16	ug/Kg	<MDL	133.	97	73		10-173	133.	86.9	65		10-173	12
Aniline	130	267	ug/Kg	<MDL	133.	<MDL	0	*	10-67	133.	<MDL	0	*	10-67	
Benzyl Alcohol	6	12	ug/Kg	<MDL	133.	54.1	41		10-138	133.	35.2	26		10-138	45
2-Methylphenol	16	38	ug/Kg	<MDL	133.	42.5	32		10-142	133.	39.8	30		10-142	6
4-Methylphenol	16	32	ug/Kg	<MDL	133.	46.2	35		10-163	133.	34.5	26		10-163	30
4-Chloroaniline	2.7	5.33	ug/Kg	<MDL	133.	<MDL	0	*	10-49	133.	<MDL	0	*	10-49	
Benzoic Acid	13	66.7	ug/Kg	<MDL	133.	93.3	70		10-158	133.	95	71		10-158	1
2-Methylnaphthalene	14	28	ug/Kg	<MDL	133.	65.8	49		22-112	133.	80.3	60		22-112	20
2,4,5-Trichlorophenol	12	24	ug/Kg	<MDL	133.	84.1	63		23-166	133.	85.7	64		23-166	2
2-Nitroaniline	13	26.7	ug/Kg	<MDL	133.	70.8	53	*	62-89	133.	74.2	56	*	62-89	6
3-Nitroaniline	13	26.7	ug/Kg	<MDL	133.	<MDL	0	*	10-52	133.	<MDL	0	*	10-52	
Dibenzofuran	14	28	ug/Kg	<MDL	133.	75.8	57		21-134	133.	84.1	63		21-134	10
4-Nitroaniline	13	26.7	ug/Kg	<MDL	133.	17	13		10-88	133.	15	11		10-88	17
Carbazole	7	14	ug/Kg	<MDL	133.	83.3	62		16-200	133.	85.4	64		16-200	3
Coprostanol	14	28	ug/Kg	<MDL	1330	865	65		10-183	1330	798	60		10-183	8
Caffeine	6	12	ug/Kg	<MDL	133.	86.2	65		17-195	133.	85	64		17-195	2

Matrix Spike Duplicate Report
MSD:WG74021-4 MS:WG74021-3 L31635-4 Matrix: SALTWTRSED Listtype: ORBNALLFULL Method: EPA 3550B/8270C (7-3-01-004) Project: 423056-160 Pkey: SED
(Matrix Spike Duplicate, Matrix Spike)

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	MS Value	% Rec.	Qual	LabLimit	Truevalue	MSD Value	% Rec.	Qual	LabLimit	RPD
Pyridine	27	53.3	ug/Kg	<MDL	133.	<MDL	0	*	10-100	133.	<MDL	0	*	10-100	

SRM:WG74021-5 Matrix: OTHR SOLID Listtype: ORBNALLFULL Method: EPA 3550B/8270C (7-3-01-004) Project: 423056-160 Pkey: SED
(Std Reference Material)

Parameter	Mdl	Rdl	Units	Truevalue	SRM Value	% Rec.	Qual	QA1Limit	Qual	LabLimit
Naphthalene	130	2800	ug/Kg	1630	220	13	G	80-120		10-29
Phenanthrene	400	800	ug/Kg	5200	3620	70	G	80-120		51-106
Anthracene	400	800	ug/Kg	1750	800	46	G	80-120		28-98
Fluoranthene	800	1600	ug/Kg	8800	7060	80		80-120		45-126
Pyrene	400	800	ug/Kg	9570	7100	74	G	80-120		36-135
Benzo(a)anthracene	200	400	ug/Kg	4660	3820	82		80-120		66-124
Chrysene	400	800	ug/Kg	4800	4170	87		80-120		77-136
Benzo(b)fluoranthene	300	600	ug/Kg	3820	3300	86		80-120		52-190
Benzo(k)fluoranthene	300	600	ug/Kg	2270	2570	113		80-120		60-146
Benzo(a)pyrene	300	600	ug/Kg	4240	3060	72	G	80-120		60-116
Indeno(1,2,3-Cd)Pyrene	900	1800	ug/Kg	2740	2070	75	G	80-120		33-121
Dibenzo(a,h)anthracene	270	1400	ug/Kg	419.	480	114		80-120		10-200
Benzo(g,h,i)perylene	800	1600	ug/Kg	2800	2320	83		80-120		15-121

LD:WG74021-6 L31635-2 Matrix: SALTWTRSED Listtype: ORBNALLFULL Method: EPA 3550B/8270C (7-3-01-004) Project: 423056-160 Pkey: SED
(Lab Duplicate)

Parameter	Mdl	Rdl	Units	SampValue	LD Value	RPD	Qual	QA1Limit
N-Nitrosodimethylamine	27	53.3	ug/Kg	<MDL	<MDL			35
Phenol	9	18	ug/Kg	<MDL	<MDL			35
Bis(2-Chloroethyl)Ether	15	30	ug/Kg	<MDL	<MDL			35
2-Chlorophenol	8	16	ug/Kg	<MDL	<MDL			35
1,3-Dichlorobenzene	.26	.53	ug/Kg	<MDL	<MDL			35
1,4-Dichlorobenzene	.13	.264	ug/Kg	<MDL	<MDL			35
1,2-Dichlorobenzene	.26	.53	ug/Kg	<MDL	<MDL			35
Bis(2-Chloroisopropyl)Ether	15	30	ug/Kg	<MDL	<MDL			35
N-Nitrosodi-N-Propylamine	9	18	ug/Kg	<MDL	<MDL			35
Hexachloroethane	15	30	ug/Kg	<MDL	<MDL			35
Nitrobenzene	16	32	ug/Kg	<MDL	<MDL			35
Isophorone	19	38	ug/Kg	<MDL	<MDL			35
2-Nitrophenol	15	30	ug/Kg	<MDL	<MDL			35
2,4-Dimethylphenol	7	14	ug/Kg	<MDL	<MDL			35
Bis(2-Chloroethoxy)Methane	17	34	ug/Kg	<MDL	<MDL			35
2,4-Dichlorophenol	16	32	ug/Kg	<MDL	<MDL			35
1,2,4-Trichlorobenzene	.26	.53	ug/Kg	<MDL	<MDL			35
Naphthalene	14	28	ug/Kg	<MDL	<MDL			35
Hexachlorobutadiene	.75	1.5	ug/Kg	<MDL	<MDL			35
4-Chloro-3-Methylphenol	13	26.7	ug/Kg	<MDL	<MDL			35
Hexachlorocyclopentadiene	27	133	ug/Kg	<MDL	<MDL			35
2,4,6-Trichlorophenol	13	26	ug/Kg	<MDL	<MDL			35
2-Chloronaphthalene	16	32	ug/Kg	<MDL	<MDL			35
Acenaphthylene	15	30	ug/Kg	<MDL	<MDL			35

KING COUNTY METRO ENVIRONMENTAL LABORATORY
Lab QC Report - 04/29/04 10:10
Run ID: R100631 Workgroup: WG74021 (BS#153-bnallfull)

LD:WG74021-6 L31635-2 Matrix: SALTWTRSED Listtype: ORBNALLFULL Method: EPA 3550B/8270C (7-3-01-004) Project: 423056-160 Pkey: SED
(Lab Duplicate)

Parameter	Mdl	Rdl	Units	SampValue	LD Value	RPD	Qual	QAlLimit
Dimethyl Phthalate	6	22	ug/Kg	<MDL	<MDL			35
2,6-Dinitrotoluene	10	20	ug/Kg	<MDL	<MDL			35
Acenaphthene	7	14	ug/Kg	<MDL	<MDL			35
2,4-Dinitrophenol	13	26.7	ug/Kg	<MDL	<MDL			35
4-Nitrophenol	13	26.7	ug/Kg	<MDL	<MDL			35
2,4-Dinitrotoluene	3	6	ug/Kg	<MDL	<MDL			35
Fluorene	13	26	ug/Kg	<MDL	<MDL			35
Diethyl Phthalate	6	12	ug/Kg	<MDL	<MDL			35
4-Chlorophenyl Phenyl Ether	13	26	ug/Kg	<MDL	<MDL			35
4,6-Dinitro-O-Cresol	13	26.7	ug/Kg	<MDL	<MDL			35
N-Nitrosodiphenylamine	6	40	ug/Kg	<MDL	<MDL			35
1,2-Diphenylhydrazine	10	20	ug/Kg	<MDL	<MDL			35
4-Bromophenyl Phenyl Ether	9	18	ug/Kg	<MDL	<MDL			35
Hexachlorobenzene	.66	1.33	ug/Kg	<MDL	<MDL			35
Pentachlorophenol	5	10	ug/Kg	<MDL	<MDL			35
Phenanthrene	4	8	ug/Kg	7.1	<MDL			35
Anthracene	4	8	ug/Kg	<MDL	<MDL			35
Di-N-Butyl Phthalate	5	10	ug/Kg	<MDL	<MDL			35
Fluoranthene	8	16	ug/Kg	15	8.5			35
Pyrene	4	8	ug/Kg	11.8	8.05	38	E	35
Benzyl Butyl Phthalate	6	12	ug/Kg	<MDL	<MDL			35
Benzo(a)anthracene	2	4	ug/Kg	6	3.7	48	E	35
Chrysene	4	8	ug/Kg	9.41	5.1	60	E	35
3,3'-Dichlorobenzidine	13	26.7	ug/Kg	<MDL	<MDL			35
Bis(2-Ethylhexyl)Phthalate	6.7	14	ug/Kg	36.4	26.4	32		35
Di-N-Octyl Phthalate	8	16	ug/Kg	<MDL	<MDL			35
Benzo(b)fluoranthene	3	6	ug/Kg	7.68	5.5	33		35
Benzo(k)fluoranthene	3	6	ug/Kg	7.52	3.5	74	E	35
Benzo(a)pyrene	3	6	ug/Kg	8.59	6	36	E	35
Indeno(1,2,3-Cd)Pyrene	9	18	ug/Kg	<MDL	<MDL			35
Dibenzo(a,h)anthracene	7	14	ug/Kg	<MDL	<MDL			35
Benzo(g,h,i)perylene	8	16	ug/Kg	<MDL	<MDL			35
Aniline	130	267	ug/Kg	<MDL	<MDL			35
Benzyl Alcohol	6	12	ug/Kg	<MDL	<MDL			35
2-Methylphenol	16	38	ug/Kg	<MDL	<MDL			35
4-Methylphenol	16	32	ug/Kg	<MDL	<MDL			35
4-Chloroaniline	2.7	5.33	ug/Kg	<MDL	<MDL			35
Benzoic Acid	13	66.7	ug/Kg	58	60			35
2-Methylnaphthalene	14	28	ug/Kg	<MDL	<MDL			35
2,4,5-Trichlorophenol	12	24	ug/Kg	<MDL	<MDL			35
2-Nitroaniline	13	26.7	ug/Kg	<MDL	<MDL			35
3-Nitroaniline	13	26.7	ug/Kg	<MDL	<MDL			35
Dibenzofuran	14	28	ug/Kg	<MDL	<MDL			35
4-Nitroaniline	13	26.7	ug/Kg	<MDL	<MDL			35
Carbazole	7	14	ug/Kg	<MDL	<MDL			35
Coprostanol	14	28	ug/Kg	<MDL	<MDL			35
Caffeine	6	12	ug/Kg	<MDL	<MDL			35

KING COUNTY METRO ENVIRONMENTAL LABORATORY
Lab QC Report - 04/29/04 10:10
Run ID: R100631 Workgroup: WG74021 (BS#153-bnallfull)

Sample #	2-Fluorophenol	d5-Phenol	d5-Nitrobenzene	d4-2-Chlorophenol	d4-1,2-Dichlorobenzene	2-Fluorobiphenyl	2,4,6-Tribromophenol	d14-Terphenyl
(Lab Limits)	10-112	10-106	28-94	11-105	24-91	31-101	29-112	51-130
L31635-1	67	77	70	74	51	77	108	91
L31635-2	32	33	46	35	33	58	92	95
L31635-3	43	44	50	47	42	63	84	97
L31635-4	38	32	44	37	38	51	64	78
L31635-5	53	54	54	54	42	74	104	94
L31635-6	56	60	66	59	46	74	109	90
L31635-7	35	37	51	38	33	62	107	99
L31635-8	55	54	64	59	50	79	110	113
WG74021-1	21	32	49	27	39	50	22 *	98
WG74021-2	48	54	52	48	44	51	61	78
WG74021-3	39	45	42	41	37	49	66	83
WG74021-4	49	49	57	49	48	56	59	79
WG74021-5	64	61	73	68	53	81	97	89
WG74021-6	44	42	54	47	40	59	84	85

(QA1 Limits)	50-150(Acids)		50-150(Base Neutrals)
L31635-1	avg=82		avg=72
L31635-2	avg=48	G	avg=58
L31635-3	avg=55		avg=63
L31635-4	avg=43	G	avg=53
L31635-5	avg=66		avg=66
L31635-6	avg=71		avg=69
L31635-7	avg=54		avg=61
L31635-8	avg=70		avg=77
WG74021-1	avg=26	G	avg=59
WG74021-2	avg=53		avg=56
WG74021-3	avg=48	G	avg=53
WG74021-4	avg=52		avg=60
WG74021-5	avg=73		avg=74
WG74021-6	avg=54		avg=60

Definition of QA1 Qualifiers

QA1 Qualifiers are based upon QA1 Limits and are applied to the QC and the associated data.

B is applied to a sample parameter result when the analyte was detected at a concentration at or greater than the MDL in the associated batch method blank.

E indicates that for a given parameter the precision (RPD) for the sample/lab duplicate exceeded 100%.

X indicates potentially low biased data wherein the true analyte concentration may be greater than the reported value based on any of the following situations: the surrogate or the matrix spike recovery is less than 10%.

G indicates potentially low biased data wherein the true analyte concentration may be greater than the reported value based on any of the following situations: the surrogate recovery is above 10% but less than 50%, the matrix spike recovery is above 10% but less than 50%, or the standard reference material recovery is above 10% but less than 80%.

L indicates potentially high biased data wherein the true analyte concentration may be lower than the reported value based on any of the following situations: the surrogate recovery is greater than 150%, the matrix spike recovery is greater than 150%, or the standard reference material recovery is greater than 120%.

Please note that for BNA analyses, acid and base/neutral surrogates are averaged and the averages are compared to the QA1 Limits for the appropriate qualifiers to be applied to the corresponding parameters. For chlorinated pesticide/PCB analyses, organophosphorus pesticides, fuel analyses, and butyltin analyses, all surrogates must be outside the QA1 Limits for the qualifiers to be applied. For volatile analyses only one surrogate need be outside the QA1 Limits for qualifiers to be applied to the corresponding parameters. No QA1 qualifiers are applied to the fuel screen test WTPH-HCID. Please see Appendix C-QC Calculations.doc for all details.

Laboratory Qualifiers are based upon statistically derived laboratory limits that are generated from matrix matched empirical recovery or replicate results. The laboratory limits reflect the nominal performance of a method for a given matrix and are applied only to the QC results.

An asterisk (*) is applied to any QC result that is outside of laboratory method limits.

HP 6890J DILUTION LOG

King County Environmental Laboratory

Date & Initials	Sample Name/ Sample Number	Extract Vol Used (ml)	Final Vol	Dil Fac	IS #	Additional IS (ul)	Total IS (ul)
4/28/04	L3635-7	.05mL	.5mL	X10		9 uL	10 uL

HP 6890J MAINTENANCE LOG

King County Environmental Laboratory

Date & Initials	Maintenance Description

GPC SAMPLE LOG

Date	Sample #	Project #	Method	Inject Vol.	Dump Time	Collect Time	Wash Time	Analyst	Comments
4/13/04	Calib	B/23056160	BNA	8.0 ml	21:00	28:00	4:00 min	LM/KM	22°C left GPC
	WG74021-1								
	-2								
	-3								
	-4		"						
	-5								
	-6								
	L31635-1								
	-2								
	-3								
	-4								
	-5								
	-6								
	-7								
	-8								
	Rinse								
	WG74022-1		P/P		29:00	20:00		LM/KM	21°C left
	-2								
	-3								
	-4								
	-5								
	-6								
	L31635-1								
	-2							"	
	-3								
	-4								
	-5								
	-6								
	-7								
	-8								
	Rinse								

Batch: /chem/6890j.i/040421.b

#	Smp. #	Injection Time	Wkgp. #	QC #	Project #	Sample Description	Matrix	Amount	DilFac	IS#2-RT	IS#2-Area	Method	Init Cali	Analyst
1	COND-1	21-APR-2004 08:44	040421	040421	421195	20 PPM CONDITION	WATER	0.000	1.0	10.115	590309	8270b.m	21-APR-2004	M.Doubrava
2	BLANK-1	21-APR-2004 09:21	040421	040421	421195	MECL2 INSTRUMENT BLANK	WATER	0.000	1.0	0.000	0	8270b.m	21-APR-2004	M.Doubrava
3	DFTPP-1	21-APR-2004 09:59	040421	040421		10 NG DFTPP MIX	WATER	0.000	1.0	13.748	103808	dftpp.m		M. Doubrava
4	CALI-3	21-APR-2004 10:38	040421	040421	421195	SS#911 K 0.020 PPM	WATER	0.000	1.0	10.115	384512	8270b.m	21-APR-2004	M.Doubrava
5	CCALI-1	21-APR-2004 11:16	040421	040421	421195	SS#911 D 6.0 PPM	WATER	0.000	1.0	10.110	779680	8270b.m	21-APR-2004	M.Doubrava
6	BLANK-2	21-APR-2004 11:55	040421	040421	421195	MECL2 INSTRUMENT BLANK	WATER	0.000	1.0	0.000	0	8270b.m	21-APR-2004	M.Doubrava
7	zzWG74021-1	21-APR-2004 12:39	WG74021	BS#153	423056-10	WG74021-1 MB NORFOLK	SOIL	18.750	0.5	10.115	414383	8270b.m	21-APR-2004	M.Doubrava
8	WG74115-1	21-APR-2004 13:17	WG74115	BS#154	423056-10	WG74115-1 MB DENNY WAY	SOIL	18.750	0.5	10.115	820452	8270b.m	21-APR-2004	M.Doubrava
9	WG74021-2	21-APR-2004 13:55	WG74021	BS#153	423056-10	WG74021-2 SB NORFOLK	SOIL	18.750	0.5	10.115	920760	8270b.m	21-APR-2004	M.Doubrava
10	WG74115-2	21-APR-2004 14:34	WG74115	BS#154	423056-80	WG74115-2 SB DENNY WAY	SOIL	18.750	0.5	10.115	555865	8270b.m	21-APR-2004	M.Doubrava
11	WG74021-3	21-APR-2004 15:12	WG74021	BS#153	423056-10	WG74021-3 MS L31635-4 NORFOL	SOIL	18.750	0.5	10.115	927279	8270b.m	21-APR-2004	M.Doubrava
12	WG74021-4	21-APR-2004 15:51	WG74021	BS#153	423056-10	WG74021-4 MSD L31635-4 NORFO	SOIL	18.750	0.5	10.115	461779	8270b.m	21-APR-2004	M.Doubrava
13	WG74021-5	21-APR-2004 16:29	WG74021	BS#153	423056-10	WG74021-5 SRM 1944 NORFOLK	SOIL	1.875	5.0	7.638	976277	8270b.m	21-APR-2004	M.Doubrava
14	WG74115-5	21-APR-2004 17:07	WG74115	BS#154	423368-80	WG74115-5 SRM 1944 DENNY WAY	SOIL	1.875	5.0	7.633	754163	8270b.m	21-APR-2004	M.Doubrava
15	WG74021-6	21-APR-2004 17:45	WG74021	BS#153	423056-10	WG74021-6 LD L31635-2 NORFOL	SOIL	18.750	0.5	10.120	539234	8270b.m	21-APR-2004	M.Doubrava
16	zzL31635-2	21-APR-2004 18:23	WG74021	BS#153	423056-10	L31635-2 NORFOLK	SOIL	18.750	0.5	10.120	330892	8270b.m	21-APR-2004	M.Doubrava
17	L31635-3	21-APR-2004 19:01	WG74021	BS#153	423056-10	L31635-3 NORFOLK	SOIL	18.750	0.5	10.120	453127	8270b.m	21-APR-2004	M.Doubrava
18	L31635-4	21-APR-2004 19:40	WG74021	BS#153	423056-10	L31635-4 NORFOLK	SOIL	18.750	0.5	10.120	392614	8270b.m	21-APR-2004	M.Doubrava
19	DFTPP-2	21-APR-2004 20:19	040421	040421		10 NG DFTPP MIX	WATER	0.000	1.0	13.748	197312	dftpp.m		M. Doubrava
20	CCALI-2	21-APR-2004 20:58	040421	040421	421195	SS#911 D 6.0 PPM	WATER	0.000	1.0	10.115	861856	8270b.m	21-APR-2004	M.Doubrava
21	WG74115-3	21-APR-2004 21:37	WG74115	BS#154	423368-80	WG74115-3 MS L31677-1 DENNY	SOIL	18.750	0.5	10.120	507308	8270b.m	21-APR-2004	M.Doubrava
22	WG74115-4	21-APR-2004 22:15	WG74115	BS#154	423368-80	WG74115-4 MSD L31677-1 DENNY	SOIL	18.750	0.5	10.120	485446	8270b.m	21-APR-2004	M.Doubrava
23	zzL31635-1	21-APR-2004 22:53	WG74021	BS#153	423056-10	L31635-1 NORFOLK	SOIL	18.750	0.5	10.125	325751	8270b.m	21-APR-2004	M.Doubrava
24	L31635-5	21-APR-2004 23:31	WG74021	BS#153	423056-10	L31635-5 NORFOLK	SOIL	18.750	0.5	10.125	539270	8270b.m	21-APR-2004	M.Doubrava
25	L31635-6	22-APR-2004 00:08	WG74021	BS#153	423056-10	L31635-6 NORFOLK	SOIL	18.750	0.5	10.125	709118	8270b.m	21-APR-2004	M.Doubrava
26	zzL31635-7	22-APR-2004 00:46	WG74021	BS#153	423056-10	L31635-7 NORFOLK	SOIL	18.750	0.5	10.129	358513	8270b.m	21-APR-2004	M.Doubrava
27	L31635-8	22-APR-2004 01:23	WG74021	BS#153	423056-10	L31635-8 NORFOLK	SOIL	18.750	0.5	10.125	730201	8270b.m	21-APR-2004	M.Doubrava
28	L31677-1	22-APR-2004 02:39	WG74115	BS#154	423368-80	L31677-1 DENNY WAY	SOIL	18.750	0.5	10.130	482797	8270b.m	21-APR-2004	M.Doubrava
29	zzL31677-2	22-APR-2004 03:17	WG74115	BS#154	423368-80	L31677-2 DENNY WAY	SOIL	18.750	0.5	10.130	459691	8270b.m	21-APR-2004	M.Doubrava
30	L31677-3	22-APR-2004 03:54	WG74115	BS#154	423368-80	L31677-3 DENNY WAY	SOIL	18.750	0.5	10.134	559980	8270b.m	21-APR-2004	M.Doubrava
31	L31677-4	22-APR-2004 04:31	WG74115	BS#154	423368-80	L31677-4 DENNY WAY	SOIL	18.750	0.5	10.139	727880	8270b.m	21-APR-2004	M.Doubrava
32	zzL31677-5	22-APR-2004 05:09	WG74115	BS#154	423368-80	L31677-5 DENNY WAY	SOIL	18.750	0.5	10.139	272529	8270b.m	21-APR-2004	M.Doubrava
33	zzL31677-6	22-APR-2004 05:47	WG74115	BS#154	423368-80	L31677-6 DENNY WAY	SOIL	18.750	0.5	10.139	329871	8270b.m	21-APR-2004	M.Doubrava
34	zzL31677-7	22-APR-2004 06:25	WG74115	BS#154	423368-80	L31677-7 DENNY WAY	SOIL	18.750	0.5	10.082	699	8270b.m	21-APR-2004	M.Doubrava
35	DFTPP-3	22-APR-2004 07:02	040421	040421		10 NG DFTPP MIX	WATER	0.000	1.0	13.762	85540	dftpp.m		M. Doubrava
36	CCALI-3	22-APR-2004 07:41	040421	040421	421195	SS#911 D 6.0 PPM	WATER	0.000	1.0	10.134	565930	8270b.m	21-APR-2004	M.Doubrava

Samples: 16 QC Samples + Misc.: 14 ContinuingCals: 2 Tunes: 3 Calibrations: 1

Batch: /chem/6890j.i/040426.b

#	Smp. #	Injection Time	Wkgp. #	QC #	Project #	Sample Description	Matrix	Amount	DilFac	IS#2-RT	IS#2-Area	Method	Init Cali	Analyst
1	DFTPP-1	26-APR-2004 12:25	040426	040426		10 NG DFTPP MIX	WATER	0.000	1.0	13.739	212480	dftpp.m		M. Doubrava
2	CCALI-1	26-APR-2004 13:04	040426	040426	421195	SS#911 D 6.0 PPM	WATER	0.000	1.0	10.106	563113	8270b.m	21-APR-2004	M.Doubrava
3	BLANK-2	26-APR-2004 13:44	040426	040426	421195	MECL2 INSTRUMENT BLANK	WATER	0.000	1.0	0.000	0	8270b.m	21-APR-2004	M.Doubrava
4	WG74021-1	26-APR-2004 14:24	WG74021	BS#153	423056-16	WG74021-1 MB NORFOLK	SOIL	18.750	0.5	10.106	546205	8270b.m	21-APR-2004	M.Doubrava
5	L31635-1	26-APR-2004 15:06	WG74021	BS#153	423056-16	L31635-1 NORFOLK	SOIL	18.750	0.5	10.120	890260	8270b.m	21-APR-2004	M.Doubrava
6	L31635-2	26-APR-2004 15:47	WG74021	BS#153	423056-16	L31635-2 NORFOLK	SOIL	18.750	0.5	10.120	541529	8270b.m	21-APR-2004	M.Doubrava
7	L31635-7	26-APR-2004 16:29	WG74021	BS#153	423056-16	L31635-7 NORFOLK	SOIL	18.750	0.5	10.115	599903	8270b.m	21-APR-2004	M.Doubrava
8	WG74115-6	26-APR-2004 17:10	WG74115	BS#154	423056-80	WG74115-6 LD L31677-3 DENNY	SOIL	18.750	0.5	10.120	482023	8270b.m	21-APR-2004	M.Doubrava
9	L31677-1	26-APR-2004 17:51	WG74115	BS#154	423056-80	L31677-1 DENNY WAY	SOIL	18.750	0.5	10.125	635804	8270b.m	21-APR-2004	M.Doubrava
10	L31677-2	26-APR-2004 18:32	WG74115	BS#154	423056-80	L31677-2 DENNY WAY	SOIL	18.750	0.5	10.125	553890	8270b.m	21-APR-2004	M.Doubrava
11	L31677-5	26-APR-2004 19:12	WG74115	BS#154	423056-80	L31677-5 DENNY WAY	SOIL	18.750	0.5	10.129	837929	8270b.m	21-APR-2004	M.Doubrava
12	L31677-6	26-APR-2004 19:52	WG74115	BS#154	423056-80	L31677-6 DENNY WAY	SOIL	18.750	0.5	10.129	723409	8270b.m	21-APR-2004	M.Doubrava
13	L31677-7	26-APR-2004 20:32	WG74115	BS#154	423056-80	L31677-7 DENNY WAY	SOIL	18.750	0.5	10.130	391362	8270b.m	21-APR-2004	M.Doubrava
14	DFTPP-2	26-APR-2004 21:10	040426	040426		10 NG DFTPP MIX	WATER	0.000	1.0	13.753	104131	dftpp.m		M. Doubrava
15	CCALI-2	26-APR-2004 21:48	040426	040426	421195	SS#911 D 6.0 PPM	WATER	0.000	1.0	10.130	375016	8270b.m	21-APR-2004	M.Doubrava

Samples: 8 QC Samples + Misc.: 4 ContinuingCals: 1 Tunes: 2 Calibrations: 0

Sequence Name: C:\MSDCHEM\1\SEQUENCE\040421.S
Comment:
Operator:
Data Path: C:\MSDchem\1\data\040421\
Pre-Seq Cmd:
Post-Seq Cmd:

Method Sections To Run
(X) Full Method
( ) Reprocessing Only

On A Barcode Mismatch
(X) Inject Anyway
( ) Don't Inject

Line	Type	Vial	DataFile	Method	Sample Name
1	Inst. Spk	1	COND-1	8270B	20 PPM CONDITION
2	Inst. Blk	2	BLANK-1	8270B	MECL2 INSTRUMENT BLANK
3	Tune	3	DFTPP-1	DFTPP	10 NG DFTPP MIX
4	Sample	4	CALI-3	8270B	SS#911 K 0.020 PPM
5	Cont.Cal	5	CCALI-1	8270B	SS#911 D 6.0 PPM
6	Inst. Blk	6	BLANK-2	8270B	MECL2 INSTRUMENT BLANK
7	Blank	7	74021-1	8270B	WG74021-1 MB NORFOLK - Rerun
8	Blank	8	74115-1	8270B	WG74115-1 MB DENNY WAY
9	SB	9	74021-2	8270B	WG74021-2 SB NORFOLK
10	SB	10	74115-2	8270B	WG74115-2 SB DENNY WAY
11	MS	11	74021-3	8270B	WG74021-3 MS L31635-4 NORFOLK
12	MSD	12	74021-4	8270B	WG74021-4 MSD L31635-4 NORFOL
13	SRM	13	74021-5	8270B	WG74021-5 SRM 1944 NORFOLK
14	SRM	14	74115-5	8270B	WG74115-5 SRM 1944 DENNY WAY
15	LD	15	74021-6	8270B	WG74021-6 LD L31635-2 NORFOLK
16	Sample	16	31635-2	8270B	L31635-2 NORFOLK - Rerun
17	Sample	17	31635-3	8270B	L31635-3 NORFOLK
18	Sample	18	31635-4	8270B	L31635-4 NORFOLK
19	Tune	3	DFTPP-2	DFTPP	10 NG DFTPP MIX
20	Sample	5	CCALI-2	8270B	SS#911 D 6.0 PPM
21	MS	19	74115-3	8270B	WG74115-3 MS L31677-1 DENNY W
22	MSD	20	74115-4	8270B	WG74115-4 MSD L31677-1 DENNY
23	Sample	21	31635-1	8270B	L31635-1 NORFOLK - Rerun
24	Sample	22	31635-5	8270B	L31635-5 NORFOLK
25	Sample	23	31635-6	8270B	L31635-6 NORFOLK
26	Sample	24	31635-7	8270B	L31635-7 NORFOLK - Rerun
27	Sample	25	31635-8	8270B	L31635-8 NORFOLK
28	LD	26	74115-6	8270B	WG74115-6 LD L31677-3 DENNY W - Rerun
29	Sample	27	31677-1	8270B	L31677-1 DENNY WAY - Rerun
30	Sample	28	31677-2	8270B	L31677-2 DENNY WAY - Rerun
31	Sample	29	31677-3	8270B	L31677-3 DENNY WAY
32	Sample	30	31677-4	8270B	L31677-4 DENNY WAY
33	Sample	31	31677-5	8270B	L31677-5 DENNY WAY - Rerun
34	Sample	32	31677-6	8270B	L31677-6 DENNY WAY - Rerun
35	Sample	33	31677-7	8270B	L31677-7 DENNY WAY - Rerun
36	Tune	3	DFTPP-3	DFTPP	10 NG DFTPP MIX
37	Sample	5	CCALI-3	8270B	SS#911 D 6.0 PPM

Sequence Name: C:\MSDCHEM\1\SEQUENCE\040426.S
Comment:
Operator:
Data Path: C:\MSDchem\1\data\040426\
Pre-Seq Cmd:
Post-Seq Cmd:

Method Sections To Run
(X) Full Method
( ) Reprocessing Only

On A Barcode Mismatch
(X) Inject Anyway
( ) Don't Inject

Line	Type	Vial	DataFile	Method	Sample Name
1	Inst. Spk	1	COND-1	8270B	20 PPM CONDITION
2	Inst. Blk	2	BLANK-1	8270B	MECL2 INSTRUMENT BLANK
3	Tune	3	DFTPP-1	DFTPP	10 NG DFTPP MIX
4	Cont.Cal	4	CCALI-1	8270B	SS#911 D 6.0 PPM
5	Inst. Blk	5	BLANK-2	8270B	MECL2 INSTRUMENT BLANK
6	Blank	6	74021-1	8270B	WG74021-1 MB NORFOLK
7	Sample	7	31635-1	8270B	L31635-1 NORFOLK
8	Sample	8	31635-2	8270B	L31635-2 NORFOLK
9	Sample	9	31635-7	8270B	L31635-7 NORFOLK -also X to delete
10	LD	10	74115-6	8270B	WG74115-6 LD L31677-3 DENNY W
11	Sample	11	31677-1	8270B	L31677-1 DENNY WAY
12	Sample	12	31677-2	8270B	L31677-2 DENNY WAY
13	Sample	13	31677-5	8270B	L31677-5 DENNY WAY
14	Sample	14	31677-6	8270B	L31677-6 DENNY WAY
15	Sample	15	31677-7	8270B	L31677-7 DENNY WAY ~~[illegible]~~
16	Tune	3	DFTPP-2	DFTPP	10 NG DFTPP MIX
17	MSD	4	CCALI-2	8270B	SS#911 D 6.0 PPM

Sequence Name: C:\MSDCHEM\1\SEQUENCE\040428.S
Comment:
Operator:
Data Path: C:\MSDchem\1\data\040428\
Pre-Seq Cmd:
Post-Seq Cmd:

Method Sections To Run
(X) Full Method
( ) Reprocessing Only

On A Barcode Mismatch
(X) Inject Anyway
( ) Don't Inject

Line	Type	Vial	DataFile	Method	Sample Name
1	Inst. Spk	1	COND-1	8270B	20 PPM CONDITION
2	Inst. Blk	2	BLANK-1	8270B	MECL2 INSTRUMENT BLANK
3	Tune	3	DFTPP-1	DFTPP	10 NG DFTPP MIX
4	Cont.Cal	4	CCALI-1	8270B	SS#911 D 6.0 PPM
5	Inst. Blk	5	BLANK-2	8270B	MECL2 INSTRUMENT BLANK
6	Sample	6	31635-7X	8270B	L31635-7 NORFOLK X 10 DIL
7	Sample	7	EDC-01	8270B	10 PPM ECD/PEST MIX
8					

Corrective Action

King County
Department of
Natural Resources and Parks

Date Occurred: 4/21/04
Date Recognized: 4/22/04
Reported by: DUGRAVA

WG #: WG74021/WG74115
Batch #: 35453
Project #: 423056-100
Sample(s) #: WG74021-4

Method: ☒ BNA ☐ CLPESTPCB ■ VOA-GCMS
☐ NWTPH-HCID ☐ NWTPH-DX ☐ NWTPH-GX
☐ HERB ☐ OPPEST ☐ BUTYL TIN
☐ BNA-LVI ☐ AIRTOX ☐ PCB ☐ PEST
☐ AIR-SULFUR ☐ EDC-LVI ☐ _____

Matrix: ☐ Liquid ☐ Solid ☐ Air ☐ Tissue ☐ Calibration ☐ _____

Instrument: GCMS: HP6890 ☐ D ☐ E ☐ J ☐ K ☐ L ☐ M ☐ _____
GC: HP6890 ☐ F ECD ☐ G ECD ☐ H FID ☐ H O14450PID/FID
☐ I FID ☐ _____

Other: ☐ Extraction ☐ GPC ☐ _____

Type of Occurrence:

☒ Out of Control Values: ☐ Surrogate Recoveries ☐ MS/MSD/Blank spike Recoveries ☐ Blank Contamination
☐ MS/MSD RPDs ☐ Continuing Calibration Checks
☒ Performance Checks ☐ Initial Calibration
☐ Sample/LD RPDs ☐ SRM ☐ Other _____

☐ Holding time exceeded by _____ days

Explanation: (include out of control values and associated limits, if applicable)

(*) WG74021-4 MSD - ISTD #6 Dip propylene exceeded -50% from CCAL area counts. (-53.6%). ALL other ISTDS are with QA/QC limits, surrogates within QA/QC limits and spikes within QA/QC limits

(*) samples WG74021-1, L31635-2, L31635-1, L31635-7, WG74115-6, L31677-1, L31677-2, L31677-5, L31677-6, L31677-7 failed ISTD area QA/QC - samples reanalyzed 4/26/04

☐ See QAQC Summary Sheet Batch #_____ for values and limits. ☐ **See reverse side for more**

Corrective Action:

☒ Sample(s) processed "AS IS" ☒ Sample(s) reanalyzed ☐ Sample(s) reextracted and reanalyzed
☐ Other: _____

Are there any impacts on the data? NO

Signatures:

Analyst: [signature] Date: 4/28/04
QA Officer (for QA1 Projects): _____ Date: _____
Reviewer: Dana McWalter Date: 5/17/04
Supervisor: _____ Date: _____

0520 (9/03)

Semi-Volatile Mass Spectroscopy Completion Sheet

WG#s: WG74021 / WG74115 **Batch#s:** BS# 153 / BS# 154

Analysis Date: 4/21 - 4/22 - 4/28

Instrument: HP6890 J ☒ Full Scan ☐ SIM

Methods: ☐ BNA ☐ BNA-SUR ☐ BN-LVI ☐ A-LVI ☐ EDC-BNA-LVI ☒ BNALL
☐ OPPEST ☐ BUTYLTINS ☐ EDC-LVI ☐ Other: _____

Matrices: ☐ Liquids ☒ Solids ☐ Tissues ☐ Calibration ☐ Other: _____

Instrument File Information Folder:
- ☒ Injection Log
- ☒ Tune
- ☒ Initial Calibration Curve
- ☒ Continuing Calibration/Check Standards
- ☒ Instrument method (calibration file only)
- ☐ LVI curve/continuing qualifiers (if necessary)
- ☒ Raw data reports/chromatograms/mass spectra
- ☒ SEED3 Reports
- ☒ Sequence Report

TC* Package:
- ☐ QC Report
- ☐ WKGP Sheet
- ☐ Extraction Sheet
- ☐ Dilution Log (if necessary)
- ☐ Corrective Action Form
- ☐ Injection Log
- ☐ SEED3 Reports
- ☐ GPC log (QA2 only)

* (If TC = Diane, please place WKGP sheet on top)

Information Folder (may be part of instrument file folder):
- ☒ QC Report
- ☒ WKGP Sheet
- ☒ Extraction Sheet
- ☒ Dilution Log (if necessary)
- ☒ Corrective Action Form
- ☒ Injection Log
- ☒ GPC log (QA2 only)

QC Package:
- ☐ QC Report
- ☐ WKGP Sheet
- ☐ Extraction Sheet
- ☐ Dilution Log (if necessary)
- ☐ Corrective Action Form
- ☐ Injection Log
- ☐ GPC log (QA2 only)

Reviewed	Yes	No	N/A	CAF	
☒	☐	☐	☐	☐	Tune passed SOP criteria
☒	☐	☐	☐	☐	Samples run within 12 hours shift
☒	☐	☐	☐	☐	Initial calibration meets method SCC/CCC SOP criteria
☒	☐	☐	☐	☐	Continuing calibration meets method SCC/CCC SOP criteria
☒	☐	☐	☐	☐	ISTD area counts meets method SOP criteria
☒	☐	☐	☐	☐	Correct extraction/dilution information
☒	☐	☐	☐	☐	Correct surrogate/matrix spike true values
☒	☐	☐	☐	☐	Correct project QC limits applied (STD/QA1)
☒	☐	☐	☐	☐	Correct project blank/QA1/LVI qualifiers applied
☒	☐	☐	☐	☒	CAF addresses QC anomalies (when necessary)
☒	☐	☐	☐	☐	Independent check standard run with initial calibration

Other: _____

Analyst: [signature] **Date:** 4/30/04

Reviewer: Diana Walker **Date:** 5/17/04

Moved to EDS: _____ **Date:** _____

King County Environmental Laboratory

WORK GROUP REPORT (wk02)

Apr 15 2004, 11:58 am

Work Group: WG74022 (PPS#296-pcbll) for Department: 7 - Organics, Trace

Created: 08-APR-04 Due: Operator: lm/km

Sample	Project Number	Project Description	PKey	C	Product	Matrix	Stat	UA	Workdate	Duedate
L31635-1	423056-160	Norfolk Cleanup Study	SED	S	PCBLL	SALTWTRSED	PREP	U	19-APR-04	20-MAY-04
L31635-2	423056-160	Norfolk Cleanup Study	SED	S	PCBLL	SALTWTRSED	PREP	U	19-APR-04	20-MAY-04
L31635-3	423056-160	Norfolk Cleanup Study	SED	S	PCBLL	SALTWTRSED	PREP	U	19-APR-04	20-MAY-04
L31635-4	423056-160	Norfolk Cleanup Study	SED	S	PCBLL	SALTWTRSED	PREP	U	19-APR-04	20-MAY-04
L31635-5	423056-160	Norfolk Cleanup Study	SED	S	PCBLL	SALTWTRSED	PREP	U	19-APR-04	20-MAY-04
L31635-6	423056-160	Norfolk Cleanup Study	SED	S	PCBLL	SALTWTRSED	PREP	U	19-APR-04	20-MAY-04
L31635-7	423056-160	Norfolk Cleanup Study	SED	S	PCBLL	SALTWTRSED	PREP	U	19-APR-04	20-MAY-04
L31635-8	423056-160	Norfolk Cleanup Study	SED	S	PCBLL	SALTWTRSED	PREP	U	19-APR-04	20-MAY-04
WG74022-1	MB			S	PCBLL	OTHR SOLID	PREP	U	08-APR-04	
WG74022-2	SB			S	PCBLL	OTHR SOLID	PREP	U	08-APR-04	
WG74022-3	MS		SED	S	PCBLL	SALTWTRSED	PREP	U	08-APR-04	
WG74022-4	MSD		SED	S	PCBLL	SALTWTRSED	PREP	U	08-APR-04	
WG74022-5	SRM			S	PCBLL	OTHR SOLID	PREP	U	08-APR-04	
WG74022-6	LD		SED	S	PCBLL	SALTWTRSED	PREP	U	08-APR-04	

Comments:

L31635-1	3 - 1/2 Grab Composite, 0 - 2 cm ✓
L31635-2	3 - 1/2 Grab Composite, 0 - 10 cm
L31635-3	3 - 1/2 Grab Composite, 0 - 2 cm
L31635-4	3 - 1/2 Grab Composite, 0 - 10 cm
L31635-5	3 - 1/2 Grab Composite, 0 - 2 cm
L31635-6	3 - 1/2 Grab Composite, 0 - 10 cm
L31635-7	3 - 1/2 Grab Composite, 0 - 2 cm
L31635-8	3 - 1/2 Grab Composite, 0 - 10 cm
WG74022-1	MB040409
WG74022-2	WG74022-1
WG74022-3	L31635-3
WG74022-4	WG74022-3 L31635-3
WG74022-5	HS2
WG74022-6	L31635-2

SOLID AND TISSUE SAMPLE EXTRACTION RECORD FOR PESTICIDE / PCB ANALYSIS
TRACE ORGANICS LABORATORY

1:1 MeCL2:Acetone
QC BATCH NO.: PPS #-296 PCBLL
EPA SW-846 EXTRACTION METHOD:
SONICATION EPA 3550 SOXHLET EPA 3540

WORKGROUP NO.: WG-74022
~~PESTLL~~ ~~PESTICIDE~~ SURROGATE SPIKE: 865
PCBLL ~~PESTICIDE~~ MATRIX SPIKE: 891

Date/ Analyst	Sample Number	Project Number	Sample Description	coc	Initial Amt. (g)	Spike Amount (ul)	Vf (ml)	Cleanups (GPC,AL TBA,H+)	Conc. Anlyst	Turn Over Date	Comments
LM/KM 4/19/04	WG-74022-1	QC	MB		20	865-160ul	1.0		LM	4/19/04	
	-2		SB			865-160ul 891-200ul					
	-3		MS (L31635-3)								
	-4		MSD (L31635-3)								
	-5		SRM 1952		5.0	865-160ul					
	-6		LD (L31635-2)		20						
	L31635-1	423056-160	Norfolk Cleanup Study								
	-2										
	-3										
	-4										
	-5										
	-6										
	-7										
	-8										

Data File Name	Sample Name	Date Acquired	Vial Numb	Sample Amount	Sample Multiple	Isodrin (RT)	Isodrin (Height)	Leptophos (RT)	Leptophos (Height)	Isodrin #2 (RT)	Isodrin #2 (Height)	Leptoph (RT)	Leptophos #2 (Height)	Misc Info	Data File Path
COND-01.D	Conditioner	4/20/2004 15:03	1	1	1										O:\HPCHEM\1\DATA\040420\
BLANK-01.D	Blank	4/20/2004 15:39	2	1	1										O:\HPCHEM\1\DATA\040420\
PCB-01.D	23D 1016/1260 PCB 500/50 (CAL CHECK	4/20/2004 16:16	3	1	1	13.551	661131663	20.281	779412000	15.763	100542635	24.484	33343120		O:\HPCHEM\1\DATA\040420\
PCB-02.D	787.3 1248 PCB 500/50 (CAL CHECK)	4/20/2004 16:52	4	1	1	13.552	703626259	20.278	750856094	15.761	99627741	24.482	33931380		O:\HPCHEM\1\DATA\040420\
PCB-03.D	786.3 1254 PCB 500/50 (CAL CHECK)	4/20/2004 17:29	5	1	1	13.552	821626769	20.280	939639012	15.762	124800485	24.480	42544374		O:\HPCHEM\1\DATA\040420\
WG74022-1.D	MB 040409	4/20/2004 18:06	6	12.5	1	13.553	578313084	20.278	636875627	15.762	89444190	24.481	32334882	WG74022; PPS296 PCBLL H+; NORFOLK SOIL	O:\HPCHEM\1\DATA\040420\
WG74022-2.D	SB	4/20/2004 18:42	7	12.5	1	13.554	590019367	20.283	695024442	15.761	85785224	24.479	29821234	WG74022; PPS296 PCBLL H+; NORFOLK SOIL	O:\HPCHEM\1\DATA\040420\
WG74022-3.D	MS L31635-3	4/20/2004 19:19	8	12.5	1	13.553	551863622	20.280	656100495	15.762	85533213	24.480	32236369	WG74022; PPS296 PCBLL H+; NORFOLK SOIL	O:\HPCHEM\1\DATA\040420\
WG74022-4.D	MSD L31635-3	4/20/2004 19:55	9	12.5	1	13.553	530302166	20.280	659714771	15.763	84522823	24.480	31953907	WG74022; PPS296 PCBLL H+; NORFOLK SOIL	O:\HPCHEM\1\DATA\040420\
WG74022-5.D	HS2	4/20/2004 20:32	10	3.125	1	13.560	336294804	20.296	682776474	15.768	24337723	24.481	34525850	WG74022; PPS296 PCBLL H+; NORFOLK SOIL	O:\HPCHEM\1\DATA\040420\
WG74022-6.D	L31635-2	4/20/2004 21:09	11	12.5	1	13.554	512305373	20.283	650390277	15.760	73035122	24.477	31701578	WG74022; PPS296 PCBLL H+; NORFOLK SOIL	O:\HPCHEM\1\DATA\040420\
L31635-1.D	NORFOLK SEDS	4/20/2004 21:45	12	12.5	1	13.554	400075848	20.287	619833546	15.764	64147228	24.481	33835258	WG74022; PPS296 PCBLL H+; NORFOLK SOIL	O:\HPCHEM\1\DATA\040420\
L31635-2.D	NORFOLK SEDS	4/20/2004 22:22	13	12.5	1	13.554	509543761	20.282	675410691	15.763	76285836	24.481	33982904	WG74022; PPS296 PCBLL H+; NORFOLK SOIL	O:\HPCHEM\1\DATA\040420\
L31635-3.D	NORFOLK SEDS	4/20/2004 22:58	14	12.5	1	13.554	541744727	20.282	682583883	15.762	83312602	24.480	31962988	WG74022; PPS296 PCBLL H+; NORFOLK SOIL	O:\HPCHEM\1\DATA\040420\
L31635-4.D	NORFOLK SEDS	4/20/2004 23:35	15	12.5	1	13.555	503288004	20.283	601494752	15.761	83649176	24.479	31245682	WG74022; PPS296 PCBLL H+; NORFOLK SOIL	O:\HPCHEM\1\DATA\040420\
BLANK-02.D	Blank	4/21/2004 0:12	2	1	1										O:\HPCHEM\1\DATA\040420\
PCB-04.D	23D 1016/1260 PCB 500/50 (CAL CHECK	4/21/2004 0:48	3	1	1	13.554	654367278	20.283	737766691	15.763	99676815	24.482	33205883		O:\HPCHEM\1\DATA\040420\
PCB-05.D	787.3 1248 PCB 500/50 (CAL CHECK)	4/21/2004 1:25	4	1	1	13.552	727789108	20.279	748801997	15.763	101708873	24.481	32050842		O:\HPCHEM\1\DATA\040420\
L31635-5.D	NORFOLK SEDS	4/21/2004 2:01	16	12.5	1	13.556	501510347	20.292	748305156	15.763	80613097	24.480	32659075	WG74022; PPS296 PCBLL H+; NORFOLK SOIL	O:\HPCHEM\1\DATA\040420\
L31635-6.D	NORFOLK SEDS	4/21/2004 2:38	17	12.5	1	13.555	420351997	20.292	690746790	15.766	66372306	24.484	32717017	WG74022; PPS296 PCBLL H+; NORFOLK SOIL	O:\HPCHEM\1\DATA\040420\
L31635-7.D	NORFOLK SEDS	4/21/2004 3:15	18	12.5	1	13.554	397107518	20.290	663979441	15.765	48153852	24.481	29688478	WG74022; PPS296 PCBLL H+; NORFOLK SOIL	O:\HPCHEM\1\DATA\040420\
L31635-8.D	NORFOLK SEDS	4/21/2004 3:51	19	12.5	1	13.555	497687480	20.284	635374763	15.763	77469065	24.480	29486488	WG74022; PPS296 PCBLL H+; NORFOLK SOIL	O:\HPCHEM\1\DATA\040420\
BLANK-03.D	Blank	4/21/2004 4:28	2	1	1										O:\HPCHEM\1\DATA\040420\
PCB-06.D	23D 1016/1260 PCB 500/50 (CAL CHECK	4/21/2004 5:04	3	1	1	13.555	670625617	20.284	749502956	15.764	100940239	24.483	33120175		O:\HPCHEM\1\DATA\040420\
PCB-07.D	786.3 1254 PCB 500/50 (CAL CHECK)	4/21/2004 5:41	5	1	1	13.555	910148137	20.286	925453077	15.762	128054385	24.481	39541034		O:\HPCHEM\1\DATA\040420\
					Ave.	13.554	572362949	20.284	710954425	15.763	84657744	24.481	33137548		
					Std. Dev.	0.002	142737534	0.005	88355860	0.002	23198745	0.002	3008225		
					%RSD		25%		12%		27%		9%		

Initial Run 4-20-04 data not used

Data File Name	Sample Name	Date Acquired	Vial Numbe	Sample Amount	Sample Multiplie	Isodrin (RT)	Isodrin (Height)	Leptophos (RT)	Leptophos (Height)	Isodrin #2 (RT)	Isodrin #2 (Height)	Leptoph (RT)	Leptophos #2 (Height)	Misc Info	Data File Path
COND-01.D	Conditioner	4/21/2004 13:12	1	1	1										O:\HPCHEM\1\DATA\040421\
BLANK-01.D	Blank	4/21/2004 13:49	2	1	1										O:\HPCHEM\1\DATA\040421\
PCB-01.D	23D 1016/1260 PCB 500/50 (CAL CHECK	4/21/2004 14:26	3	1	1	13.549	708018603	20.276	750645500	15.758	119309347	24.479	83232641		O:\HPCHEM\1\DATA\040421\
PCB-02.D	787.3 1248 PCB 500/50 (CAL CHECK)	4/21/2004 15:02	4	1	1	13.551	784326639	20.278	787828718	15.759	115001899	24.481	77950252		O:\HPCHEM\1\DATA\040421\
PCB-03.D	786.3 1254 PCB 500/50 (CAL CHECK)	4/21/2004 15:39	5	1	1	13.553	568373740	20.278	590412925	15.759	86268837	24.481	54866024		O:\HPCHEM\1\DATA\040421\
WG74022-1.D	MB 040409	4/21/2004 16:16	6	12.5	1	13.552	639785086	20.278	689781474	15.758	98482499	24.480	75817078	WG74022; PPS296 PCBLL H+; NORFOLK SOIL	O:\HPCHEM\1\DATA\040421\
WG74022-2.D	SB	4/21/2004 16:52	7	12.5	1	13.551	593677177	20.279	672512481	15.758	88055231	24.479	57479842	WG74022; PPS296 PCBLL H+; NORFOLK SOIL	O:\HPCHEM\1\DATA\040421\
WG74022-3.D	MS L31635-3	4/21/2004 17:29	8	12.5	1	13.552	588350307	20.279	657915553	15.758	91499898	24.476	77165439	WG74022; PPS296 PCBLL H+; NORFOLK SOIL	O:\HPCHEM\1\DATA\040421\
WG74022-4.D	MSD L31635-3	4/21/2004 18:05	9	12.5	1	13.552	555534894	20.279	634921184	15.759	90088129	24.477	66479179	WG74022; PPS296 PCBLL H+; NORFOLK SOIL	O:\HPCHEM\1\DATA\040421\
WG74022-5.D	HS2	4/21/2004 18:42	10	3.125	1	13.558	319360583	20.290	638816914	15.766	22135546	24.479	70438837	WG74022; PPS296 PCBLL H+; NORFOLK SOIL	O:\HPCHEM\1\DATA\040421\
WG74022-6.D	L31635-2	4/21/2004 19:18	11	12.5	1	13.553	506057474	20.279	591644213	15.757	72412286	24.474	57083513	WG74022; PPS296 PCBLL H+; NORFOLK SOIL	O:\HPCHEM\1\DATA\040421\
L31635-1.D	NORFOLK SEDS	4/21/2004 19:55	12	12.5	1	13.553	434725129	20.283	658275838	15.760	64036258	24.477	58213634	WG74022; PPS296 PCBLL H+; NORFOLK SOIL	O:\HPCHEM\1\DATA\040421\
L31635-2.D	NORFOLK SEDS	4/21/2004 20:31	13	12.5	1	13.552	528244508	20.283	643954344	15.758	75345239	24.478	53995785	WG74022; PPS296 PCBLL H+; NORFOLK SOIL	O:\HPCHEM\1\DATA\040421\
L31635-3.D	NORFOLK SEDS	4/21/2004 21:08	14	12.5	1	13.552	609208476	20.278	696605142	15.758	84464158	24.477	53252255	WG74022; PPS296 PCBLL H+; NORFOLK SOIL	O:\HPCHEM\1\DATA\040421\
L31635-4.D	NORFOLK SEDS	4/21/2004 21:45	15	12.5	1	13.551	627666760	20.277	718724388	15.757	86478052	24.476	52847912	WG74022; PPS296 PCBLL H+; NORFOLK SOIL	O:\HPCHEM\1\DATA\040421\
BLANK-02.D	Blank	4/21/2004 22:21	2	1	1										O:\HPCHEM\1\DATA\040421\
PCB-04.D	23D 1016/1260 PCB 500/50 (CAL CHECK	4/21/2004 22:58	3	1	1	13.551	792155196	20.276	860955975	15.757	109183633	24.478	53086860		O:\HPCHEM\1\DATA\040421\
PCB-05.D	787.3 1248 PCB 500/50 (CAL CHECK)	4/21/2004 23:34	4	1	1	13.549	715788913	20.274	817525040	15.755	107805114	24.477	54112147		O:\HPCHEM\1\DATA\040421\
L31635-5.D	NORFOLK SEDS	4/22/2004 0:11	16	12.5	1	13.550	467937963	20.282	773668970	15.758	82349206	24.474	61605076	WG74022; PPS296 PCBLL H+; NORFOLK SOIL	O:\HPCHEM\1\DATA\040421\
L31635-6.D	NORFOLK SEDS	4/22/2004 0:47	17	12.5	1	13.550	398889581	20.286	666939285	15.758	66004098	24.474	53749916	WG74022; PPS296 PCBLL H+; NORFOLK SOIL	O:\HPCHEM\1\DATA\040421\
L31635-7.D	NORFOLK SEDS	4/22/2004 1:24	18	12.5	1	13.552	394208059	20.285	689061322	15.758	45554653	24.474	50618686	WG74022; PPS296 PCBLL H+; NORFOLK SOIL	O:\HPCHEM\1\DATA\040421\
L31635-8.D	NORFOLK SEDS	4/22/2004 2:01	19	12.5	1	13.549	498822063	20.276	667292064	15.757	77356868	24.475	49334997	WG74022; PPS296 PCBLL H+; NORFOLK SOIL	O:\HPCHEM\1\DATA\040421\
BLANK-03.D	Blank	4/22/2004 2:37	2	1	1										O:\HPCHEM\1\DATA\040421\
PCB-06.D	23D 1016/1260 PCB 500/50 (CAL CHECK	4/22/2004 3:14	3	1	1	13.548	645286327	20.276	800029387	15.756	108480055	24.476	52511838		O:\HPCHEM\1\DATA\040421\
PCB-07.D	786.3 1254 PCB 500/50 (CAL CHECK)	4/22/2004 3:50	5	1	1	13.549	548570938	20.275	642601810	15.757	80630218	24.480	37072773		O:\HPCHEM\1\DATA\040421\
					Ave.	13.551	567856582	20.279	697624406	15.758	84330534	24.477	59567356		
					Std. Dev.	0.002	125515179	0.004	74328150	0.002	23056237	0.002	11485947		
					%RSD		22%		11%		27%		19%		

Corrective Action

King County
Department of
Natural Resources and Parks

Date Occurred: 4-21-04
Date Recognized: 4-22-04
Reported by: JSF

WG #: 74022
Batch #: PPS 296
Project #: 423056

Method: ☐ BNA ☐ CLPESTPCB ■ VOA-GCMS ☐ NWTPH-HCID ☐ NWTPH-DX ☐ NWTPH-GX ☐ HERB ☐ OPPEST ☐ BUTYL TIN ☐ BNA-LVI ☐ AIRTOX ☐ PCB ☐ PEST ☐ AIR-SULFUR ☐ EDC-LVI ☒ PCBLL

Sample(s) #:

Matrix: ☐ Liquid ☒ Solid ☐ Air ☐ Tissue ☐ Calibration ☐

Instrument: GCMS: HP6890 ☐ D ☐ E ☐ J ☐ K ☐ L ☐ M ☐
GC: HP6890 ☒ F ECD ☐ G ECD ☐ H FID ☐ H O14450PID/FID ☐ I FID ☐

Other: ☐ Extraction ☐ GPC ☐

Type of Occurrence:

☒ Out of Control Values: ☐ Surrogate Recoveries ☐ MS/MSD/Blank spike Recoveries ☐ Blank Contamination ☐ MS/MSD RPDs ☐ Continuing Calibration Checks ☐ Performance Checks ☐ Initial Calibration ☐ Sample/LD RPDs (1) ☒ SRM (2) ☒ Other

☐ Holding time exceeded by _____ days

Explanation: (include out of control values and associated limits, if applicable)

(1) SRM recovery is 134% inside lab limits but outside QA1 limits. Recovery fairly typical for matrix + method. Values from back column still seem odd, even after rerun. There seems to be something going on with isodrin

(2) Analytes toward the end of the back column (DCB, leptophos, 1260) are being suppressed for some reason; not as much as on 4-20, but I would expect better results after maintenance. Will work further on this.

☐ See QAQC Summary Sheet Batch #_____ for values and limits. ☐ **See reverse side for more**

Corrective Action:

☐ Sample(s) processed "AS IS" ☒ Sample(s) reanalyzed ☐ Sample(s) reextracted and reanalyzed
☐ Other: Instrument maintenance after analysis on 4-20-04. Rerun 4-21-04, all data reported off 4-21-04 run.

Are there any impacts on the data? Appropriate flags.

Signatures:

Analyst: [signature] Date: 4-22-04
QA Officer (for QA1 Projects): Date:
Reviewer: Date:
Supervisor: [signature] Date: 4/26/2004

0520 (9/03)

KING COUNTY METRO ENVIRONMENTAL LABORATORY
Lab QC Report - 04/29/04 11:00
Run ID: R100529 Workgroup: WG74022 (PPS#296-pcbll)

MB:WG74022-1 Matrix: OTHR SOLID Listtype: ORPCBLL Method: EPA 8081A/8082 (7-3-03-002) Project: Pkey: SED
(Method Blank)

Parameter	Mdl	Rdl	Units	MB Value	Qual
Aroclor 1016	2	4	ug/Kg	<MDL	
Aroclor 1221	4	8	ug/Kg	<MDL	
Aroclor 1232	4	8	ug/Kg	<MDL	
Aroclor 1242	2	4	ug/Kg	<MDL	
Aroclor 1248	2	4	ug/Kg	<MDL	
Aroclor 1254	2	4	ug/Kg	<MDL	
Aroclor 1260	2	4	ug/Kg	<MDL	

SB:WG74022-2 MB:WG74022-1 Matrix: OTHR SOLID Listtype: ORPCBLL Method: EPA 8081A/8082 (7-3-03-002) Project: Pkey: SED
(Spike Blank, Method Blank)

Parameter	Mdl	Rdl	Units	MB Value	Truevalue	SB Value	% Rec.	Qual	LabLimit
Aroclor 1016	2	4	ug/Kg	<MDL	48.0	24.8	52		35-111
Aroclor 1260	2	4	ug/Kg	<MDL	48.0	43.3	90		47-146

Matrix Spike Report
MS:WG74022-3 L31635-3 Matrix: SALTWTRSED Listtype: ORPCBLL Method: EPA 8081A/8082 (7-3-03-002) Project: Pkey: SED
(Matrix Spike)

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	MS Value	% Rec.	Qual	QA1Limit
Aroclor 1016	2	4	ug/Kg	<MDL	48.0	28.7	60		50-150
Aroclor 1260	2	4	ug/Kg	<MDL	48.0	37.4	78		50-150

Matrix Spike Duplicate Report
MSD:WG74022-4 MS:WG74022-3 L31635-3 Matrix: SALTWTRSED Listtype: ORPCBLL Method: EPA 8081A/8082 (7-3-03-002) Project: Pkey: SED
(Matrix Spike Duplicate, Matrix Spike)

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	MS Value	% Rec.	Qual	LabLimit	Truevalue	MSD Value	% Rec.	Qual	LabLimit	RPD
Aroclor 1016	2	4	ug/Kg	<MDL	48.0	28.7	60		43-176	48.0	34.7	72		43-176	18
Aroclor 1260	2	4	ug/Kg	<MDL	48.0	37.4	78		13-198	48.0	36.5	76		13-198	3

SRM:WG74022-5 Matrix: OTHR SOLID Listtype: ORPCBLL Method: EPA 8081A/8082 (7-3-03-002) Project: Pkey: SED
(Std Reference Material)

Parameter	Mdl	Rdl	Units	Truevalue	SRM Value	% Rec.	Qual	QA1Limit	Qual	LabLimit
Aroclor 1254	8	16	ug/Kg	112.	150	134	L	80-120		57-139

LD:WG74022-6 L31635-2 Matrix: SALTWTRSED Listtype: ORPCBLL Method: EPA 8081A/8082 (7-3-03-002) Project: Pkey: SED
(Lab Duplicate)

Parameter	Mdl	Rdl	Units	SampValue	LD Value	RPD	Qual	QA1Limit
Aroclor 1016	2	4	ug/Kg	<MDL	<MDL			35
Aroclor 1221	4	8	ug/Kg	<MDL	<MDL			35
Aroclor 1232	4	8	ug/Kg	<MDL	<MDL			35
Aroclor 1242	2	4	ug/Kg	<MDL	<MDL			35

KING COUNTY METRO ENVIRONMENTAL LABORATORY
Lab QC Report - 04/29/04 11:00
Run ID: R100529 Workgroup: WG74022 (PPS#296-pcbll)

LD:WG74022-6 L31635-2 Matrix: SALTWTRSED Listtype: ORPCBLL Method: EPA 8081A/8082 (7-3-03-002) Project: Pkey: SED
(Lab Duplicate)

Parameter	Mdl	Rdl	Units	SampValue	LD Value	RPD	Qual	QAlLimit
Aroclor 1248	2	4	ug/Kg	244	244	0		35
Aroclor 1254	2	4	ug/Kg	125	120	5		35
Aroclor 1260	2	4	ug/Kg	<MDL	<MDL			35

KING COUNTY METRO ENVIRONMENTAL LABORATORY
Lab QC Report - 04/29/04 11:00
Run ID: R100529 Workgroup: WG74022 (PPS#296-pcb11)

Sample #	2,4,5,6-Tetrachlo-ro-m-xylene	Decachlorobipheny-1
(Lab Limits)	35-144	43-160
L31635-1	74	71
L31635-2	58	77
L31635-3	60	81
L31635-4	56	81
L31635-5	64	73
L31635-6	65	72
L31635-7	75	80
L31635-8	50	86
WG74022-1	44	80
WG74022-2	54	99
WG74022-3	63	89
WG74022-4	69	85
WG74022-5	102	97
WG74022-6	66	71
(QA1 Limits)	50-150	50-150
L31635-1	74	71
L31635-2	58	77
L31635-3	60	81
L31635-4	56	81
L31635-5	64	73
L31635-6	65	72
L31635-7	75	80
L31635-8	50	86
WG74022-1	44	80
WG74022-2	54	99
WG74022-3	63	89
WG74022-4	69	85
WG74022-5	102	97
WG74022-6	66	71

Definition of QA1 Qualifiers

QA1 Qualifiers are based upon QA1 Limits and are applied to the QC and the associated data.

B is applied to a sample parameter result when the analyte was detected at a concentration at or greater than the MDL in the associated batch method blank.

E indicates that for a given parameter the precision (RPD) for the sample/lab duplicate exceeded 100%.

X indicates potentially low biased data wherein the true analyte concentration may be greater than the reported value based on any of the following situations: the surrogate or the matrix spike recovery is less than 10%.

G indicates potentially low biased data wherein the true analyte concentration may be greater than the reported value based on any of the following situations: the surrogate recovery is above 10% but less than 50%, the matrix spike recovery is above 10% but less than 50%, or the standard reference material recovery is above 10% but less than 80%.

L indicates potentially high biased data wherein the true analyte concentration may be lower than the reported value based on any of the following situations: the surrogate recovery is greater than 150%, the matrix spike recovery is greater than 150%, or the standard reference material recovery is greater than 120%.

Please note that for BNA analyses, acid and base/neutral surrogates are averaged and the averages are compared to the QA1 Limits for the appropriate qualifiers to be applied to the corresponding parameters. For chlorinated pesticide/PCB analyses, organophosphorus pesticides, fuel analyses, and butyltin analyses, all surrogates must be outside the QA1 Limits for the qualifiers to be applied. For volatile analyses only one surrogate need be outside the QA1 Limits for qualifiers to be applied to the corresponding parameters. No QA1 qualifiers are applied to the fuel screen test WTPH-HCID. Please see Appendix C-QC Calculations.doc for all details.

Laboratory Qualifiers are based upon statistically derived laboratory limits that are generated from matrix matched empirical recovery or replicate results. The laboratory limits reflect the nominal performance of a method for a given matrix and are applied only to the QC results.

An asterisk (*) is applied to any QC result that is outside of laboratory method limits.