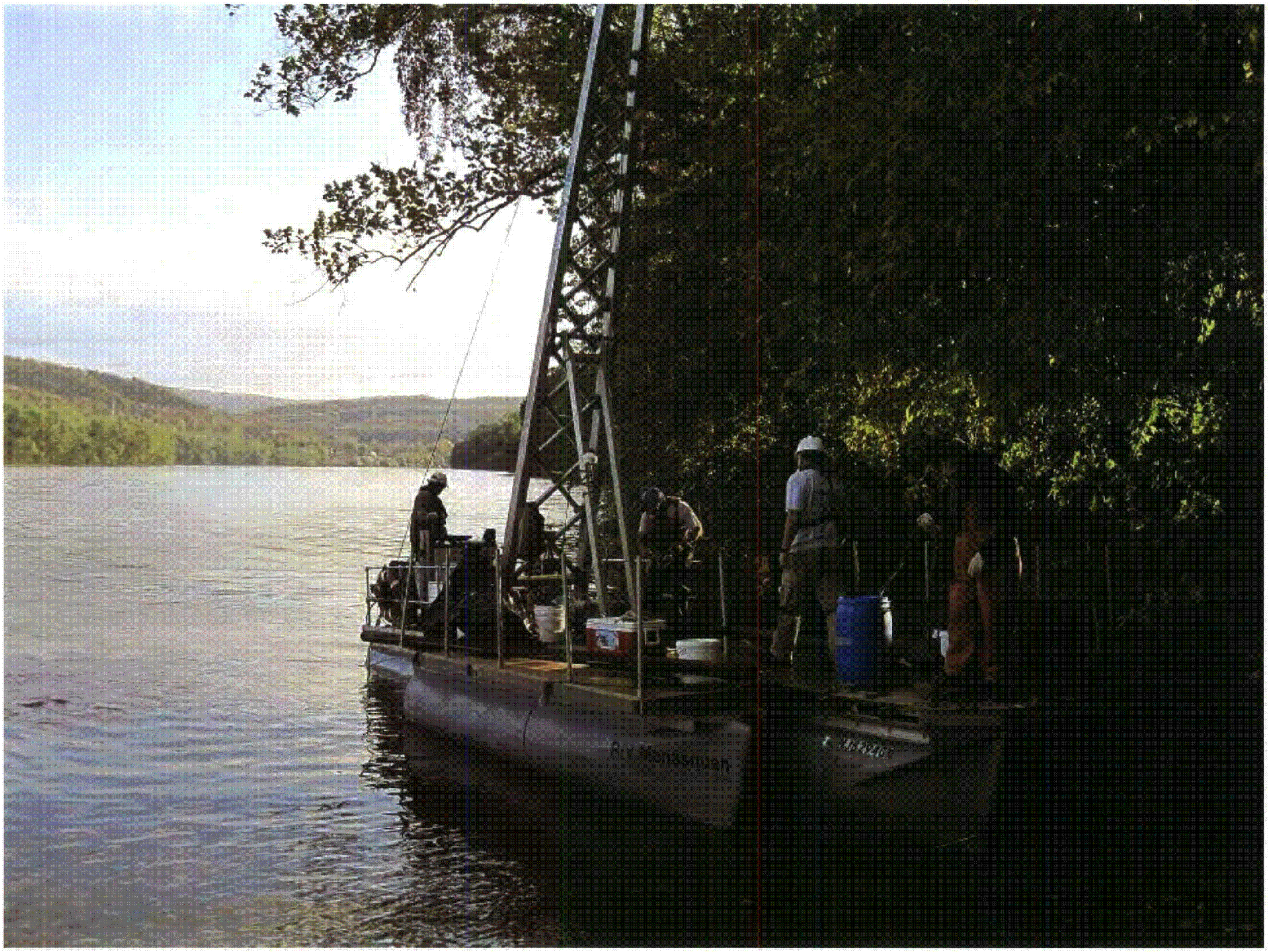
AECOM Environment

Prepared for:
UniStar Nuclear Energy
ore, MD

Prepared by:
AECOM
Piscataway, NJ
60160208.5
March 2011

Sediment Characterization Report Bell Bend Nuclear Power Plant Susquehanna River, Berwick, Pennsylvania

Final



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Bell Bend Nuclear Power Plant
Susquehanna River,
Berwick, Pennsylvania
Final

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List of Acronyms

ac	acres
ASI	Aqua Surveys Inc.
ASL	above sea level
BBNPP	Bell Bend Nuclear Power Plant
CAS	Chemical Abstracts Service (Registry/Identifier Number)
COC	Chain of Custody
CWIS	cooling water intake structure
DGPS	Differential Global Positioning System
DQO	Data Quality Objective
EMPC	Estimated Maximum Possible Concentration
FTL	Field Task Leader
JPA	Joint Permit Application
km^2	square kilometers
LCS	Laboratory Control Samples
MDL	Method Detection Limit
MS	matrix spike
MSD	matrix spike duplicate
NRC	Nuclear Regulatory Commission
NSSS	Nuclear Steam Supply System
PADEP	Pennsylvania Department of Environmental Protection
PAH	polycyclic aromatic hydrocarbons
PID	photoionization detector
PPL	PPL Bell Bend, LLC
QA	Quality Assurance

QA/QC	Quality Control/Quality Assurance
QC	Quality Control
RL	Reporting Limit
RPD	relative percent difference
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedure
SRBC	Susquehanna River Basin Commission
SSES	Susquehanna Steam Electric Station
SVOC	semivolatile organic compounds
TSA	Technical Surveillance Audit
UCL	Upper confidence limit
USACE	US Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound

1.0 Introduction

As given in the Sampling and Analysis Plan (SAP) located in Appendix A, PPL Bell Bend, LLC (PPL) is seeking a construction and operating license from the Nuclear Regulatory Commission (NRC) and various permits and approvals from the Susquehanna River Basin Commission (SRBC), Pennsylvania Department of Environmental Protection (PADEP), US Army Corps of Engineers (USACE), and other regulatory agencies, for a proposed nuclear power generation facility adjacent to the existing PPL Corporation's Susquehanna Steam Electric Station (SSES) located in Luzerne County, Salem Township, Pennsylvania. The proposed power station (Bell Bend Nuclear Power Plant [BBNPP]) will require dredging within a portion of the Susquehanna River adjacent to the SSES to an elevation of approximately 474 feet (NAVD 1988). The removal of sediment is needed to accommodate the new cooling water intake structure (CWIS) and blowdown discharge diffuser. In all, it is estimated that approximately 17,000 to 25,000 cubic yards of material will need to be removed from the portion of the Susquehanna River adjacent to the SSES property.

To determine sediment condition within the proposed dredged area and its eligibility for upland disposal, a preliminary desktop investigation was performed to identify existing and historical sediment data that could provide evidence that the material could be managed as clean fill. No data or documentation was identified that confirmed sediment condition. In addition, preliminary discussion with PADEP and the United States Environmental Protection Agency (USEPA) in August 2010 did not uncover any studies that would further assist with the characterization of sediment in the vicinity of the SSES. In lieu of a due diligence study and in order to sufficiently characterize the sediment within the CWIS dredge footprint and along the proposed pipeline pathway of the blowdown discharge diffuser, it was decided to prepare a sampling plan and perform a sediment characterization study of the proposed dredge area based on guidance provided in the PADEP Bureau of Waste Management's Document 258-2182-773, *Management of Fill*, dated August 7, 2010. This document replaced the Pennsylvania Clean Fill Policy (Clean Fill) dated February 29, 1996.

1.1 Project Description

The US Army Corps of Engineers (USACE) Joint Permit Application (JPA) requires that physical and chemical sediment analysis be performed prior to any dredging within the Susquehanna River to determine sediment composition, the presence and concentrations of pollutants within that sediment, and to assist in the identification of upland placement options. To satisfy JPA requirements and determine if proposed dredged material would qualify as "clean fill" and meet PADEP's criteria necessary for upland placement, the AECOM team performed a sub-surface sediment characterization survey and analysis within the proposed CWIS and blowdown diffuser dredge area (Figure 1-1). Additional field and collection support was provided by Ecology III and Aqua Surveys, Inc. (ASI). Laboratory analysis was provided by Accutest Laboratories, GeoTesting Express, Cape Fear Analytical, and Meta Environmental.

Prior to field mobilization, AECOM prepared a comprehensive sediment sampling and analysis plan (SAP) and submitted to PADEP for agency approval. A copy of the SAP was also provided to USACE after PADEP concurrence. The SAP was based on guidance provided in the Pennsylvania Clean Fill Policy (Clean Fill), the most current version of the USEPA RCRA Manual, SW-846 (*Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. Office of Solid Waste and Emergency*

Response), and recommendations provided by PADEP. The SAP included project data quality objectives (DQO), sampling rationale, proposed field methodology, a list of the compounds to be analyzed, quality control, and standard operating procedures (SOPs) for field equipment (Appendix A).

The AECOM team collected sub-surface sediment samples at 23 locations within the CWIS dredge footprint, five (5) locations within proposed blowdown discharge diffuser footprint, and an additional reference sample located upriver of the proposed CWIS (Figure 1-2). Samples were collected using a vibracorer to a depth approximately 2-3 feet below target dredge depth. In all, a total of 26 composite samples were analyzed to determine if dredged material was "clean" and eligible for upland disposal.

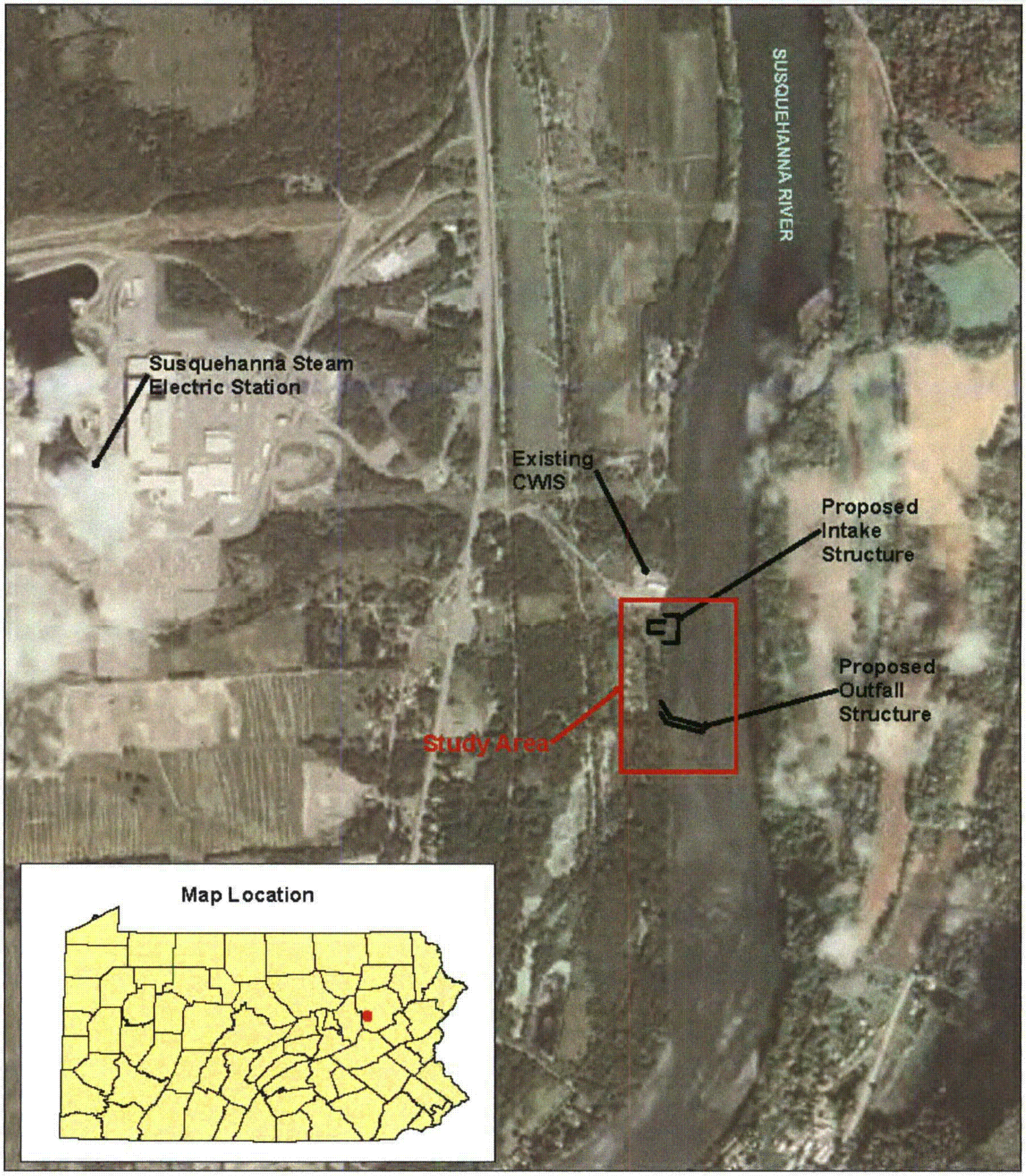
1.2 Study Objectives

The primary objective of the BBNPP sub-surface sediment analysis and sampling program was to determine if dredged sediment removed from within the footprint of the BBNPP CWIS and blowdown diffuser (Figure 1-1) met PADEP *Management of Fill* standards and could be classified as "clean fill". Determination was necessary to assist in the identification of dredged material final placement and to identify additional permitting needs.

1.3 Regulatory Guidance

Upland placement of dredged material requires that the material meet the "clean fill" criteria as specified in the PADEP Bureau of Waste Management's Document 258-2182-773, *Management of Fill*, dated August 7, 2010. This policy was designed to replace PADEP's existing Clean Fill Policy dated February 29, 1996 and provides PADEP with procedures for determining whether material is clean fill or regulated fill. In addition, the policy further provides technical guidance for due diligence and the sampling and analysis of regulated fill.

As stated in the policy, analytical assessment, testing, or sampling is only required if visual inspection or reviews of historic property use indicates evidence of a release of a regulated substance. A preliminary desktop investigation was performed to identify existing and historical sediment data that could provide evidence that the material could be managed as clean fill. No data or documentation was identified that confirmed whether sediment could be managed as clean or regulated fill. In addition, preliminary discussion with PADEP and USEPA on August 18, 2010 did not uncover any studies that would further assist with the characterization or management of sediment in the vicinity of the SSES. Therefore, in order to sufficiently characterize the sediment within the CWIS dredge footprint and along the proposed pipeline pathway of the blowdown discharge diffuser, it was decided to prepare a sampling plan and perform a sub-surface sediment characterization study of the proposed dredge area based on guidance provided in the PADEP Bureau of Waste Management's Document 258-2182-773, Appendix A, *Sampling and Analyses for Regulated Material to be Used as Fill*. Additional guidance documentation used to prepare the SAP and perform the sub-surface sediment characterization included the most current version of the USEPA RCRA Manual, SW-846 (*Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. Office of Solid Waste and Emergency Response*) and recommendations provided by PADEP and USEPA during an August 18, 2010 conference call. The goal of the sampling and analysis program was to follow the SAP as defined and analyze the samples as described in Appendix A of PADEP Bureau of Waste Management's Document 258-2182-773, *Management of Fill*, dated August 7, 2010.

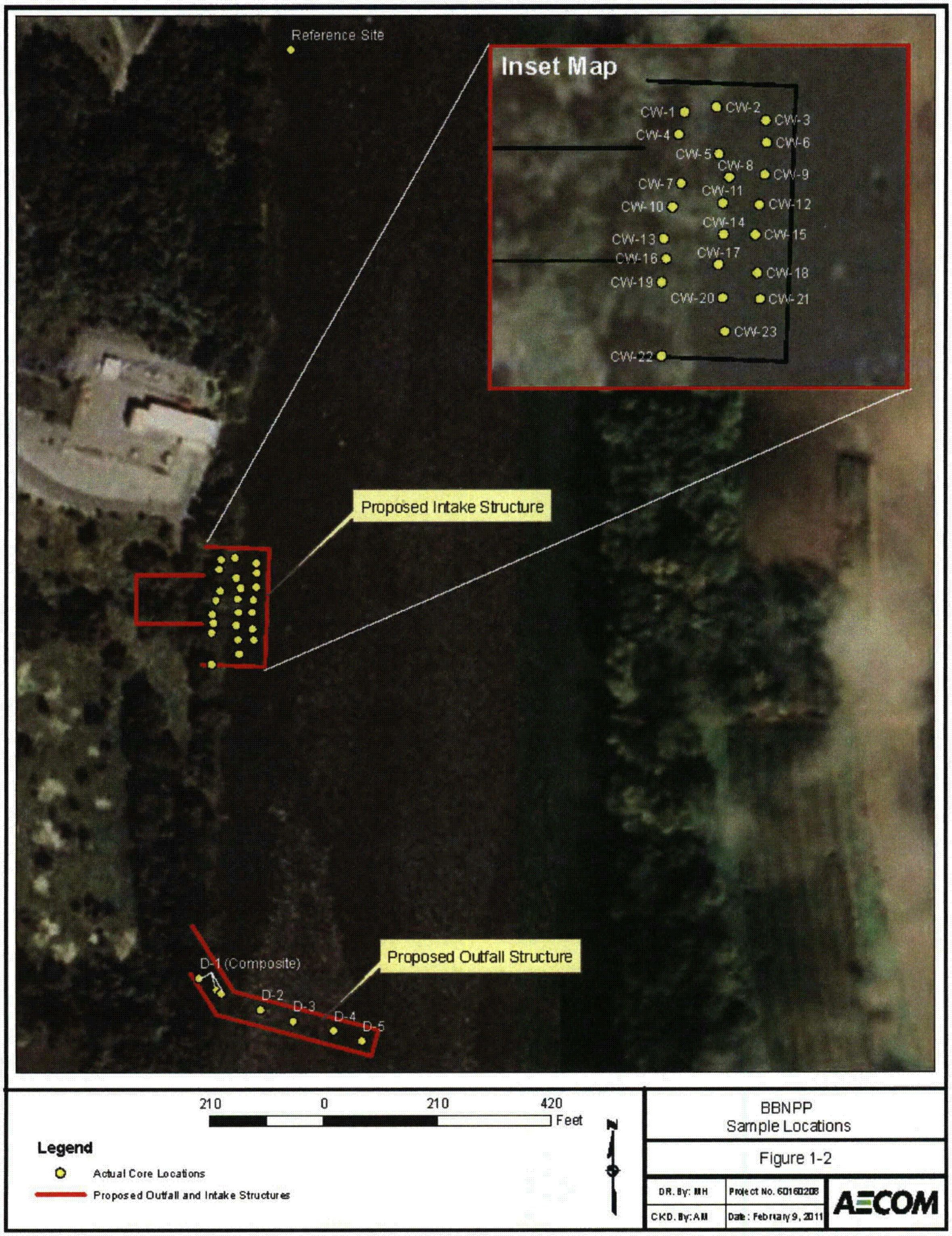


BBNPP
Site Location

Figure 1-1

DR. By: MH
Project No. 60160206
CKD. By: AM
Date: February 9, 2011

AECOM



BBNPP
Sample Locations

Figure 1-2

DR. By: MH
Project No. 60160208
CKD. By: AM
Date: February 9, 2011
AECOM

2.0 Sampling and Analysis Procedures

The following sections describe the field and laboratory programs for the Bell Bend Sediment Characterization Study as given in the SAP to include sampling locations, sample collection and processing, sample processing, parameters measured, laboratory analysis, quality assurance/quality control (QA/QC), and deviations from the SAP. Methods and materials used to collect, handle, process, and deliver sub-surface sediment samples from the project site to the laboratory as well as the laboratory physical and chemical analyses followed those specified and outlined in the final SAP (Appendix A) to the extent practicable. Cited tables are located at the end of the section.

2.1 Field Program

Samples were collected between October 12, 2010 and October 14, 2010 at 29 locations as specified in the final SAP with some deviation as given in Table 2-1 and Figure 1-2 and further discussed in Section 2.1.6. Sediment cores were collected and transferred to an onshore processing facility upriver where they were split, classified, sub-sampled, and containerized. Standard QA/QC procedures were followed, including equipment decontamination, chain of custody, and collection of sediment sample duplicates, matrix spikes (MS) and matrix spike duplicates (MSD), and a rinseate water blank. Sediment grab samples were attempted at five (5) locations but due to the presence of unconsolidated sediment, the gear was ineffective and shallow coring was performed in its place. Sample collection and core processing procedures are described in Sections 2.1.2 and 2.1.3 respectively. Vibracoring and grab sampling procedures followed the protocol given in the appropriate SOPs given in Appendix A and B of the SAP (Appendix A).

2.1.1 Sampling Locations

Overall, there were a total of 29 stations sampled to properly characterize the sediment within the proposed footprints of the CWIS and blowdown diffuser pipe (Figure 1-2). Coordinates for each station are given in Table 2-1. Sample locations were located via predetermined coordinates as given in the SAP. In the event local bottom conditions or sediment type did not support an acceptable recovery, the vessel was repositioned in close proximity to the original station, station probed, and sampling re-initiated once a suitable sample depth was observed. If after three (3) attempts an acceptable sample was still not recovered, an alternative location in proximity to the original station was sampled. For stations D1-D5, sampling gear was ineffective and changed from Ponar grab to Vibracorer to ensure a representative sample. Station D-1 consisted of three separate cores, separated into four (4) discrete samples, and composited into one sample due to the low amount of recovery. Initially, Stations D1 through D5 were to be one (1) composite sample.

Sediment station location was identified using Differential Global Positioning System (DGPS) integrated with HYPACK survey software. Prior to use, the DGPS unit was inspected for functionality and tested daily using known geodetic points to ensure accuracy. Coordinates for the selected sample locations were entered into the DGPS on the sampling vessel. ASI navigated the vessel onto target and once the target coordinates were located, anchors were dropped to hold the vessel on station during sampling. Due to the difficulty in setting an anchor in unconsolidated sediment and the shallowness of the desired core, live boating was performed at stations D2-D5.

2.1.2 Sample Collection

Prior to sampling, the Pennsylvania One-Call System was notified and provided the necessary information to ensure selected sampling locations were not located above a submerged or sediment buried utility. It was determined that stations were not located in the vicinity of submerged utilities.

As previously mentioned, vibracoring was performed at 29 locations to include 23 cores in the CWIS dredge prism, five (5) shallow cores within the blowdown diffuser footprint, and one (1) reference core taken approximately 900 feet upriver of the northernmost boundary of the proposed CWIS sample area. Core samples were collected by ASI from the pontoon vessel R/V Manasquan using a Vibro-Torsional Rossfelder VT-6 electric vibrahead outfitted with 10-20 foot steel sampling barrels, soft polyethylene liners, and stainless steel core catchers. Samples were collected as outlined in Section 4.0 of the SAP and the Standard Operating Procedures for Sediment Coring Using a Vibracorer (SAP, Appendix A) and Sediment Grab Sampling (SAP, Appendix B).

Sample target depth was calculated at each station using surface water elevation, substrate elevation, and proposed dredge depth with 2-4 foot over-dredge. At the start of each daily sampling event and periodically throughout, the surface elevation of the river was checked at Ecology III's water gauge located approximately 900 feet upriver of the reference site (Figure 1-2). Surface water elevation on October 12 and 13, 2010 was 491' (feet) above sea level (ASL) and 490' 6" on October 14, 2010 (Table 2-2). Once on station, depth to substrate was determined by taking the average of three (3) depth readings using a weighted, graduated line and subtracting that measurement from the most recent surface water elevation. As previously mentioned, proposed dredge elevation was approximately 474' ASL. For the purpose of the sampling program, target depth calculations were based on a target elevation between 470' and 472' to incorporate over-dredge and was dependent on refusal depth and/or gear capability. This differed from processing which was completed to an elevation of 472'. Table 2-2 gives date and time of sample, surface water elevations, substrate elevations, and target depths for each sample site. Actual penetration depths and recovery lengths are also included.

Once target depths were confirmed, the core barrel was graduated and a soft, decontaminated, polyethylene liner was inserted and secured to the core shoe/cutter with pop rivets. The core shoe or cutter was equipped with a stainless steel, decontaminated core catcher to aid in sample recovery. The core barrel was hoisted vertically using a winch system and A-Frame, and lowered through the "moon pool" to the sediment water interface. The core barrel was advanced into the sediment to target depth or the point of refusal dependent on which was encountered first. Using the winch system, the core barrel was then extracted from the sediments, exterior of the core rinsed with site water, brought aboard the deck of the sampling vessel, and laid horizontally. The sediment core was extracted from the core barrel and each end was secured with electrical tape. The recovery length was measured and the core sample liner was labeled accordingly to include sample identifier, date and time of sample, penetration depth, substrate elevation, water depth, and a directional arrow pointing to the top of core. Data and other particulars for each sample were documented in a dedicated field log book (Appendix B). The core was then loaded onto a smaller support vessel, the Chain of Custody (COCs) signed, and core transferred to the onshore processing team.

2.1.3 Sample Processing

Sample processing was performed as described in the SAP at an onshore, open area located adjacent to the river. Chain-of-custody (COC) procedures followed the SAP with consistent use of AECOM COC forms throughout the three (3) day event. Collected samples were stored on double bagged ice in coolers with the associated COC documents and transferred to the analysis laboratory by courier or FedEx. The photoionization detector (PID) was calibrated daily to the manufacturer's recommendations using fresh air and 100 parts per million (ppm) isobutylene. Relevant data was recorded on data sheets and in a dedicated logbook (Appendices B and C respectively).

The outdoor processing area was located in a level, stable, and secure area approximately 200 feet west of the boat ramp located at Ecology III's Susquehanna River Facility. The boat ramp was located approximately 1200 feet upriver of the reference site (Figure 1-2). The processing station was underlain with plastic sheeting and consisted of a sample staging area, a sample processing area containing plastic covered tables, and a decontamination area for sampling equipment. Core samples arrived via support vessel and were off-loaded from the support vessel and either hand-carried or transported via pick-up truck to the processing area. When necessary, cores were stored horizontally on plastic sheeting in a secure portion of the staging area until the processing team was ready for processing. Clean nitrile gloves were worn during all handling and transfer operations.

For initial processing, individual cores were placed on the plastic-lined processing tables, an incision made along the length of the core, and the soft plastic liner was gently pulled back from the top of core for further processing. Once opened, the core was visually inspected for any evidence of contamination as well as any distinct strata. Volatile organic compound (VOC) screening was performed by making a small incision in the sediment at one (1) foot intervals at a shallow angle with a decontaminated spatula, gently lifting the sediment resting on the spatula, and inserting the probe of a pre-calibrated, MiniRAE 2000 into the pocket created. PID readings were recorded on the Core Log Form (Appendix C). If no elevated PID readings were observed, the VOC sample was collected from 2 feet below ground surface (bgs). Once identified, a VOC sample was collected according to the procedure described in Attachment 4 of the SAP (Appendix A), "Specialized Sample Collection Procedures," using a Terra Core Sampler^{TM} provided by Accutest Laboratories. Following collection, VOC samples were placed immediately in a cooler containing ice and a VOC trip blank.

Following the collection of the VOC sample, sediment was examined and a description of the lithology and sediment characteristics was recorded on the Core Log Form given in Appendix C. Each core was then divided into four (4) equal segments, A, B, C and D and photographed (Appendix D). The depth intervals and sampling parameters for each section were recorded on the Core Processing Form (Appendix C) when applicable. A discrete sample was collected from each of the four (4) segments using decontaminated utensils. The four samples were then placed together in a decontaminated stainless steel bowl and homogenized to create one composite sample for each core. Composited material was then placed in properly-labeled, laboratory-provided sampling jars using decontaminated stainless steel utensils. The sample jars were then packed into freezer-type plastic storage bags stored at 4^{o} Celsius either on wet-ice in coolers at the sample processing station or in a secure refrigerator located in the Ecology III building. Grain size samples were placed directly into a one-gallon freezer-type plastic storage bags and stored in a secure container at ambient temperature.

Sampling equipment was decontaminated following procedures outlined in Section 6.4 of the SAP (Appendix A). Decontamination included a tap water rinse, Alconox scrub, tap water rinse, and then a de-ionized water rinse. Selected USEPA guidance recommended the use of isopropanol as a decontamination solvent when organic compounds were included on the COPC list (e.g., USEPA 2001). For this project, pesticide-grade isopropanol was on hand in the event that the field or core processing team identified sediment that had been oiled. No oiled sediment was observed and the use of isopropanol was not necessary.

Residual materials were disposed of in accordance with the procedures outlined in Section 8 of the SAP. The site was expected to meet clean fill standards, and strict control of residuals was warranted. Residual sediment remaining after sample collection was returned to the river bottom. No hazardous Investigation Derived Waste (IDW) was generated during investigation activities.

2.1.4 Sample Distribution and Condition

Samples were handled according to the procedures outlined in Section 9 of the SAP, *"Sample Documentation and Shipment*". Each sample was given a pre-assigned, identifiable, and unique sample ID consisting of three (3) components separated by a hyphen (-). The following provides an example sample identification number and description for station 1 located in the CWIS footprint: BBNPP- CW-1-C; where BBNPP represents the Study Area, CW-1 represents the CWIS study site station number 1,and C represents Gear Type or "Core". Due to field conditions, no samples were collected using grab equipment; therefore, the "G" designation was not used. For QA/QC samples, an additional suffix was applied to the root sample number to define type of QA/QC sample as given in the SAP. Sample labels were completed for each sample using waterproof ink. Samples were properly packaged on ice at 4°C for shipment and dispatched to the laboratory for analysis according to AECOM SOP 7510 given in the SAP (Appendix A). Shipping containers were latched and secured with packing tape and custody seals prior to shipment. The custody seals were attached to the front and back opposite corners of the cooler and covered with clear plastic tape. The cooler was strapped shut with packing tape in at least two locations. All sample shipments were accompanied by the COC record identifying the contents. The original record and one copy accompanied the shipment, and one copy was be retained by the sampler.

Samples sent to Meta Environmental and GeoTesting Express were shipped via FedEx. Samples sent to Accutest Laboratories were shipped by courier. When FedEx was used, the signed custody record (COC) was enclosed and secured to the inside of the cooler.

2.1.5 Field Quality Assurance/Quality Control (QA/QC)

The following describes Quality Assurance/Quality Control measures incorporated during the field program to ensure processing and sample integrity.

2.1.5.1 Field Activity Technical Surveillance Audit

A Technical Surveillance Audit (TSA) of field processing activities was conducted by the Field Task Leader (FTL) on October 13, 2010. The TSA included examination of field sampling records and logbook; field measurement results; field instrument operating and calibration records; sample processing as given in the SAP; handling and packaging procedures; QA procedures; COC documentation, and Health and Safety. No major deficiencies were observed. Minor corrections to coring logs were completed on-site.

2.1.5.2 QA/QC Samples

Field QA/QC samples were collected according to the procedures given in the SAP (Appendix A). A total of three (3) field duplicates, two (2) MS/MSDs, and one rinseate blank were collected for quality control and monitoring purposes during the field sampling. A trip blank accompanied VOC samples.

2.1.6 Procedural Deviations from SAP

During the course of the sampling program, it was necessary to slightly deviate from or modify the procedures given in the SAP in order to collect representative samples. Deviations to sampling methodology, sample relocation due to station abandonment, and processing are discussed below. Due to heavy canopy cover in the riparian zone, it was sometimes necessary to position slightly off station for Health and Safety. Positions were normally only 5-10 feet from the originally anticipated shoreline location.

Due to the presence of unconsolidated material at Stations D1 through D5 and the initial Reference Station and the inability of the grab sampler to collect a representative sample to target depth, grab sampling was abandoned after three (3) attempts at each station and replaced with vibracoring. Cores were able to penetrate the initial lens of unconsolidated material and reach the target depth for each station. Target depths for each station are given in Table 2-2.

Coring and grab sampling were unsuccessful at the original Reference Site due to the presence of cobble and woody debris. Site was relocated after one (1) unsuccessful attempt to a mid-shore location more representative of the dredge material to be removed (Figure 1-2). Original coordinates for the Reference Site are provided in the SAP (Appendix A).

At Station CW-22, three (3) attempts by coring were made in order to collect a representative sample. Each additional sample was attempted slightly off -target (approximatelty10-20 feet from center point) but was unsuccessful. Station was relocated downriver where an acceptable sample was collected.

Due to low recovery at Station D-1, it was necessary to collect three (3) cores, BBNPP-D1-C-A, BBNPP-D1-C-B, and BBNPP-D1-C-C, in order to ensure sufficient volume was available for sample collection. In this case, each core was screened for VOCs, photographed, logged, and divided into four sections in the same manner as all other cores. The VOC sample was collected from 2 feet of the BBNPP-D1-C-C core. A discrete sample was then collected from section of each core using decontaminated utensils and each sample was placed together in a decontaminated stainless steel bowl and homogenized to create a composite sample for the D-1 station.

Originally, as given in the SAP, Stations D1 through D5 were to be composited into one (1) sample. Due to limited recovery of cores at these stations, Stations D2 through D5 were composited into one (1) sample and D1 was processed as described above. For Stations D2 through D5, sediment from each core was transferred to a dedicated decontaminated stainless steel bowl on the vessel. The sediment was then screened and processed for VOCs, photographed, and logged onboard. Sample was then covered with clean aluminum foil. Once these four (4) core samples had been collected, they were transported to the onshore processing area and homogenized to create one (1) composite sample.

2.2 Laboratory Program

Before implementing the field and laboratory programs, details of the SAP were discussed with PADEP to include the development of a target parameter list that would sufficiently determine if the sediment removed could be classified as “clean fill’. The project approach and target analyte list was discussed with the agencies on August 18, 2010 (PADEP and EPA; Attachment 1). During the discussion, PADEP personnel acknowledged the following:

- The regulated list is expansive and that selected parameters are not generally analyzed by standard laboratories and could be omitted from further analyses;
- Some methods are not sensitive enough to meet the limits specified; and
- The measurement of some compounds would require research or specialty laboratories using non-standard methods, and may not be appropriate to include.

Four laboratories were selected to accomplish as much of the regulated list as possible, and included Accutest laboratories (NJ), Cape Fear Analytical (NC), Meta Environmental (MA) and Geotesting Express (MA). Cape Fear provided specialty dioxin analysis and Meta Environmental provided tetraethyl lead analysis. Geotesting Express provided grain size measurements and all remaining parameters were measured by Accutest laboratories. Laboratory certifications are provided in Appendix H.

2.2.1 Parameters Analyzed

The full list of parameters analyzed for the project is provided in the project SAP (Appendix A). In the final analysis, the full reporting of 206 parameters was achieved, along with an additional 26 compounds that are less commonly analyzed in the analytical industry but reported here as "screening" results since the laboratory used a non-standard approach to determine the presence/absence of these compounds. Eleven (11) of the original target compounds could not be reported due to various issues as identified in Table 2-3.

2.2.2 Data Validation

Project data were validated according to USEPA Region 3 requirements (USEPA Region III, 1994 and 1995). Some sample results were qualified based on validation findings and a small data subset was rejected. Validation qualifiers are identified/defined in the result tables.

2.2.3 Procedural Deviations from SAP

As indicated in Section 2.2.1, eleven (11) parameters were not analyzed as detailed in Table 2-3. Further, twenty-six (26) compounds were analyzed using non-standard quantification methods since those parameters are not normally analyzed by the selected laboratory. The quantification method details for these compounds are provided in the laboratory report narratives (Appendix E)

Table 2-1 Station Coordinates

Station#	Northing	Easting
CW-1	339636.597	2414689.699
CW-2	339640.438	2414715.530
CW-3	339629.846	2414754.717
CW-4	339618.576	2414685.659
CW-5	339603.389	2414717.447
CW-6	339612.170	2414755.340
CW-7	339579.677	2414687.764
CW-8	339584.486	2414725.503
CW-9	339586.593	2414754.100
CW-10	339561.147	2414680.287
CW-11	339564.049	2414720.593
CW-12	339562.900	2414749.815
CW-13	339535.618	2414673.443
CW-14	339539.114	2414721.240
CW-15	339538.833	2414746.436
CW-16	339519.493	2414675.527
CW-17	339514.988	2414717.156
CW-18	339508.087	2414748.27
CW-19	339500.750	2414671.912
CW-20	339488.012	2414720.589
CW-21	339487.308	2414750.240
CW-22	339441.572	2414672.008
CW-23	339461.077	2414722.657
D-1	338839.030	2414681.425
D-1 (2)	338832.268	2414690.201
D-1 (3)	338861.075	2414648.939
D-2	338802.365	2414762.999
D-3	338780.671	2414823.210
D-4	338762.718	2414897.149
D-5	338743.808	2414949.243
Reference Site	340579.382	2414817.651

Coordinates are in PA State Plane NAD 83.

Table 2-2 Sediment Coring Data

Station #	Date	Time	Surface Water Elevation (1/10 ft)	Substrate Elevation (1/10 ft)	Water Depth (1/10 ft)	Core Target Depth (1/10 ft)	Core Penetration Depth (1/10 ft)	Recovery (1/10 ft)
CW-1	12-Oct-10	10:26	491.00	482.00	9.00	11.0 - 12.0	13.00	10.54
CW-2	12-Oct-10	11:10	491.00	477.33	13.67	7.3 -10.0	11.00	8.00
CW-3	12-Oct-10	12:02	491.00	473.42	17.58	3.4 - 4.0	10.00	9.25
CW-4	13-Oct-10	14:37	491.00	482.33	8.67	12.3 - 12.5	14.00	10.42
CW-5	13-Oct-10	08:00	491.00	474.50	16.50	4.5-5.0	10.00	6.50
CW-6	12-Oct-10	12:45	491.00	472.83	18.17	2.8 - 3.0	7.00	3.00
CW-7	13-Oct-10	15:00	491.00	483.67	7.33	13.6 - 14.0	14.08	8.75
CW-8	13-Oct-10	08:55	491.00	474.33	16.67	4.3 - 4.5	9.00	4.83
CW-9	12-Oct-10	14:19	491.00	473.92	17.08	3.9-4.25	8.25	4.67
CW-10	13-Oct-10	15:30	491.00	483.50	7.50	13.5 - 14.0	14.00	7.00
CW-11	13-Oct-10	09:25	491.00	473.42	17.58	3.4 -3.5	12.75	4.75
CW-12	12-Oct-10	14:51	491.00	474.25	16.75	4.25 - 4.5	10.00	7.50
CW-13	13-Oct-10	15:49	491.00	485.58	5.42	15.58 - 16.0	14.50	4.67
CW-14	13-Oct-10	10:01	491.00	476.25	14.75	6.25 - 6.5	14.50	7.0
CW-15	12-Oct-10	15:49	491.00	474.33	16.67	4.3 - 4.5	10.08	7.50
CW-16	13-Oct-10	16:10	491.00	487.75	3.25	17.75 - 18.0	17.17	13.33
CW-17	13-Oct-10	10:25	491.00	474.33	16.67	4.3 - 4.5	11.58	6.33
CW-18	12-Oct-10	16:11	491.00	474.25	16.75	4.25 - 4.5	9.00	6.58
CW-19	13-Oct-10	16:32	491.00	485.50	5.50	15.50 - 16.0	14.50	11.58
CW-20	13-Oct-10	11:15	491.00	476.83	14.17	6.8 - 7.0	12.58	7.83
CW-21	12-Oct-10	16:29	491.00	476.67	14.33	6.7 - 7.0	11.50	4.58
CW-22	14-Oct-10	12:45	490.50	483.33	7.17	13.33-13.5	7.67	2.58
CW-23	13-Oct-10	11:58	491.00	475.67	15.33	5.6 -6.0	7.00	4.00
D-1	14-Oct-10	09:00	490.50	481.50	9.00	11.5 - 12.0	2.00	1.50
D-1 (2)	14-Oct-10	09:38	490.50	481.25	9.25	11.75 - 12.0	3.00	2.50
D-1 (3)	14-Oct-10	10:05	490.50	487.17	3.33	18.17 - 18.25	3.00	2.10
D-2	14-Oct-10	10:38	490.50	474.92	15.58	2.0	3.25	0.00
D-3	14-Oct-10	11:13	490.50	473.33	17.17	2.0	3.33	0.25
D-4	14-Oct-10	11:26	490.50	473.25	17.25	2.0	3.08	1.00
D-5	14-Oct-10	11:54	490.50	473.33	17.17	2.0	3.50	0.33
Reference Site	14-Oct-10	12:20	490.50	475.25	15.25	5.25 - 6.0	6.00	5.50

Table 2-3 Project Compounds Not Analyzed

Compound	CAS No.	Clean Fill Limit	unit	Note
Ammonia 7664	-41-7	360	mg/kg	1
BIS(Chloromethyl)Ether 542-88	-1	0.00001	mg/kg	2
Carbaryl 63-2	5-2	41	mg/kg	3
Chlordane 5	7-74-9	49	mg/kg	4
Chloronaphthalene, 2-	91-58-7	6200	mg/kg	2
Endosulfan 115-29	-7	30	mg/kg	4
Ethoxyethanol, 2-(EGEE)	110-80-5	7.8	mg/kg	5
Furfural 98-0	1-1	1.4	mg/kg	2
Methanol 67-5	6-1	58	mg/kg	5
Toluidine, M-	108-44-1	0.13	mg/kg	2
Toluidine, P-	106-49-0	0.32	mg/kg	2

Notes

1 Laboratory failure – parameter not analyzed

2 Parameter not supported by the laboratory

3 Requires HPLC; Not supported by the laboratory

4 Not supported by the laboratory although other isomers were determined

5 Alternate method/additional sample needed (not collected)

3.0 Analytical Results and Discussion

The project findings are detailed in Tables 3-1 and 3-2 located at the end of this section. Table 3-2 data corresponds to a subset of parameters that are provided as screening results. Table 3-1 provides the larger set of parameters that have been reported using standard/approved reporting procedures. Ancillary parameter data, grain-size, and total organic carbon (TOC) are also provided in Table 3-1. Full laboratory reports are provided in Appendix E.

3.1 Sediment Geotechnical Findings

Most of the project samples were classified as either silty sand or sandy silt. CW15 and CW20 were exceptions to this and contained mostly sand (78 to 86 percent sand). Samples CW6, CW11, D1, D2 and the reference sample also contained a large (20-40 percent) fraction of gravel.

3.2 Sediment Chemistry Findings

Most of the project parameters were either not detected or measured at concentrations far below the threshold concentrations listed in the PADEP Bureau of Waste Management's Document 258-2182-773, *Management of Fill*, dated August 7, 2010. Three parameters (cobalt, formaldehyde, and acetaldehyde) were detected in one or more samples above the Management of Fill Standard (Standard) as discussed in detail below.

3.2.1 Metals and Organometallics.

Most metals occur naturally above typical laboratory reporting limits (RLs) and most of the metals were measured at concentrations above the corresponding RL. Lead concentrations were typical for solid/sediment samples and mercury concentrations were low relative to sediment quality standards. Tetraethyl lead was not detected in any project sample.

Like many metals, cobalt was detected above the laboratory RL and was at a concentration above the Clean Fill Standard in seven cases (CW1, CW18, CW20 and 20-FD, CW22, D1 and D1-FD) although concentrations exceeded the Standard by a relatively small amount. Cobalt concentrations at the site ranged from less than the Clean Fill Standard of 8.1 mg/Kg to a high of 13.7 mg/Kg. Ninety-five percent upper confidence limit (95% UCL) statistical testing resulted in an upper limit of 9.5 mg/Kg including both field duplicates as discrete data points. The fact that 10 mg/Kg has been reported as the background cobalt level for freshwater sediments (Buchman, 1999), and that the mean global sediment value has been reported to be 14 mg/Kg (Bowen, 1979) indicates that all project results are in fact near background concentrations. Supporting UCL statistical data are provided in Appendix F.

3.2.2 Ancillary Chemicals

Cyanide was not detected in any project sample. Chloride and Sulfate were detected in one project sample each (CW16 and CW22 respectively) measured near laboratory RLs (within a factor of 2). Inorganic nitrogen was also not detected in any project sample.

3.2.3 Pesticides/Herbicides

Pesticide and herbicide compounds were not detected in any project sample except DDE and DDT, although these measured parameters were at concentrations several orders of magnitude below the Clean Fill Standard.

3.2.4 Polychlorinated Biphenyls (PCBs)

PCBs were not detected in any project sample.

3.2.5 Dioxin (2,3,7,8-TCDD)

The dioxin congener 2,3,7,8-TCDD was detected in four (4) project samples but at concentrations far below the PADEP Clean Fill Standard.

3.2.6 Semivolatile Organic Compounds (SVOCs) including Polycyclic Aromatic Hydrocarbons (PAHs)

SVOC/PAH compounds were not detected above laboratory RLs except acetaldehyde, fluoranthene, pyrene, and formaldehyde. Fluoranthene and pyrene were measured at concentrations far below the Clean Fill Standard.

Acetaldehyde was detected in most samples but only one sample exceeded the Clean Fill Standard (at 255 vs 230 ug/Kg). By Pennsylvania's regulation for clean fill acetaldehyde meets the acceptance criterion since more than 75 percent of the samples were measured at concentrations below the Standard.

Formaldehyde was generally detected above the corresponding RL by a factor of 2 to 4 in all project samples, with the exception of CW15-C. Formaldehyde was generally measured in the 7 to 24 ppm (mg/Kg) range versus the Clean Fill Standard of 12 ppm. 95% UCL statistical testing results in an upper limit of 16.6 mg/Kg including both field duplicates as discrete data points. The presence of formaldehyde in nearly all project samples, including the gravel-rich reference station does not fit normal environmental trends and added investigation may be warranted, particularly since the 95% UCL for the sample set is below the concentration observed at the reference station (of 19.8 mg/Kg).

3.2.7 Volatile Organic Compounds (VOCs)

VOC compounds were not detected above laboratory RLs except for chlorodifluoromethane, carbon disulfide, and toluene. Further, all of the compounds were detected in very few samples and at concentrations below the Clean Fill Standard.

Table 3-1 Project Sediment Texture and Chemistry Results (dry units)

			Sample ID	CW1-C	CW2-C	CW3-C	CW4-C	CW5-C	CW6-C	CW7-C	CW8-C	CW9-C	CW9-FD	CW10-C	CW11-C	CW12-C	CW13-C	CW14-C
Analyte	CAS[1]	Unit	CLEANFILL															
Grainsize																		
Gravel		%	-	2.7	3.8	0.7	0.0	0.6	28.9	1.6	0.0	7.9	11.4	0.0	41.0	0.5	12.4	4.0
Sand		%	-	33.4	38.3	52.2	50.1	28.7	25.0	33.8	32.5	39.4	36.8	50.7	22.3	50.6	42.4	43.9
Fines (silt + clay)		%	-	63.9	57.9	47.1	49.9	70.7	46.1	64.6	67.5	52.7	51.8	49.3	36.7	48.9	45.2	52.1
Total Organic Carbon	TOC	mg/kg	-	11500	7770	7170	14800	12600	7290	12300	10400 J	23000	7600	18500 J	7740	8420	30000 J	6760
Solids, Percent	SOLID	%	-	78.4	82.4	83.7	77.5	83.5	83.4	78.2	79.7	78.3	85.2	78.8	82.7	85.8	60.9	84.5
Metals																		
Antimony	7440-36-0	mg/kg	27	< 2.5 UL	< 2.4 UL	< 2.4 UL	< 2.6 UL	< 2.3 UL	< 2.4 UL	< 2.5 UL	< 2.6 UL	< 2.4 UL	< 2.4 UL	< 2.6 UL	< 2.3 UL	< 2.2 UL	< 3.1 UL	< 2.4 UL
Arsenic	7440-38-2	mg/kg	12	5.4	3.1	2.8	3.9	3.1	2.9	3.3	2.8	2.6	2.8	3.9	3.4	2.9	4.7	2.7
Barium	7440-39-3	mg/kg	8200	40.7	< 24 U	< 24 U	< 26 U	25.5	< 24 U	27.2	34.3	29.5	< 24 U	32	26.8	22.8	< 31 U	< 24 U
Beryllium	7440-41-7	mg/kg	320	0.43	0.3	0.26	0.31	0.33	0.29	0.35	0.4	0.36	0.32	0.39	0.32	0.3	0.47	0.29
BORON	7440-42-8	mg/kg	6.7	< 13 U	< 12 U	< 12 U	< 13 U	< 12 U	< 12 U	< 13 U	< 13 U	< 12 U	< 12 U	< 13 U	< 11 U	< 11 U	< 16 U	< 12 U
Cadmium	7440-43-9	mg/kg	38	< 0.63 U	< 0.60 U	< 0.61 U	< 0.65 U	< 0.58 U	< 0.60 U	< 0.63 U	< 0.64 U	< 0.61 U	< 0.59 U	< 0.66 U	< 0.57 U	< 0.56 U	< 0.78 U	< 0.60 U
Chromium	7440-47-3	mg/kg	-	10.8	8.9	6.1	7.6	7.8	6.8	7.9	10.2	8.6	7	8.7	12.1	7.8	9.3	7.1
Chromium, Trivalent	-	mg/kg	190000	10.3	8.9	6.1	7.6	7.8	6.8	7.9	10.2	8.6	7	8.7	12.1	7.8	9.3	7.1
Chromium, hexavalent	18540-29-9	mg/kg	94	< 0.51 U	< 0.49 U	< 0.48 U	< 0.52 UL	< 0.48 U	< 0.48 U	< 0.51 UL	< 0.50 U	< 0.51 U	< 0.47 U	< 0.51 UL	< 0.48 U	< 0.47 U	< 0.66 U	< 0.47 U
Cobalt	7440-48-4	mg/kg	8.1	13.7	6.6	< 6.1 U	6.7	6.7	6	6.8	7.6	7	6.6	7.6	6.3	6.5	8	6.2
Copper	7440-50-8	mg/kg	8200	17	14.3	10.8	13.9	14.3	12.4	14.8	15.4	14.8	12.6	15.3	13.4	11.4	15.6	12.9
Lead	7439-92-1	mg/kg	450	13	7.8	7.2	8.9	8.9	7.7	9.4	10.8	10.1	9.4	10.6	9.4	7.3	11.4	7.9
Manganese	7439-96-5	mg/kg	31000	344 L	373 L	308 L	440 L	486 L	428 L	449 L	499 L	438 L	370 L	397 L	407 L	387 L	394 L	416 L
Mercury	7439-97-6	mg/kg	10	< 0.039 U	< 0.040 U	< 0.038 U	< 0.042 U	< 0.036 U	< 0.036 U	< 0.037 U	< 0.039 U	< 0.037 U	< 0.037 U	< 0.037 U	< 0.039 U	< 0.034 U	< 0.049 U	< 0.036 U
Nickel	7440-02-0	mg/kg	650	25.9	13.8	10.1	13.4	13.1	11.5	13.7	15.1	13.8	12.2	14.7	15.9	13	15.7	12.3
Vanadium	7440-62-2	mg/kg	1500	10.4	7.3	< 6.1 U	9.8	7.6	6.6	10.3	8.9	8.1	6.9	11	7.6	7.3	10.9	7.1
Zinc	7440-66-6	mg/kg	12000	271	36.4	28.5	36.9	36.1	32.7	44.2	41.8	38.7	35.2	40.1	36.2	34.6	47.3	32.9
Organometallic																		
Tetraethyl Lead	78-00-2	mg/kg	0.0046	< 0.006 U	< 0.006 U	< 0.006 U	< 0.005 U	< 0.006 U	< 0.006 U	< 0.006 U	< 0.006 U	< 0.006 U	< 0.006 U	< 0.006 U	< 0.006 U	< 0.006 U	< 0.006 U	< 0.006 U
Ancillary Parameters																		
PH	-	su	-	6.74	7.49	7.7	8.01	7.66	7.96	7.93	7.93	7.98	7.94	7.79	7.96	8.03	6.77	8.37 -
CHLORIDE	16887-00-6	mg/kg	-	< 25 U	< 24 U	< 24 U	< 26 U	< 24 U	< 24 U	< 25 U	< 25 U	< 25 U	< 23 U	< 25 U	< 24 U	< 23 U	< 33 U	< 24 U
SULFATE AS SO4	14808-79-8	mg/kg	-	< 130 U	< 120 U	< 120 U	< 130 U	< 120 U	< 120 U	< 130 U	< 120 U	< 130 U	< 120 U	< 130 U	< 120 U	< 120 U	< 160 U	< 120 U
Nitrogen, Nitrate + Nitrite	-	mg/kg	-	< 24 U	< 23 U	< 22 U	< 26 U	< 24 U	< 23 U	< 25 U	< 23 U	< 24 U	< 23 U	< 24 U	< 23 U	< 23 U	< 30 U	< 22 U
Cyanide	57-12-5	mg/kg	200	< 0.27 U	< 0.25 U	< 0.25 U	< 0.30 U	< 0.29 U	< 0.27 U	< 0.26 U	< 0.30 U	< 0.28 U	< 0.25 U	< 0.27 U	< 0.28 U	< 0.27 U	< 0.35 U	< 0.26 U
Pesticides/Herbicides																		
4,4'-DDD	72-54-8	ug/kg	6800	< 1.5 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.5 U	< 1.5 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.9 U	< 1.4 U
4,4'-DDE	72-55-9	ug/kg	41000	< 1.5 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.5 U	< 1.5 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.9 U	1.8
4,4'-DDT	50-29-3	ug/kg	53000	< 1.5 U	1.8 J	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.5 U	< 1.5 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.9 U	2.7 J
Aldrin	309-00-2	ug/kg	100	< 1.5 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.5 U	< 1.5 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.9 U	< 1.4 U
alpha-BHC	319-84-6	ug/kg	46	< 1.5 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.5 U	< 1.5 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.9 U	< 1.4 U
alpha-Chlordane	5103-71-9	ug/kg	49000	< 1.5 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.5 U	< 1.5 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.9 U	< 1.4 U
beta-BHC	319-85-7	ug/kg	220	< 1.5 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.5 U	< 1.5 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.9 U	< 1.4 U
Chlordane	12789-03-6	ug/kg	49000	< 37 U	< 35 U	< 35 U	< 38 U	< 35 U	< 35 U	< 38 U	< 36 U	< 37 U	< 34 U	< 37 U	< 35 U	< 34 U	< 48 U	< 34 U
delta-BHC	319-86-8	ug/kg	11000	< 1.5 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.5 U	< 1.5 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.9 U	< 1.4 U
Dieldrin	60-57-1	ug/kg	110	< 1.5 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.5 U	< 1.5 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.9 U	< 1.4 U
Endosulfan I	959-98-8	ug/kg	110000	< 1.5 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.5 U	< 1.5 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.9 U	< 1.4 U
Endosulfan II	33213-65-9	ug/kg	130000	< 1.5 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.5 U	< 1.5 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.9 U	< 1.4 U
Endosulfan Sulfate	1031-07-8	ug/kg	70000	< 1.5 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.5 U	< 1.5 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.9 U	< 1.4 U
Endrin	72-20-8	ug/kg	5500	< 1.5 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.5 U	< 1.5 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.9 U	< 1.4 U
gamma-BHC (Lindane)	58-89-9	ug/kg	72	< 1.5 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.5 U	< 1.5 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.9 U	< 1.4 U
gamma-Chlordane	5103-74-2	ug/kg	49000	< 1.5 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.5 U	< 1.5 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.9 U	< 1.4 U
Heptachlor	76-44-8	ug/kg	680	< 1.5 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.5 U	< 1.5 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.9 U	< 1.4 U
Heptachlor Epoxide	1024-57-3	ug/kg	1100	< 1.5 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.5 U	< 1.5 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.9 U	< 1.4 U

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[1] CAS - Chemical Abstracts service

U - Undetected
J - Estimated; below RL or Validation Action
L - Biased Low
R - Datapoint Rejected
N - Value represents an EMPC value (Estimated Maximum Possible Concentration)

Table 3-1 Project Sediment Texture and Chemistry Results (dry units)

			Sample ID	CW1-C	CW2-C	CW3-C	CW4-C	CW5-C	CW6-C	CW7-C	CW8-C	CW9-C	CW9-FD	CW10-C	CW11-C	CW12-C	CW13-C	CW14-C
Methoxychlor	72-43-5	ug/kg	630000	< 1.5 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.5 U	< 1.5 U	< 1.5 U	< 1.4 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.9 U	< 1.4 U
Toxaphene	8001-35-2	ug/kg	1200	< 19 U	< 18 U	< 17 U	< 19 U	< 18 U	< 18 U	< 19 U	< 18 U	< 19 U	< 17 U	< 19 U	< 18 U	< 17 U	< 24 U	< 17 U
CHLORPYRIFOS	2921-88-2	ug/kg	23000	< 86 U	< 81 U	< 79 U	< 87 U	< 79 U	< 81 U	< 85 U	< 83 U	< 85 U	< 78 U	< 85 U	< 80 U	< 78 U	< 110 U	< 78 U
Diazinon	333-41-5	ug/kg	82	< 86 U	< 81 U	< 79 U	< 87 U	< 79 U	< 81 U	< 85 U	< 83 U	< 85 U	< 78 U	< 85 U	< 80 U	< 78 U	< 110 U	< 78 U
Dichlorvos	62-73-7	ug/kg	12	< 86 U	< 81 U	< 79 U	< 87 U	< 79 U	< 81 U	< 85 U	< 83 U	< 85 U	< 78 U	< 85 U	< 80 U	< 78 U	< 110 U	< 78 U
Dimethoate	60-51-5	ug/kg	280	< 86 U	< 81 U	< 79 U	< 87 U	< 79 U	< 81 U	< 85 U	< 83 U	< 85 U	< 78 U	< 85 U	< 80 U	< 78 U	< 110 U	< 78 U
Disulfoton	298-04-4	ug/kg	78	< 86 U	< 81 U	< 79 U	< 87 U	< 79 U	< 81 U	< 85 U	< 83 U	< 85 U	< 78 U	< 85 U	< 80 U	< 78 U	< 110 U	< 78 U
Ethyl Parathion	56-38-2	ug/kg	130000	< 86 U	< 81 U	< 79 U	< 87 U	< 79 U	< 81 U	< 85 U	< 83 U	< 85 U	< 78 U	< 85 U	< 80 U	< 78 U	< 110 U	< 78 U
MALATHION	121-75-5	ug/kg	34000	< 86 U	< 81 U	< 79 U	< 87 U	< 79 U	< 81 U	< 85 U	< 83 U	< 85 U	< 78 U	< 85 U	< 80 U	< 78 U	< 110 U	< 78 U
Methyl parathion	298-00-0	ug/kg	420	< 86 U	< 81 U	< 79 U	< 87 U	< 79 U	< 81 U	< 85 U	< 83 U	< 85 U	< 78 U	< 85 U	< 80 U	< 78 U	< 110 U	< 78 U
Phorate	298-02-2	ug/kg	410	< 86 U	< 81 U	< 79 U	< 87 U	< 79 U	< 81 U	< 85 U	< 83 U	< 85 U	< 78 U	< 85 U	< 80 U	< 78 U	< 110 U	< 78 U
RONNEL	299-84-3	ug/kg	280000	< 86 U	< 81 U	< 79 U	< 87 U	< 79 U	< 81 U	< 85 U	< 83 U	< 85 U	< 78 U	< 85 U	< 80 U	< 78 U	< 110 U	< 78 U
Sulfotep	3689-24-5	ug/kg	730	< 86 U	< 81 U	< 79 U	< 87 U	< 79 U	< 81 U	< 85 U	< 83 U	< 85 U	< 78 U	< 85 U	< 80 U	< 78 U	< 110 U	< 78 U
2,4,5-T	93-76-5	ug/kg	1500	< 3.6 U	< 3.4 U	< 3.4 U	< 3.7 UL	< 3.4 U	< 3.4 U	< 3.6 UL	< 3.6 U	< 3.6 U	< 3.3 U	< 3.6 UL	< 3.5 U	< 3.3 U	< 4.7 UL	< 3.4 U
2,4,5-TP (Silvex)	93-72-1	ug/kg	22000	< 3.6 U	< 3.4 U	< 3.4 U	< 3.7 U	< 3.4 U	< 3.4 U	< 3.6 U	< 3.6 U	< 3.6 U	< 3.3 U	< 3.6 U	< 3.5 U	< 3.3 U	< 4.7 U	< 3.4 U
2,4-D	94-75-7	ug/kg	1800	< 18 U	< 17 U	< 17 U	< 18 UL	< 17 U	< 17 U	< 18 UL	< 18 U	< 18 U	< 17 U	< 18 UL	< 17 U	< 17 U	< 23 UL	< 17 U
Dalapon	75-99-0	ug/kg	5300	< 3.6 U	< 3.4 U	< 3.4 U	< 3.7 R	< 3.4 U	< 3.4 U	< 3.6 R	< 3.6 U	< 3.6 U	< 3.3 U	< 3.6 R	< 3.5 U	< 3.3 U	< 4.7 R	< 3.4 U
Dinoseb	88-85-7	ug/kg	290	< 18 U	< 17 U	< 17 U	< 18 U	< 17 U	< 17 U	< 18 U	< 18 U	< 18 U	< 17 U	< 18 U	< 17 U	< 17 U	< 23 U	< 17 U
PCBs																		
Aroclor-1016	12674-11-2	ug/kg	15000	< 37 U	< 35 UJ	< 35 U	< 38 U	< 35 U	< 35 U	< 38 U	< 36 U	< 37 U	< 34 U	< 37 U	< 35 U	< 34 U	< 48 U	< 34 U
Aroclor-1221	11104-28-2	ug/kg	630	< 37 U	< 35 UJ	< 35 U	< 38 U	< 35 U	< 35 U	< 38 U	< 36 U	< 37 U	< 34 U	< 37 U	< 35 U	< 34 U	< 48 U	< 34 U
Aroclor-1232	11141-16-5	ug/kg	500	< 37 U	< 35 UJ	< 35 U	< 38 U	< 35 U	< 35 U	< 38 U	< 36 U	< 37 U	< 34 U	< 37 U	< 35 U	< 34 U	< 48 U	< 34 U
Aroclor-1242	53469-21-9	ug/kg	16000	< 37 U	< 35 UJ	< 35 U	< 38 U	< 35 U	< 35 U	< 38 U	< 36 U	< 37 U	< 34 U	< 37 U	< 35 U	< 34 U	< 48 U	< 34 U
Aroclor-1248	12672-29-6	ug/kg	9900	< 37 U	< 35 UJ	< 35 U	< 38 U	< 35 U	< 35 U	< 38 U	< 36 U	< 37 U	< 34 U	< 37 U	< 35 U	< 34 U	< 48 U	< 34 U
Aroclor-1254	11097-69-1	ug/kg	4400	< 37 U	< 35 UJ	< 35 U	< 38 U	< 35 U	< 35 U	< 38 U	< 36 U	< 37 U	< 34 U	< 37 U	< 35 U	< 34 U	< 48 U	< 34 U
Aroclor-1260	11096-82-5	ug/kg	30000	< 37 U	< 35 UJ	< 35 U	< 38 U	< 35 U	< 35 U	< 38 U	< 36 U	< 37 U	< 34 U	< 37 U	< 35 U	< 34 U	< 48 U	< 34 U
Dioxin																		
2,3,7,8-TCDD	1746-01-6	pg/g	120	< 0.929 U	< 0.971 U	< 0.990 U	< 0.0688 U	< 0.947 U	< 0.963 U	< 0.057 U	< 0.963 U	< 0.979 U	< 0.982 U	0.0506 N	< 0.934 U	< 0.983 U	0.0785 J	< 0.966 U
SVOCs																		
1,1'-Biphenyl	92-52-4	ug/kg	790000	< 72 U	< 69 U	< 68 U	< 73 U	< 68 U	< 68 U	< 72 U	< 71 U	< 73 U	< 67 U	< 72 U	< 69 U	< 66 U	< 93 U	< 67 U
1,2,4,5-Tetrachlorobenzene	95-94-3	ug/kg	5100	< 180 U	< 170 U	< 170 U	< 180 U	< 170 U	< 170 U	< 180 U	< 180 U	< 180 U	< 170 U	< 180 U	< 170 U	< 170 U	< 230 U	< 170 U
1,2,4-Trichlorobenzene	120-82-1	ug/kg	27000	< 72 U	< 69 U	< 68 U	< 73 U	< 68 U	< 68 U	< 72 U	< 71 U	< 73 U	< 67 U	< 72 U	< 69 U	< 66 U	< 93 U	< 67 U
1,2-Dichlorobenzene	95-50-1	ug/kg	59000	< 72 U	< 69 U	< 68 U	< 73 U	< 68 U	< 68 U	< 72 U	< 71 U	< 73 U	< 67 U	< 72 U	< 69 U	< 66 U	< 93 U	< 67 U
1,2-DIPHENYLHYDRAZINE	122-66-7	ug/kg	150	< 72 U	< 69 U	< 68 U	< 73 UJ	< 68 U	< 68 U	< 72 UJ	< 71 U	< 73 U	< 67 U	< 72 UJ	< 69 U	< 66 U	< 93 UJ	< 67 U
1,3-Dichlorobenzene	541-73-1	ug/kg	61000	< 72 U	< 69 U	< 68 U	< 73 U	< 68 U	< 68 U	< 72 U	< 71 U	< 73 U	< 67 U	< 72 U	< 69 U	< 66 U	< 93 U	< 67 U
1,4-Dichlorobenzene	106-46-7	ug/kg	10000	< 72 U	< 69 U	< 68 U	< 73 U	< 68 U	< 68 U	< 72 U	< 71 U	< 73 U	< 67 U	< 72 U	< 69 U	< 66 U	< 93 U	< 67 U
2,2'-oxybis(1-Chloropropane)	108-60-1	ug/kg	8000	< 72 U	< 69 U	< 68 U	< 73 U	< 68 U	< 68 U	< 72 U	< 71 U	< 73 U	< 67 U	< 72 U	< 69 U	< 66 U	< 93 U	< 67 U
2,3,4,6-Tetrachlorophenol	58-90-2	ug/kg	450000	< 180 U	< 170 U	< 170 U	< 180 U	< 170 U	< 170 U	< 180 U	< 180 U	< 180 U	< 170 U	< 180 U	< 170 U	< 170 U	< 230 U	< 170 U
2,4,5-Trichlorophenol	95-95-4	ug/kg	2300000	< 180 U	< 170 U	< 170 U	< 180 U	< 170 U	< 170 U	< 180 U	< 180 U	< 180 U	< 170 U	< 180 U	< 170 U	< 170 U	< 230 U	< 170 U
2,4,6-Trichlorophenol	88-06-2	ug/kg	3100	< 180 U	< 170 U	< 170 U	< 180 U	< 170 U	< 170 U	< 180 U	< 180 U	< 180 U	< 170 U	< 180 U	< 170 U	< 170 U	< 230 U	< 170 U
2,4-Dichlorophenol	120-83-2	ug/kg	1000	< 180 U	< 170 U	< 170 U	< 180 U	< 170 U	< 170 U	< 180 U	< 180 U	< 180 U	< 170 U	< 180 U	< 170 U	< 170 U	< 230 U	< 170 U
2,4-Dimethylphenol	105-67-9	ug/kg	32000	< 180 U	< 170 U	< 170 U	< 180 U	< 170 U	< 170 U	< 180 U	< 180 U	< 180 U	< 170 U	< 180 U	< 170 U	< 170 U	< 230 U	< 170 U
2,4-Dinitrophenol	51-28-5	ug/kg	210	< 720 U	< 690 U	< 680 U	< 730 UJ	< 680 U	< 680 U	< 720 UJ	< 710 U	< 730 U	< 670 U	< 720 UJ	< 690 U	< 660 U	< 930 UJ	< 670 U
2,4-Dinitrotoluene	121-14-2	ug/kg	50	< 72 U	< 69 U	< 68 U	< 73 U	< 68 U	< 68 U	< 72 U	< 71 U	< 73 U	< 67 U	< 72 U	< 69 U	< 66 U	< 93 U	< 67 U
2,6-Dinitrotoluene	606-20-2	ug/kg	1100	< 72 U	< 69 U	< 68 U	< 73 U	< 68 U	< 68 U	< 72 U	< 71 U	< 73 U	< 67 U	< 72 U	< 69 U	< 66 U	< 93 U	< 67 U
2-Chlorophenol	95-57-8	ug/kg	4400	< 180 U	< 170 U	< 170 U	< 180 U	< 170 U	< 170 U	< 180 U	< 180 U	< 180 U	< 170 U	< 180 U	< 170 U	< 170 U	< 230 U	< 170 U
2-Methylnaphthalene	91-57-6	ug/kg	2900000	< 72 U	< 69 U	< 68 U	< 73 U	< 68 U	< 68 U	< 72 U	< 71 U	< 73 U	< 67 U	< 72 U	< 69 U	< 66 U	< 93 U	< 67 U
2-Methylphenol	95-48-7	ug/kg	64000	< 72 U	< 69 U	< 68 U	< 73 U	< 68 U	< 68 U	< 72 U	< 71 U	< 73 U	< 67 U	< 72 U	< 69 U	< 66 U	< 93 U	< 67 U
2-Nitroaniline	88-74-4	ug/kg	38	< 180 U	< 170 U	< 170 U	< 180 U	< 170 U	< 170 U	< 180 U	< 180 U	< 180 U	< 170 U	< 180 U	< 170 U	< 170 U	< 230 U	< 170 U
2-Nitrophenol	88-75-5	ug/kg	5900	< 180 U	< 170 U	< 170 U	< 180 U	< 170 U	< 170 U	< 180 U	< 180 U	< 180 U	< 170 U	< 180 U	< 170 U	< 170 U	< 230 U	< 170 U
3-Methylphenol (co-elut with 106-114-5)	108-39-4	ug/kg	36	< 72 U	< 69 U	< 68 U	< 73 U	< 68 U	< 68 U	< 72 U	< 71 U	< 73 U	< 67 U	< 72 U	< 69 U	< 66 U	< 93 U	< 67 U
4-Methylphenol (co-elut with 108-39-4)	106-114-5	ug/kg	4.2															
3,3'-Dichlorobenzidine	91-94-1	ug/kg	8300	< 180 U	< 170 U	< 170 U	< 180 U	< 170 U	< 170 U	< 180 U	< 180 U	< 180 U	< 170 U	< 180 U	< 170 U	< 170 U	< 230 U	< 170 U
3-Nitroaniline	99-09-2	ug/kg	33	< 180 U	< 170 U	< 170 U	< 180 U	< 170 U	< 170 U	< 180 U	< 180 U	< 180 U	< 170 U	< 180 U	< 170 U	< 170 U	< 230 U	< 170 U
4-Chloro-3-methylphenol	59-50-7	ug/kg	37000	< 180 U	< 170 U	< 170 U	< 180 U	< 170 U	< 170 U	< 180 U	< 180 U	< 180 U	< 170 U	< 180 U	< 170 U	< 170 U	< 230 U	< 170 U
4-Chloroaniline	106-47-8	ug/kg	19000	< 180 U	< 170 U	< 170 U	< 180 U	< 170 U	< 170 U	< 180 U	< 180 U	< 180 U	< 170 U	< 180 U	< 170 U	< 170 U	< 230 U	< 170 U
4-Nitroaniline	100-01-6	ug/kg	31	< 180 U	< 170 U	< 170 U	< 180 U	< 170 U	< 170 U	< 180 U	< 180 U	< 180 U	< 170 U	< 180 U	< 170 U	< 170 U	< 230 U	< 170 U
4-Nitrophenol	100-02-7	ug/kg	4100	< 360 U	< 350 U	< 340 U	< 370 U	< 340 U	< 340 U	< 360 U	< 360 U	< 360 U	< 330 U	< 360 U	< 340 U	< 330 U	< 470 U	< 340 U
Acenaphthene	83-32-9	ug/kg	2700000	< 36 U	< 35 U	< 34 U	< 37 U	< 34 U	< 34 U	< 36 U	< 36 U	< 36 U	< 33 U	< 36 U	< 34 U	< 33 U	< 47 U	< 34 U
Acenaphthylene	208-96-8	ug/kg	2500000	< 36 U	< 35 U	< 34 U	< 37 U	< 34 U	< 34 U	< 36 U	< 36 U	< 36 U	< 33 U	< 36 U	< 34 U	< 33 U	< 47 U	< 34 U
ACETALDEHYDE	75-07-0	ug/kg	230	108 J	65.1 J	65.9 J	66.2 J	133 J	65.7 J	84.0 J	81.4 J	< 1000 U	75.5 J	111 J	< 970 U	< 930 U	184 J	88.5 J
Acetophenone	98-86-2	ug/kg	200000	< 180 U	< 170 U	< 170 U	< 180 U	< 170 U	< 170 U	< 180 U	< 180 U	< 180 U	< 170 U	< 180 U	< 170 U	< 170 U	< 230 U	< 170 U

[1] CAS - Chemical Abstracts service

U - Undetected
J - Estimated; below RL or Validation Action
L - Biased Low
R - Datapoint Rejected
N - Value represents an EMPC value (Estimated Maximum Possible Concentration)

Table 3-1 Project Sediment Texture and Chemistry Results (dry units)

			Sample ID	CW1-C	CW2-C	CW3-C	CW4-C	CW5-C	CW6-C	CW7-C	CW8-C	CW9-C	CW9-FD	CW10-C	CW11-C	CW12-C	CW13-C	CW14-C
ANILINE	62-53-3	ug/kg	160	< 72 U	< 69 U	< 68 U	< 73 U	< 68 U	< 68 U	< 72 U	< 71 U	< 73 U	< 67 U	< 72 U	< 69 U	< 66 U	< 93 U	< 67 U
Anthracene	120-12-7	ug/kg	350000	< 36 U	< 35 U	< 34 U	< 37 U	< 34 U	< 34 U	< 36 U	< 36 U	< 36 U	< 33 U	< 36 U	< 34 U	< 33 U	< 47 U	< 34 U
Atrazine	1912-24-9	ug/kg	130	< 180 U	< 170 U	< 170 U	< 180 U	< 170 U	< 170 U	< 180 U	< 180 U	< 180 U	< 170 U	< 180 U	< 170 U	< 170 U	< 230 U	< 170 U
BENZIDINE	92-87-5	ug/kg	78	< 720 UJ	< 690 UJ	< 680 UJ	< 730 UJ	< 680 UJ	< 680 UJ	< 720 UJ	< 710 UJ	< 730 UJ	< 670 UJ	< 720 UJ	< 690 UJ	< 660 UJ	< 930 UJ	< 670 UJ
Benzo(a)anthracene	56-55-3	ug/kg	25000	< 36 U	< 35 U	< 34 U	< 37 U	< 34 U	< 34 U	< 36 U	< 36 U	< 36 U	< 33 U	< 36 U	< 34 U	< 33 U	21.2 J	< 34 U
Benzo(a)pyrene	50-32-8	ug/kg	2500	< 36 U	< 35 U	< 34 U	< 37 U	< 34 U	< 34 U	< 36 U	< 36 U	< 36 U	< 33 U	< 36 U	< 34 U	< 33 U	< 47 U	< 34 U
Benzo(b)fluoranthene	205-99-2	ug/kg	25000	< 36 U	< 35 U	< 34 U	< 37 U	< 34 U	< 34 U	< 36 U	< 36 U	< 36 U	< 33 U	< 36 U	< 34 U	< 33 U	< 47 U	< 34 U
Benzo(g,h,i)perylene	191-24-2	ug/kg	180000	< 36 U	< 35 U	< 34 U	< 37 U	< 34 U	< 34 U	< 36 U	< 36 U	< 36 U	< 33 U	< 36 U	< 34 U	< 33 U	< 47 U	< 34 U
Benzo(k)fluoranthene	207-08-9	ug/kg	250000	< 36 U	< 35 U	< 34 U	< 37 U	< 34 U	< 34 U	< 36 U	< 36 U	< 36 U	< 33 U	< 36 U	< 34 U	< 33 U	< 47 U	< 34 U
BENZOIC ACID	65-85-0	ug/kg	2900000	< 720 U	< 690 U	< 680 U	< 730 U	< 680 U	< 680 U	< 720 U	< 710 U	< 730 U	< 670 U	< 720 U	< 690 U	< 660 U	< 930 U	< 670 U
BENZYL ALCOHOL	100-51-6	ug/kg	400000	< 72 U	< 69 U	< 68 U	< 73 U	< 68 U	< 68 U	< 72 U	< 71 U	< 73 U	< 67 U	< 72 U	< 69 U	< 66 U	< 93 U	< 67 U
bis-(2-Chloroethyl)ether	111-44-4	ug/kg	3.9	< 72 U	< 69 U	< 68 U	< 73 U	< 68 U	< 68 U	< 72 U	< 71 U	< 73 U	< 67 U	< 72 U	< 69 U	< 66 U	< 93 U	< 67 U
bis-(2-Ethylhexyl)phthalate	117-81-7	ug/kg	130000	< 72 U	< 69 U	< 68 U	< 73 U	< 68 U	< 68 U	< 72 U	< 71 U	< 73 U	< 67 U	< 72 U	< 69 U	< 66 U	< 93 U	< 67 U
Butylbenzylphthalate	85-68-7	ug/kg	10000000	< 72 U	< 69 U	< 68 U	< 73 U	< 68 U	< 68 U	< 72 U	< 71 U	< 73 U	< 67 U	< 72 U	< 69 U	< 66 U	< 93 U	< 67 U
Carbazole	86-74-8	ug/kg	21000	< 72 U	< 69 U	< 68 U	< 73 U	< 68 U	< 68 U	< 72 U	< 71 U	< 73 U	< 67 U	< 72 U	< 69 U	< 66 U	< 93 U	< 67 U
Chrysene	218-01-9	ug/kg	230000	< 36 U	< 35 U	< 34 U	< 37 U	< 34 U	< 34 U	< 36 U	< 36 U	< 36 U	< 33 U	< 36 U	< 34 U	< 33 U	34.1 J	< 34 U
Dibenzo(a,h)anthracene	53-70-3	ug/kg	2500	< 36 U	< 35 U	< 34 U	< 37 U	< 34 U	< 34 U	< 36 U	< 36 U	< 36 U	< 33 U	< 36 U	< 34 U	< 33 U	< 47 U	< 34 U
Dibenzofuran	132-64-9	ug/kg	30000	< 72 U	< 69 U	< 68 U	< 73 U	< 68 U	< 68 U	< 72 U	< 71 U	< 73 U	< 67 U	< 72 U	< 69 U	< 66 U	< 93 U	< 67 U
Diethylphthalate	84-66-2	ug/kg	160000	< 72 U	< 69 U	< 68 U	< 73 U	< 68 U	< 68 U	< 72 U	< 71 U	< 73 U	< 67 U	< 72 U	< 69 U	< 66 U	< 93 U	< 67 U
Di-n-butylphthalate	84-74-2	ug/kg	1500000	< 72 U	< 69 U	< 68 U	< 73 U	< 68 U	< 68 U	< 72 U	< 71 U	< 73 U	< 67 U	< 72 U	< 69 U	< 66 U	< 93 U	< 67 U
Di-n-octylphthalate	117-84-0	ug/kg	4400000	< 72 U	< 69 U	< 68 U	< 73 U	< 68 U	< 68 U	< 72 U	< 71 U	< 73 U	< 67 U	< 72 U	< 69 U	< 66 U	< 93 U	< 67 U
Ethylene glycol	107-21-1	mg/kg	170	< 0.32 UL	< 0.30 UL	< 0.30 UL	< 0.32 UL	< 0.30 UL	< 0.30 UL	< 0.32 UL	< 0.31 UL	< 0.32 UL	< 0.29 UL	< 0.32 UL	< 0.30 UL	< 0.29 UL	< 0.41 UL	< 0.30 UL
Fluoranthene	206-44-0	ug/kg	3200000	< 36 U	< 35 U	< 34 U	< 37 U	< 34 U	< 34 U	< 36 U	< 36 U	< 36 U	< 33 U	< 36 U	< 34 U	< 33 U	37.7 J	< 34 U
Fluorene	86-73-7	ug/kg	3000000	< 36 U	< 35 U	< 34 U	< 37 U	< 34 U	< 34 U	< 36 U	< 36 U	< 36 U	< 33 U	< 36 U	< 34 U	< 33 U	< 47 U	< 34 U
FORMALDEHYDE	50-00-0	ug/kg	12000	18700 L	20300 L	9470 L	17200	15400 L	18400 L	19600	19500 L	16400 L	12600 L	16400	10600 L	9470 L	10700	20600 L
Hexachlorobenzene	118-74-1	ug/kg	960	< 72 U	< 69 U	< 68 U	< 73 U	< 68 U	< 68 U	< 72 U	< 71 U	< 73 U	< 67 U	< 72 U	< 69 U	< 66 U	< 93 U	< 67 U
Hexachlorobutadiene	87-68-3	ug/kg	1200	< 36 U	< 35 U	< 34 U	< 37 U	< 34 U	< 34 U	< 36 U	< 36 U	< 36 U	< 33 U	< 36 U	< 34 U	< 33 U	< 47 U	< 34 U
Hexachlorocyclo-pentadiene	77-47-4	ug/kg	91000	< 720 U	< 690 U	< 680 U	< 730 U	< 680 U	< 680 U	< 720 U	< 710 U	< 730 U	< 670 U	< 720 U	< 690 U	< 660 U	< 930 U	< 670 U
Hexachloroethane	67-72-1	ug/kg	560	< 180 U	< 170 U	< 170 U	< 180 U	< 170 U	< 170 U	< 180 U	< 180 U	< 180 U	< 170 U	< 180 U	< 170 U	< 170 U	< 230 U	< 170 U
Indeno(1,2,3-cd)pyrene	193-39-5	ug/kg	25000	< 36 U	< 35 U	< 34 U	< 37 U	< 34 U	< 34 U	< 36 U	< 36 U	< 36 U	< 33 U	< 36 U	< 34 U	< 33 U	< 47 U	< 34 U
Isophorone	78-59-1	ug/kg	1900	< 72 U	< 69 U	< 68 U	< 73 U	< 68 U	< 68 U	< 72 U	< 71 U	< 73 U	< 67 U	< 72 U	< 69 U	< 66 U	< 93 U	< 67 U
METHANAMINE, N-METHYL-N-NITROSO	62-75-9	ug/kg	0.041	< 72 U	< 69 U	< 68 U	< 73 UJ	< 68 U	< 68 U	< 72 UJ	< 71 U	< 73 U	< 67 U	< 72 UJ	< 69 U	< 66 U	< 93 UJ	< 67 U
Naphthalene	91-20-3	ug/kg	25000	< 36 U	< 35 U	< 34 U	< 37 U	< 34 U	< 34 U	< 36 U	< 36 U	< 36 U	< 33 U	< 36 U	< 34 U	< 33 U	< 47 U	< 34 U
Nitrobenzene	98-95-3	ug/kg	790	< 72 U	< 69 U	< 68 U	< 73 U	< 68 U	< 68 U	< 72 U	< 71 U	< 73 U	< 67 U	< 72 U	< 69 U	< 66 U	< 93 U	< 67 U
N-Nitroso-di-n-propylamine	621-64-7	ug/kg	1.3	< 72 U	< 69 U	< 68 U	< 73 U	< 68 U	< 68 U	< 72 U	< 71 U	< 73 U	< 67 U	< 72 U	< 69 U	< 66 U	< 93 U	< 67 U
N-Nitrosodiphenylamine	86-30-6	ug/kg	20000	< 180 U	< 170 U	< 170 U	< 180 U	< 170 U	< 170 U	< 180 U	< 180 U	< 180 U	< 170 U	< 180 U	< 170 U	< 170 U	< 230 U	< 170 U
Pentachlorophenol	87-86-5	ug/kg	5000	< 360 U	< 350 U	< 340 U	< 370 U	< 340 U	< 340 U	< 360 U	< 360 U	< 360 U	< 330 U	< 360 U	< 340 U	< 330 U	< 470 U	< 340 U
Phenanthrene	85-01-8	ug/kg	10000000	< 36 U	< 35 U	< 34 U	< 37 U	< 34 U	< 34 U	< 36 U	< 36 U	< 36 U	< 33 U	< 36 U	< 34 U	< 33 U	< 47 U	< 34 U
Phenol	108-95-2	ug/kg	66000	< 72 U	< 69 U	< 68 U	< 73 U	< 68 U	< 68 U	< 72 U	< 71 U	< 73 U	< 67 U	< 72 U	< 69 U	< 66 U	< 93 U	< 67 U
Pyrene	129-00-0	ug/kg	2200000	< 36 U	< 35 U	< 34 U	< 37 U	< 34 U	< 34 U	< 36 U	< 36 U	< 36 U	< 33 U	< 36 U	< 34 U	< 33 U	37.2 J	< 34 U
PYRIDINE	110-86-1	ug/kg	110	< 72 U	< 69 U	< 68 U	< 73 U	< 68 U	< 68 U	< 72 U	< 71 U	< 73 U	< 67 U	< 72 U	< 69 U	< 66 U	< 93 U	< 67 U
Quinoline	91-22-5	ug/kg	18	< 180 U	< 170 U	< 170 U	< 180 U	< 170 U	< 170 U	< 180 U	< 180 U	< 180 U	< 170 U	< 180 U	< 170 U	< 170 U	< 230 U	< 170 U
VOCs																		
1,1,1,2-TETRACHLOROETHANE	630-20-6	ug/kg	18000	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
1,1,1-Trichloroethane	71-55-6	ug/kg	7200	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
1,1,2,2-Tetrachloroethane	79-34-5	ug/kg	9.3	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 UJ	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
1,1,2-Trichloroethane	79-00-5	ug/kg	150	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
1,1-Dichloroethane	75-34-3	ug/kg	650	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
1,1-Dichloroethene	75-35-4	ug/kg	190	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
1,2,4-TRIMETHYLBENZENE	95-63-6	ug/kg	9000	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
1,2-Dibromo-3-chloropropane	96-12-8	ug/kg	9.2	< 5.5 U	< 5.4 U	< 5.4 U	< 5.1 U	< 6.4 UJ	< 5.8 U	< 6.1 U	< 5.8 U	< 5.5 U	< 5.6 U	< 5.2 U	< 5.7 UJ	< 5.9 U	< 8.5 U	< 6.1 U
1,2-Dibromoethane	106-93-4	ug/kg	1.2	< 0.55 U	< 0.54 U	< 0.54 U	< 0.51 U	< 0.64 U	< 0.58 U	< 0.61 U	< 0.58 U	< 0.55 U	< 0.56 U	< 0.52 U	< 0.57 UJ	< 0.59 U	< 0.85 U	< 0.61 U
1,2-Dichloroethane	107-06-2	ug/kg	100	< 0.55 UJ	< 0.54 UJ	< 0.54 UJ	< 0.51 U	< 0.64 UJ	< 0.58 UJ	< 0.61 UJ	< 0.58 UJ	< 0.55 UJ	< 0.56 UJ	< 0.52 UJ	< 0.57 UJ	< 0.59 UJ	< 0.85 UJ	< 0.61 UJ
1,2-Dichloropropane	78-87-5	ug/kg	110	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
1,3,5-TRICHLOROBENZENE	108-70-3	ug/kg	31000	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 UJ	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 UJ	< 2.8 UJ	< 2.9 U	< 4.2 UJ	< 3.1 U
1,4-Dioxane	123-91-1	ug/kg	73	< 68 U	< 68 U	< 68 U	< 64 U	< 80 U	< 72 U	< 77 U	< 72 U	< 69 U	< 70 U	< 65 U	< 71 UJ	< 74 U	< 110 U	< 76 U
1-CHLORO-2,3-EPOXYPROPANE	106-89-8	ug/kg	56	< 55 UL	< 54 UL	< 54 UL	< 51 U	< 64 UL	< 58 UL	< 61 UL	< 58 UL	< 55 UL	< 56 UL	< 52 UL	< 57 UL	< 59 UL	< 85 UL	< 61 UL
2-Butanone	78-93-3	ug/kg	54000	< 5.5 UL	< 5.4 UL	< 5.4 UL	< 5.1 U	< 6.4 UL	< 5.8 UL	< 6.1 UL	< 5.8 UL	< 5.5 UL	< 5.6 UL	< 5.2 UL	< 5.7 UL	< 5.9 UL	< 8.5 UL	< 6.1 UL
2-CHLOR-1,3-BUTADIENE	126-99-8	ug/kg	450	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 UJ	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
2-CHLOROTOLUENE	95-49-8	ug/kg	20000	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
2-METHYL-1-PROPANOL	78-83-1	ug/kg	76000	< 27 R	< 27 R	< 27 R	< 26 U	< 32 R	< 29 R	< 31 U	< 29 R	< 28 R	< 28 R	< 26 U	< 28 R	< 29 R	< 42 U	< 31 R
2-NITROPROPANE	79-46-9	ug/kg	0.26	< 5.5 R	< 5.4 R	< 5.4 R	< 4.0 U	< 6.4 R	< 5.8 R	< 6.1 R	< 5.8 R	< 5.5 R	< 5.6 R	< 5.2 R	< 5.7 R	< 5.9 R	< 8.5 R	< 6.1 R

[1] CAS - Chemical Abstracts service

U - Undetected
J - Estimated; below RL or Validation Action
L - Biased Low
R - Datapoint Rejected
N - Value represents an EMPC value (Estimated Maximum Possible Concentration)

Table 3-1 Project Sediment Texture and Chemistry Results (dry units)

			Sample ID	CW1-C	CW2-C	CW3-C	CW4-C	CW5-C	CW6-C	CW7-C	CW8-C	CW9-C	CW9-FD	CW10-C	CW11-C	CW12-C	CW13-C	CW14-C
4-Methyl-2-pentanone	108-10-1	ug/kg	2900	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 U	< 2.9 UJ	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 UJ
Acetone	67-64-1	ug/kg	41000	< 5.5 UL	< 5.4 UL	< 5.4 UL	< 5.1 U	< 6.4 UL	< 5.8 UL	< 6.1 UL	< 5.8 UL	< 5.5 UL	< 5.6 UL	< 5.2 UL	< 5.7 UL	< 5.9 UL	16.3 L	< 6.1 UL
ACETONITRILE	75-05-8	ug/kg	1900	< 55 UL	< 54 UL	< 54 UL	< 51 U	< 64 UL	< 58 UL	< 61 UL	< 58 UL	< 55 UL	< 56 UL	< 52 UL	< 57 UL	< 59 UL	< 85 UL	< 61 UL
ACRYLONITRILE	107-13-1	ug/kg	8.7	< 27 U	< 27 U	< 27 U	< 26 UL	< 32 U	< 29 U	< 31 UL	< 29 U	< 28 U	< 28 U	< 26 UL	< 28 UJ	< 29 U	< 42 UL	< 31 U
Benzene	71-43-2	ug/kg	130	< 0.55 U	< 0.54 U	< 0.54 U	< 0.51 U	< 0.64 U	< 0.58 U	< 0.61 U	< 0.58 U	< 0.55 U	< 0.56 U	< 0.52 U	< 0.57 UJ	< 0.59 U	< 0.85 U	< 0.61 U
BENZYL CHLORIDE	100-44-7	ug/kg	51	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
Bromochloromethane	74-97-5	ug/kg	1600	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
Bromodichloromethane	75-27-4	ug/kg	3400	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 UJ	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 UJ	< 2.8 UJ	< 2.9 U	< 4.2 UJ	< 3.1 U
Bromoform	75-25-2	ug/kg	4400	< 2.7 UJ	< 2.7 UJ	< 2.7 UJ	< 2.6 U	< 3.2 UJ	< 2.9 UJ	< 3.1 UJ	< 2.9 U	< 2.8 UJ	< 2.8 UJ	< 2.6 UJ	< 2.8 UJ	< 2.9 UJ	< 4.2 UJ	< 3.1 U
Bromomethane	74-83-9	ug/kg	540	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
BUTYLBENZENE, N-	104-51-8	ug/kg	950000	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
BUTYLEBENZENE, TERT-	98-06-6	ug/kg	270000	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
Carbon Disulfide	75-15-0	ug/kg	160000	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
Carbon Tetrachloride	56-23-5	ug/kg	260	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 UJ	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 UJ	< 2.8 UJ	< 2.9 U	< 4.2 UJ	< 3.1 U
CHLORO-1-PROPENE, 3- (ALLYL CHLORIDE)	107-05-1	ug/kg	65	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
Chlorobenzene	108-90-7	ug/kg	6100	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
CHLORODIFLUOROMETHANE	75-45-6	ug/kg	2.6	< 2.7 U	< 2.7 U	< 2.7 U	< 2.0 U	< 3.2 U	2.5 J	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	1.0 J	< 2.9 U	< 4.2 U	< 3.1 U
Chloroethane	75-00-3	ug/kg	5000	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
Chloroform	67-66-3	ug/kg	2500	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
Chloromethane	74-87-3	ug/kg	38	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
cis-1,2-Dichloroethylene	156-59-2	ug/kg	1600	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
Dibromochloromethane	124-48-1	ug/kg	3200	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
DIBROMOMETHANE	74-95-3	ug/kg	3700	< 2.7 UJ	< 2.7 UJ	< 2.7 UJ	< 2.6 U	< 3.2 UJ	< 2.9 UJ	< 3.1 UJ	< 2.9 U	< 2.8 UJ	< 2.8 UJ	< 2.6 UJ	< 2.8 UJ	< 2.9 UJ	< 4.2 UJ	< 3.1 U
ETHYL ACETATE	141-78-6	ug/kg	220000	< 2.7 UL	< 2.7 UL	< 2.7 UL	< 2.6 U	< 3.2 UL	< 2.9 UL	< 3.1 UL	< 2.9 UL	< 2.8 UL	< 2.8 UL	< 2.6 UL	< 2.8 UL	< 2.9 UL	< 4.2 UL	< 3.1 UL
ETHYL ETHER	60-29-7	ug/kg	53000	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
ETHYL METHACRYLATE	97-63-2	ug/kg	14000	< 5.5 U	< 5.4 U	< 5.4 U	< 5.1 U	< 6.4 U	< 5.8 U	< 6.1 U	< 5.8 U	< 5.5 U	< 5.6 U	< 5.2 U	< 5.7 UJ	< 5.9 U	< 8.5 U	< 6.1 U
Ethylbenzene	100-41-4	ug/kg	46000	< 0.55 U	< 0.54 U	< 0.54 U	< 0.51 U	< 0.64 U	< 0.58 U	< 0.61 U	< 0.58 U	< 0.55 U	< 0.56 U	< 0.52 U	< 0.57 UJ	< 0.59 U	< 0.85 U	< 0.61 U
HEXANE	110-54-3	ug/kg	500000	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 UJ	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
Isopropylbenzene	98-82-8	ug/kg	780000	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
Methyl Acetate	79-20-9	ug/kg	690000	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
METHYL METHACRYLATE	80-62-6	ug/kg	26000	< 5.5 U	< 5.4 U	< 5.4 U	< 5.1 U	< 6.4 U	< 5.8 U	< 6.1 U	< 5.8 U	< 5.5 U	< 5.6 U	< 5.2 U	< 5.7 UJ	< 5.9 U	< 8.5 U	< 6.1 U
Methyl tert-Butyl Ether (MTBE)	1634-04-4	ug/kg	280	< 0.55 U	< 0.54 U	< 0.54 U	< 0.51 U	< 0.64 U	< 0.58 U	< 0.61 U	< 0.58 U	< 0.55 U	< 0.56 U	< 0.52 U	< 0.57 UJ	< 0.59 U	< 0.85 U	< 0.61 U
Methylene Chloride	75-09-2	ug/kg	76	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
N-BUTYL ALCOHOL	71-36-3	ug/kg	12000	< 140 R	< 140 R	< 140 R	< 100 UL	< 160 R	< 140 R	< 150 R	< 140 R	< 140 R	< 140 R	< 130 R	< 140 R	< 150 R	< 210 R	< 150 R
PROPYLBENZENE, N-	103-65-1	ug/kg	290000	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
SEC-BUTYLBENZENE	135-98-8	ug/kg	350000	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
Styrene	100-42-5	ug/kg	24000	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
Tetrachloroethylene	127-18-4	ug/kg	430	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
Toluene	108-88-3	ug/kg	44000	< 0.55 U	< 0.54 U	< 0.54 U	< 0.51 U	< 0.64 U	< 0.58 U	< 0.61 U	< 0.58 U	< 0.55 U	< 0.56 U	< 0.52 U	< 0.57 UJ	< 0.59 U	< 0.85 U	< 0.61 U
trans-1,2-Dichloroethene	156-60-5	ug/kg	2300	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
Trichloroethene	79-01-6	ug/kg	170	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 UJ	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 UJ	< 2.8 UJ	< 2.9 U	< 4.2 UJ	< 3.1 U
TRICHLOROPROPANE, 1,2,3-	96-18-4	ug/kg	1600	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 UJ	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
TRIMETHYLBENZENE, 1,3,5-	108-67-8	ug/kg	2800	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
VINYL ACETATE	108-05-4	ug/kg	6500	< 5.5 UL	< 5.4 UL	< 5.4 UL	< 5.1 U	< 6.4 UL	< 5.8 UL	< 6.1 UL	< 5.8 UL	< 5.5 UL	< 5.6 UL	< 5.2 UL	< 5.7 UL	< 5.9 UL	< 8.5 UL	< 6.1 UL
Vinyl Chloride	75-01-4	ug/kg	30	< 2.7 U	< 2.7 U	< 2.7 U	< 2.6 U	< 3.2 U	< 2.9 U	< 3.1 U	< 2.9 U	< 2.8 U	< 2.8 U	< 2.6 U	< 2.8 UJ	< 2.9 U	< 4.2 U	< 3.1 U
XYLENES (TOTAL)	1330-20-7	ug/kg	990000	< 1.1 U	< 1.1 U	< 1.1 U	< 1.0 U	< 1.3 U	< 1.2 U	< 1.2 U	< 1.2 U	< 1.1 U	< 1.1 U	< 1.0 U	< 1.1 UJ	< 1.2 U	< 1.7 U	< 1.2 U

[1] CAS - Chemical Abstracts service

U - Undetected
J - Estimated; below RL or Validation Action
L - Biased Low
R - Datapoint Rejected
N - Value represents an EMPC value (Estimated Maximum Possible Concentration)

Table 3-1 Project Sediment Texture and Chemistry Results (dry units)

			Sample ID	CW15-C	CW16-C	CW17-C	CW18-C	CW19-C	CW20-C	CW20-C-FD	CW21-C	CW22-C	CW23-C	D1-C	D1-CFD	D2	R-C
Analyte	CAS[1]	Unit	CLEANFILL														
Grainsize																	
Gravel		%	-	5.9	6.2	1.6	0.0	1.3	6.3	4.2	3.3	6.0	4.3	21.5	25.2	41.7	28.7
Sand		%	-	86.2	42.5	50.2	66.2	30.4	77.5	52.0	30.6	55.0	18.5	34.2	35.7	14.2	34.6
Fines (silt + clay)		%	-	7.9	51.3	48.2	33.8	68.3	16.2	43.8	66.1	39.0	77.2	44.3	39.1	44.1	36.7
Total Organic Carbon	TOC	mg/kg	-	< 1200 U	20100	9090 J	10500	11700 J	27700 J	31300 J	29200	19800	15100	8170	9910 J	31900	12600
Solids, Percent	SOLID	%	-	83.6	71.7	78.7	75.4	74.2	81.4	59.4	81.8	78.1	79.1	68.8	60.3	75.9	74.8
Metals																	
Antimony	7440-36-0	mg/kg	27	< 2.4 UL	< 2.7 UL	< 2.6 UL	< 2.7 UL	< 2.7 UL	< 2.4 UL	< 3.5 UL	< 2.4 UL	< 2.4 UL	< 2.4 UL	< 2.9 UL	< 3.3 UL	< 2.5 UL	< 2.7 UL
Arsenic	7440-38-2	mg/kg	12	< 2.4 U	4.3	3.6	9.3	4.3	3.4	4.4	3	5.7	2.6	3.6	6.2	3.7	4.6
Barium	7440-39-3	mg/kg	8200	< 24 U	46.3	41.5	49.6	< 27 U	27.4	49.7	< 24 U	35.9	29.6	47.6	59	30	29
Beryllium	7440-41-7	mg/kg	320	< 0.24 U	0.41	0.41	0.53	0.38	0.36	0.61	0.26	0.45	0.34	0.52	0.69	0.37	0.35
BORON	7440-42-8	mg/kg	6.7	< 12 U	< 14 U	< 13 U	< 14 U	< 13 U	< 12 U	< 17 U	< 12 U	< 12 U	< 12 U	< 14 U	< 16 U	< 13 U	< 13 U
Cadmium	7440-43-9	mg/kg	38	< 0.60 U	< 0.68 U	< 0.64 U	< 0.68 U	< 0.66 U	< 0.59 U	< 0.87 U	< 0.59 U	< 0.61 U	< 0.61 U	< 0.72 U	< 0.82 U	< 0.64 U	< 0.67 U
Chromium	7440-47-3	mg/kg	-	4.9	13.4	8.8	12.3	11.4	8.2	11.2	6.6	13.4	8.7	15.2	19.3	9.2	8.9
Chromium, Trivalent	-	mg/kg	190000	4.9	13.4	8.8	12.3	11.4	8.2	11.2	6.6	13.4	8.7	14.7	19.3	9.2	8.9
Chromium, hexavalent	18540-29-9	mg/kg	94	< 0.48 U	< 0.56 U	< 0.51 U	< 0.53 U	< 0.54 UL	< 0.49 U	< 0.67 U	< 0.49 U	< 0.51 U	< 0.51 U	< 0.58 U	< 0.66 U	< 0.53 UL	< 0.53 U
Cobalt	7440-48-4	mg/kg	8.1	< 6.0 U	7.6	7.6	10.2	8	8.4	9.3	6.5	10.1	7.8	9.8	12.8	7.6	7.4
Copper	7440-50-8	mg/kg	8200	6.6	14.6	15.5	19.7	15.8	13	19.2	12.1	17	14.3	14.8	21.8	14.8	14.5
Lead	7439-92-1	mg/kg	450	4.5	11	9.6	15.6	11	10.1	13.5	6.6	13.1	8.8	10.1	16.4	9.4	8.9
Manganese	7439-96-5	mg/kg	31000	152 L	355 L	406 L	627 L	393 L	381 L	532 L	411 L	277 L	529 L	580 L	617 L	456 L	429 L
Mercury	7439-97-6	mg/kg	10	< 0.035 U	0.16	< 0.037 U	< 0.038 U	< 0.041 U	< 0.038 U	< 0.050 U	< 0.038 U	< 0.040 U	< 0.038 U	< 0.045 U	< 0.052 U	< 0.042 U	< 0.039 U
Nickel	7440-02-0	mg/kg	650	8	17.5	14.5	19.7	18.9	15	17.6	11.8	24	15	24	30.6	15.5	14.4
Vanadium	7440-62-2	mg/kg	1500	< 6.0 U	13	8.6	11.6	13.1	7.4	9.5	6.3	14.2	8.2	15.6	20.8	11.1	10.5
Zinc	7440-66-6	mg/kg	12000	24.7	49.2	38.2	55.5	44.3	43.3	52.6	34.6	62.3	41.7	63.6	159	42.6	38.4
Organometallic																	
Tetraethyl Lead	78-00-2	mg/kg	0.0046	< 0.006 U	< 0.006 U	< 0.006 U	< 0.006 U	< 0.006 U	< 0.006 U	< 0.006 U	< 0.006 U	< 0.006 U	< 0.005 U	< 0.006 U	< 0.006 U	< 0.006 U	< 0.006 U
Ancillary Parameters																	
PH	-	su	-	7.47	6.59	7.91	7.27	7.8	7.34	7.24	7.76	6.58	7.92	7.47	7.65	7.91	6.8
CHLORIDE	16887-00-6	mg/kg	-	< 24 U	32.7	< 25 U	< 27 U	< 27 U	< 25 U	< 33 U	< 24 U	< 26 U	< 25 U	< 29 U	< 33 U	< 26 U	< 27 U
SULFATE AS SO4	14808-79-8	mg/kg	-	< 120 U	< 140 U	< 130 U	< 130 U	< 130 U	< 120 U	< 170 U	< 120 U	234	< 130 U	< 140 U	< 170 U	< 130 U	< 130 U
Nitrogen, Nitrate + Nitrite	-	mg/kg	-	< 23 U	< 26 U	< 25 U	< 26 U	< 26 U	< 23 U	< 32 U	< 23 U	< 23 U	< 24 U	< 27 U	< 31 U	< 24 U	< 25 U
Cyanide	57-12-5	mg/kg	200	< 0.25 U	< 0.29 U	< 0.29 U	< 0.28 U	< 0.28 U	< 0.26 U	< 0.36 U	< 0.27 U	< 0.27 U	< 0.29 U	< 0.30 U	< 0.40 U	< 0.31 U	< 0.28 U
Pesticides/Herbicides																	
4,4'-DDD	72-54-8	ug/kg	6800	< 1.4 U	< 1.6 U	< 1.5 U	< 1.6 U	< 1.6 U	< 1.4 U	< 1.9 U	< 1.4 U	< 1.5 U	< 1.5 U	< 1.7 U	< 2.0 U	< 1.6 U	< 1.6 U
4,4'-DDE	72-55-9	ug/kg	41000	< 1.4 U	3.5	< 1.5 U	< 1.6 U	< 1.6 U	< 1.4 U	< 1.9 U	< 1.4 U	< 1.5 U	< 1.5 U	< 1.7 U	< 2.0 U	< 1.6 U	< 1.6 U
4,4'-DDT	50-29-3	ug/kg	53000	< 1.4 U	12.5	< 1.5 U	< 1.6 U	< 1.6 U	< 1.4 U	< 1.9 U	< 1.4 U	< 1.5 U	1.9	< 1.7 U	< 2.0 U	< 1.6 U	< 1.6 U
Aldrin	309-00-2	ug/kg	100	< 1.4 U	< 1.6 U	< 1.5 U	< 1.6 U	< 1.6 U	< 1.4 U	< 1.9 U	< 1.4 U	< 1.5 U	< 1.5 U	< 1.7 U	< 2.0 U	< 1.6 U	< 1.6 U
alpha-BHC	319-84-6	ug/kg	46	< 1.4 U	< 1.6 U	< 1.5 U	< 1.6 U	< 1.6 U	< 1.4 U	< 1.9 U	< 1.4 U	< 1.5 U	< 1.5 U	< 1.7 U	< 2.0 U	< 1.6 U	< 1.6 U
alpha-Chlordane	5103-71-9	ug/kg	49000	< 1.4 U	< 1.6 U	< 1.5 U	< 1.6 U	< 1.6 U	< 1.4 U	< 1.9 U	< 1.4 U	< 1.5 U	< 1.5 U	< 1.7 U	< 2.0 U	< 1.6 U	< 1.6 U
beta-BHC	319-85-7	ug/kg	220	< 1.4 U	< 1.6 U	< 1.5 U	< 1.6 U	< 1.6 U	< 1.4 U	< 1.9 U	< 1.4 U	< 1.5 U	< 1.5 U	< 1.7 U	< 2.0 U	< 1.6 U	< 1.6 U
Chlordane	12789-03-6	ug/kg	49000	< 35 U	< 41 U	< 37 U	< 39 U	< 40 U	< 36 U	< 49 U	< 36 U	< 38 U	< 37 U	< 43 U	< 49 U	< 39 U	< 39 U
delta-BHC	319-86-8	ug/kg	11000	< 1.4 U	< 1.6 U	< 1.5 U	< 1.6 U	< 1.6 U	< 1.4 U	< 1.9 U	< 1.4 U	< 1.5 U	< 1.5 U	< 1.7 U	< 2.0 U	< 1.6 U	< 1.6 U
Dieldrin	60-57-1	ug/kg	110	< 1.4 U	< 1.6 U	< 1.5 U	< 1.6 U	< 1.6 U	< 1.4 U	< 1.9 U	< 1.4 U	< 1.5 U	< 1.5 U	< 1.7 U	< 2.0 U	< 1.6 U	< 1.6 U
Endosulfan I	959-98-8	ug/kg	110000	< 1.4 U	< 1.6 U	< 1.5 U	< 1.6 U	< 1.6 U	< 1.4 U	< 1.9 U	< 1.4 U	< 1.5 U	< 1.5 U	< 1.7 U	< 2.0 U	< 1.6 U	< 1.6 U
Endosulfan II	33213-65-9	ug/kg	130000	< 1.4 U	< 1.6 U	< 1.5 U	< 1.6 U	< 1.6 U	< 1.4 U	< 1.9 U	< 1.4 U	< 1.5 U	< 1.5 U	< 1.7 U	< 2.0 U	< 1.6 U	< 1.6 U
Endosulfan Sulfate	1031-07-8	ug/kg	70000	< 1.4 U	< 1.6 U	< 1.5 U	< 1.6 U	< 1.6 U	< 1.4 U	< 1.9 U	< 1.4 U	< 1.5 U	< 1.5 U	< 1.7 U	< 2.0 U	< 1.6 U	< 1.6 U
Endrin	72-20-8	ug/kg	5500	< 1.4 U	< 1.6 U	< 1.5 U	< 1.6 U	< 1.6 U	< 1.4 U	< 1.9 U	< 1.4 U	< 1.5 U	< 1.5 U	< 1.7 U	< 2.0 U	< 1.6 U	< 1.6 U
gamma-BHC (Lindane)	58-89-9	ug/kg	72	< 1.4 U	< 1.6 U	< 1.5 U	< 1.6 U	< 1.6 U	< 1.4 U	< 1.9 U	< 1.4 U	< 1.5 U	< 1.5 U	< 1.7 U	< 2.0 U	< 1.6 U	< 1.6 U
gamma-Chlordane	5103-74-2	ug/kg	49000	< 1.4 U	< 1.6 U	< 1.5 U	< 1.6 U	< 1.6 U	< 1.4 U	< 1.9 U	< 1.4 U	< 1.5 U	< 1.5 U	< 1.7 U	< 2.0 U	< 1.6 U	< 1.6 U
Heptachlor	76-44-8	ug/kg	680	< 1.4 U	< 1.6 U	< 1.5 U	< 1.6 U	< 1.6 U	< 1.4 U	< 1.9 U	< 1.4 U	< 1.5 U	< 1.5 U	< 1.7 U	< 2.0 U	< 1.6 U	< 1.6 U
Heptachlor Epoxide	1024-57-3	ug/kg	1100	< 1.4 U	< 1.6 U	< 1.5 U	< 1.6 U	< 1.6 U	< 1.4 U	< 1.9 U	< 1.4 U	< 1.5 U	< 1.5 U	< 1.7 U	< 2.0 U	< 1.6 U	< 1.6 U

[1] CAS - Chemical Abstracts service

U - Undetected
J - Estimated; below RL or Validation Action
L - Biased Low
R - Datapoint Rejected
N - Value represents an EMPC value (Estimated Maximum Possible Concentration)

Table 3-1 Project Sediment Texture and Chemistry Results (dry units)

			Sample ID	CW15-C	CW16-C	CW17-C	CW18-C	CW19-C	CW20-C	CW20-C-FD	CW21-C	CW22-C	CW23-C	D1-C	D1-CFD	D2	R-C
Methoxychlor	72-43-5	ug/kg	630000	< 1.4 U	< 1.6 U	< 1.5 U	< 1.6 U	< 1.6 U	< 1.4 U	< 1.9 U	< 1.4 U	< 1.5 U	< 1.5 U	< 1.7 U	< 2.0 U	< 1.6 U	< 1.6 U
Toxaphene	8001-35-2	ug/kg	1200	< 17 U	< 21 U	< 19 U	< 19 U	< 20 U	< 18 U	< 24 U	< 18 U	< 19 U	< 18 U	< 21 U	< 24 U	< 19 U	< 20 U
CHLORPYRIFOS	2921-88-2	ug/kg	23000	< 80 U	< 94 U	< 85 U	< 89 U	< 90 U	< 81 U	< 110 U	< 81 U	< 85 U	< 84 U	< 98 U	< 110 U	< 87 U	< 88 U
Diazinon	333-41-5	ug/kg	82	< 80 U	< 94 U	< 85 U	< 89 U	< 90 U	< 81 U	< 110 U	< 81 U	< 85 U	< 84 U	< 98 U	< 110 U	< 87 U	< 88 U
Dichlorvos	62-73-7	ug/kg	12	< 80 U	< 94 U	< 85 U	< 89 U	< 90 U	< 81 U	< 110 U	< 81 U	< 85 U	< 84 U	< 98 U	< 110 U	< 87 U	< 88 U
Dimethoate	60-51-5	ug/kg	280	< 80 U	< 94 U	< 85 U	< 89 U	< 90 U	< 81 U	< 110 U	< 81 U	< 85 U	< 84 U	< 98 U	< 110 U	< 87 U	< 88 U
Disulfoton	298-04-4	ug/kg	78	< 80 U	< 94 U	< 85 U	< 89 U	< 90 U	< 81 U	< 110 U	< 81 U	< 85 U	< 84 U	< 98 U	< 110 U	< 87 U	< 88 U
Ethyl Parathion	56-38-2	ug/kg	130000	< 80 U	< 94 U	< 85 U	< 89 U	< 90 U	< 81 U	< 110 U	< 81 U	< 85 U	< 84 U	< 98 U	< 110 U	< 87 U	< 88 U
MALATHION	121-75-5	ug/kg	34000	< 80 U	< 94 U	< 85 U	< 89 U	< 90 U	< 81 U	< 110 U	< 81 U	< 85 U	< 84 U	< 98 U	< 110 U	< 87 U	< 88 U
Methyl parathion	298-00-0	ug/kg	420	< 80 U	< 94 U	< 85 U	< 89 U	< 90 U	< 81 U	< 110 U	< 81 U	< 85 U	< 84 U	< 98 U	< 110 U	< 87 U	< 88 U
Phorate	298-02-2	ug/kg	410	< 80 U	< 94 U	< 85 U	< 89 U	< 90 U	< 81 U	< 110 U	< 81 U	< 85 U	< 84 U	< 98 U	< 110 U	< 87 U	< 88 U
RONNEL	299-84-3	ug/kg	280000	< 80 U	< 94 U	< 85 U	< 89 U	< 90 U	< 81 U	< 110 U	< 81 U	< 85 U	< 84 U	< 98 U	< 110 U	< 87 U	< 88 U
Sulfotep	3689-24-5	ug/kg	730	< 80 U	< 94 U	< 85 U	< 89 U	< 90 U	< 81 U	< 110 U	< 81 U	< 85 U	< 84 U	< 98 U	< 110 U	< 87 U	< 88 U
2,4,5-T	93-76-5	ug/kg	1500	< 3.4 U	< 4.0 UL	< 3.6 U	< 3.8 U	< 3.8 UL	< 3.5 U	< 4.8 U	< 3.5 U	< 3.6 UL	< 3.6 U	< 4.1 UL	< 4.7 UL	< 3.7 UL	< 3.8 UL
2,4,5-TP (Silvex)	93-72-1	ug/kg	22000	< 3.4 U	< 4.0 U	< 3.6 U	< 3.8 U	< 3.8 U	< 3.5 U	< 4.8 U	< 3.5 U	< 3.6 U	< 3.6 U	< 4.1 U	< 4.7 U	< 3.7 U	< 3.8 U
2,4-D	94-75-7	ug/kg	1800	< 17 U	< 20 UL	< 18 U	< 19 U	< 19 UL	< 18 U	< 24 U	< 17 U	< 18 UL	< 18 U	< 21 UL	< 23 UL	< 19 UL	< 19 UL
Dalapon	75-99-0	ug/kg	5300	< 3.4 U	< 4.0 R	< 3.6 U	< 3.8 U	< 3.8 R	< 3.5 U	< 4.8 U	< 3.5 U	< 3.6 R	< 3.6 U	< 4.1 R	< 4.7 R	< 3.7 R	< 3.8 R
Dinoseb	88-85-7	ug/kg	290	< 17 U	< 20 U	< 18 U	< 19 U	< 19 U	< 18 U	< 24 U	< 17 U	< 18 U	< 18 U	< 21 U	< 23 U	< 19 U	< 19 U
PCBs																	
Aroclor-1016	12674-11-2	ug/kg	15000	< 35 U	< 41 U	< 37 U	< 39 U	< 40 U	< 36 U	< 49 U	< 36 U	< 38 U	< 37 U	< 43 U	< 49 U	< 39 U	< 39 U
Aroclor-1221	11104-28-2	ug/kg	630	< 35 U	< 41 U	< 37 U	< 39 U	< 40 U	< 36 U	< 49 U	< 36 U	< 38 U	< 37 U	< 43 U	< 49 U	< 39 U	< 39 U
Aroclor-1232	11141-16-5	ug/kg	500	< 35 U	< 41 U	< 37 U	< 39 U	< 40 U	< 36 U	< 49 U	< 36 U	< 38 U	< 37 U	< 43 U	< 49 U	< 39 U	< 39 U
Aroclor-1242	53469-21-9	ug/kg	16000	< 35 U	< 41 U	< 37 U	< 39 U	< 40 U	< 36 U	< 49 U	< 36 U	< 38 U	< 37 U	< 43 U	< 49 U	< 39 U	< 39 U
Aroclor-1248	12672-29-6	ug/kg	9900	< 35 U	< 41 U	< 37 U	< 39 U	< 40 U	< 36 U	< 49 U	< 36 U	< 38 U	< 37 U	< 43 U	< 49 U	< 39 U	< 39 U
Aroclor-1254	11097-69-1	ug/kg	4400	< 35 U	< 41 U	< 37 U	< 39 U	< 40 U	< 36 U	< 49 U	< 36 U	< 38 U	< 37 U	< 43 U	< 49 U	< 39 U	< 39 U
Aroclor-1260	11096-82-5	ug/kg	30000	< 35 U	< 41 U	< 37 U	< 39 U	< 40 U	< 36 U	< 49 U	< 36 U	< 38 U	< 37 U	< 43 U	< 49 U	< 39 U	< 39 U
Dioxin																	
2,3,7,8-TCDD	1746-01-6	pg/g	120	< 0.952 U	< 0.0506 U	< 0.903 U	< 0.953 U	< 0.0504 U	< 0.943 U	< 0.993 U	< 0.932 U	0.0643 N	< 0.954 U	0.0554 J	< 0.052 U	< 0.0547 U	< 0.110 U
SVOCs																	
1,1'-Biphenyl	92-52-4	ug/kg	790000	< 68 U	< 79 U	< 72 U	< 75 U	< 76 U	< 70 U	< 96 U	< 70 U	< 73 U	< 72 U	< 83 U	< 94 U	< 75 U	< 76 U
1,2,4,5-Tetrachlorobenzene	95-94-3	ug/kg	5100	< 170 U	< 200 U	< 180 U	< 190 U	< 190 U	< 180 U	< 240 U	< 170 U	< 180 U	< 180 U	< 210 U	< 240 U	< 190 U	< 190 U
1,2,4-Trichlorobenzene	120-82-1	ug/kg	27000	< 68 U	< 79 U	< 72 U	< 75 U	< 76 U	< 70 U	< 96 U	< 70 U	< 73 U	< 72 U	< 83 U	< 94 U	< 75 U	< 76 U
1,2-Dichlorobenzene	95-50-1	ug/kg	59000	< 68 U	< 79 U	< 72 U	< 75 U	< 76 U	< 70 U	< 96 U	< 70 U	< 73 U	< 72 U	< 83 U	< 94 U	< 75 U	< 76 U
1,2-DIPHENYLHYDRAZINE	122-66-7	ug/kg	150	< 68 U	< 79 UJ	< 72 U	< 75 U	< 76 UJ	< 70 U	< 96 U	< 70 U	< 73 UJ	< 72 U	< 83 UJ	< 94 UJ	< 75 UJ	< 76 U
1,3-Dichlorobenzene	541-73-1	ug/kg	61000	< 68 U	< 79 U	< 72 U	< 75 U	< 76 U	< 70 U	< 96 U	< 70 U	< 73 U	< 72 U	< 83 U	< 94 U	< 75 U	< 76 U
1,4-Dichlorobenzene	106-46-7	ug/kg	10000	< 68 U	< 79 U	< 72 U	< 75 U	< 76 U	< 70 U	< 96 U	< 70 U	< 73 U	< 72 U	< 83 U	< 94 U	< 75 U	< 76 U
2,2'-oxybis(1-Chloropropane)	108-60-1	ug/kg	8000	< 68 U	< 79 U	< 72 U	< 75 U	< 76 U	< 70 U	< 96 U	< 70 U	< 73 U	< 72 U	< 83 U	< 94 U	< 75 U	< 76 U
2,3,4,6-Tetrachlorophenol	58-90-2	ug/kg	450000	< 170 U	< 200 U	< 180 U	< 190 U	< 190 U	< 180 U	< 240 U	< 170 U	< 180 U	< 180 U	< 210 U	< 240 U	< 190 U	< 190 U
2,4,5-Trichlorophenol	95-95-4	ug/kg	2300000	< 170 U	< 200 U	< 180 U	< 190 U	< 190 U	< 180 U	< 240 U	< 170 U	< 180 U	< 180 U	< 210 U	< 240 U	< 190 U	< 190 U
2,4,6-Trichlorophenol	88-06-2	ug/kg	3100	< 170 U	< 200 U	< 180 U	< 190 U	< 190 U	< 180 U	< 240 U	< 170 U	< 180 U	< 180 U	< 210 U	< 240 U	< 190 U	< 190 U
2,4-Dichlorophenol	120-83-2	ug/kg	1000	< 170 U	< 200 U	< 180 U	< 190 U	< 190 U	< 180 U	< 240 U	< 170 U	< 180 U	< 180 U	< 210 U	< 240 U	< 190 U	< 190 U
2,4-Dimethylphenol	105-67-9	ug/kg	32000	< 170 U	< 200 U	< 180 U	< 190 U	< 190 U	< 180 U	< 240 U	< 170 U	< 180 U	< 180 U	< 210 U	< 240 U	< 190 U	< 190 U
2,4-Dinitrophenol	51-28-5	ug/kg	210	< 680 U	< 790 UJ	< 720 U	< 750 U	< 760 UJ	< 700 U	< 960 U	< 700 U	< 730 UJ	< 720 U	< 830 UJ	< 940 UJ	< 750 UJ	< 760 UJ
2,4-Dinitrotoluene	121-14-2	ug/kg	50	< 68 U	< 79 U	< 72 U	< 75 U	< 76 U	< 70 U	< 96 U	< 70 U	< 73 U	< 72 U	< 83 U	< 94 U	< 75 U	< 76 U
2,6-Dinitrotoluene	606-20-2	ug/kg	1100	< 68 U	< 79 U	< 72 U	< 75 U	< 76 U	< 70 U	< 96 U	< 70 U	< 73 U	< 72 U	< 83 U	< 94 U	< 75 U	< 76 U
2-Chlorophenol	95-57-8	ug/kg	4400	< 170 U	< 200 U	< 180 U	< 190 U	< 190 U	< 180 U	< 240 U	< 170 U	< 180 U	< 180 U	< 210 U	< 240 U	< 190 U	< 190 U
2-Methylnaphthalene	91-57-6	ug/kg	2900000	< 68 U	< 79 U	< 72 U	< 75 U	< 76 U	< 70 U	< 96 U	< 70 U	< 73 U	< 72 U	< 83 U	< 94 U	< 75 U	< 76 U
2-Methylphenol	95-48-7	ug/kg	64000	< 68 U	< 79 U	< 72 U	< 75 U	< 76 U	< 70 U	< 96 U	< 70 U	< 73 U	< 72 U	< 83 U	< 94 U	< 75 U	< 76 U
2-Nitroaniline	88-74-4	ug/kg	38	< 170 U	< 200 U	< 180 U	< 190 U	< 190 U	< 180 U	< 240 U	< 170 U	< 180 U	< 180 U	< 210 U	< 240 U	< 190 U	< 190 U
2-Nitrophenol	88-75-5	ug/kg	5900	< 170 U	< 200 U	< 180 U	< 190 U	< 190 U	< 180 U	< 240 U	< 170 U	< 180 U	< 180 U	< 210 U	< 240 U	< 190 U	< 190 U
3-Methylphenol (co-elut with 106-114-5)	108-39-4	ug/kg	36	< 68 U	< 79 U	< 72 U	< 75 U	< 76 U	< 70 U	< 96 U	< 70 U	< 73 U	< 72 U	< 83 U	< 94 U	< 75 U	< 76 U
4-Methylphenol (co-elut with 108-39-4)	106-114-5	ug/kg	4.2														
3,3'-Dichlorobenzidine	91-94-1	ug/kg	8300	< 170 U	< 200 U	< 180 U	< 190 U	< 190 U	< 180 U	< 240 U	< 170 U	< 180 U	< 180 U	< 210 U	< 240 U	< 190 U	< 190 U
3-Nitroaniline	99-09-2	ug/kg	33	< 170 U	< 200 U	< 180 U	< 190 U	< 190 U	< 180 U	< 240 U	< 170 U	< 180 U	< 180 U	< 210 U	< 240 U	< 190 U	< 190 U
4-Chloro-3-methylphenol	59-50-7	ug/kg	37000	< 170 U	< 200 U	< 180 U	< 190 U	< 190 U	< 180 U	< 240 U	< 170 U	< 180 U	< 180 U	< 210 U	< 240 U	< 190 U	< 190 U
4-Chloroaniline	106-47-8	ug/kg	19000	< 170 U	< 200 U	< 180 U	< 190 U	< 190 U	< 180 U	< 240 U	< 170 U	< 180 U	< 180 U	< 210 U	< 240 U	< 190 U	< 190 U
4-Nitroaniline	100-01-6	ug/kg	31	< 170 U	< 200 U	< 180 U	< 190 U	< 190 U	< 180 U	< 240 U	< 170 U	< 180 U	< 180 U	< 210 U	< 240 U	< 190 U	< 190 U
4-Nitrophenol	100-02-7	ug/kg	4100	< 340 U	< 400 U	< 360 U	< 380 U	< 380 U	< 350 U	< 480 U	< 350 U	< 360 U	< 360 U	< 420 U	< 470 U	< 380 U	< 380 U
Acenaphthene	83-32-9	ug/kg	2700000	< 34 U	< 40 U	< 36 U	< 38 U	< 38 U	< 35 U	< 48 U	< 35 U	< 36 U	< 36 U	< 42 U	< 47 U	< 38 U	< 38 U
Acenaphthylene	208-96-8	ug/kg	2500000	< 34 U	< 40 U	< 36 U	< 38 U	< 38 U	< 35 U	< 48 U	< 35 U	< 36 U	< 36 U	< 42 U	< 47 U	< 38 U	< 38 U
ACETALDEHYDE	75-07-0	ug/kg	230	73.8 J	193 J	79.5 J	103 J	166 J	111 J	127 J	69.6 J	255 J	99.9 J	120 J	101 J	99.0 J	95.3 J
Acetophenone	98-86-2	ug/kg	200000	< 170 U	< 200 U	< 180 U	< 190 U	< 190 U	< 180 U	< 240 U	< 170 U	< 180 U	< 180 U	< 210 U	< 240 U	< 190 U	< 190 U

[1] CAS - Chemical Abstracts service

U - Undetected
J - Estimated; below RL or Validation Action
L - Biased Low
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N - Value represents an EMPC value (Estimated Maximum Possible Concentration)

Table 3-1 Project Sediment Texture and Chemistry Results (dry units)

			Sample ID	CW15-C	CW16-C	CW17-C	CW18-C	CW19-C	CW20-C	CW20-C-FD	CW21-C	CW22-C	CW23-C	D1-C	D1-CFD	D2	R-C
ANILINE	62-53-3	ug/kg	160	< 68 U	< 79 U	< 72 U	< 75 U	< 76 U	< 70 U	< 96 U	< 70 U	< 73 U	< 72 U	< 83 U	< 94 U	< 75 U	< 76 U
Anthracene	120-12-7	ug/kg	350000	< 34 U	< 40 U	< 36 U	< 38 U	< 38 U	< 35 U	< 48 U	< 35 U	< 36 U	< 36 U	< 42 U	< 47 U	< 38 U	< 38 U
Atrazine	1912-24-9	ug/kg	130	< 170 U	< 200 U	< 180 U	< 190 U	< 190 U	< 180 U	< 240 U	< 170 U	< 180 U	< 180 U	< 210 U	< 240 U	< 190 U	< 190 U
BENZIDINE	92-87-5	ug/kg	78	< 680 UJ	< 790 UJ	< 720 UJ	< 750 UJ	< 760 UJ	< 700 UJ	< 960 UJ	< 700 UJ	<.730 UJ	< 720 UJ	< 830 UJ	< 940 UJ	< 750 UJ	< 760 R
Benzo(a)anthracene	56-55-3	ug/kg	25000	< 34 U	< 40 U	< 36 U	< 38 U	< 38 U	< 35 U	< 48 U	< 35 U	25.5 J	< 36 U	< 42 U	< 47 U	< 38 U	< 38 U
Benzo(a)pyrene	50-32-8	ug/kg	2500	< 34 U	< 40 U	< 36 U	< 38 U	< 38 U	< 35 U	< 48 U	< 35 U	19.3 J	< 36 U	< 42 U	< 47 U	< 38 U	< 38 U
Benzo(b)fluoranthene	205-99-2	ug/kg	25000	< 34 U	< 40 U	< 36 U	< 38 U	< 38 U	< 35 U	< 48 U	< 35 U	19.1 J	< 36 U	< 42 U	< 47 U	< 38 U	< 38 U
Benzo(g,h,i)perylene	191-24-2	ug/kg	180000	< 34 U	< 40 U	< 36 U	< 38 U	< 38 U	< 35 U	< 48 U	< 35 U	< 36 U	< 36 U	< 42 U	< 47 U	< 38 U	< 38 U
Benzo(k)fluoranthene	207-08-9	ug/kg	250000	< 34 U	< 40 U	< 36 U	< 38 U	< 38 U	< 35 U	< 48 U	< 35 U	24.8 J	< 36 U	< 42 U	< 47 U	< 38 U	< 38 U
BENZOIC ACID	65-85-0	ug/kg	2900000	< 680 U	< 790 U	< 720 U	< 750 U	< 760 U	< 700 U	< 960 U	< 700 U	< 730 U	< 720 U	< 830 U	< 940 U	< 750 U	< 760 U
BENZYL ALCOHOL	100-51-6	ug/kg	400000	< 68 U	< 79 U	< 72 U	< 75 U	< 76 U	< 70 U	< 96 U	< 70 U	< 73 U	< 72 U	< 83 U	< 94 U	< 75 U	< 76 UJ
bis-(2-Chloroethyl)ether	111-44-4	ug/kg	3.9	< 68 U	< 79 U	< 72 U	< 75 U	< 76 U	< 70 U	< 96 U	< 70 U	< 73 U	< 72 U	< 83 U	< 94 U	< 75 U	< 76 U
bis-(2-Ethylhexyl)phthalate	117-81-7	ug/kg	130000	< 68 U	< 79 U	< 72 U	< 75 U	< 76 U	< 70 U	< 96 U	< 70 U	< 73 U	< 72 U	< 83 U	< 94 U	< 75 U	< 76 U
Butylbenzylphthalate	85-68-7	ug/kg	10000000	< 68 U	< 79 U	< 72 U	< 75 U	< 76 U	< 70 U	< 96 U	< 70 U	< 73 U	< 72 U	< 83 U	< 94 U	< 75 U	< 76 U
Carbazole	86-74-8	ug/kg	21000	< 68 U	< 79 U	< 72 U	< 75 U	< 76 U	< 70 U	< 96 U	< 70 U	< 73 U	< 72 U	< 83 U	< 94 U	< 75 U	< 76 U
Chrysene	218-01-9	ug/kg	230000	< 34 U	< 40 U	< 36 U	< 38 U	< 38 U	< 35 U	< 48 U	< 35 U	29.5 J	< 36 U	< 42 U	< 47 U	< 38 U	< 38 U
Dibenzo(a,h)anthracene	53-70-3	ug/kg	2500	< 34 U	< 40 U	< 36 U	< 38 U	< 38 U	< 35 U	< 48 U	< 35 U	< 36 U	< 36 U	< 42 U	< 47 U	< 38 U	< 38 U
Dibenzofuran	132-64-9	ug/kg	30000	< 68 U	< 79 U	< 72 U	< 75 U	< 76 U	< 70 U	< 96 U	< 70 U	< 73 U	< 72 U	< 83 U	< 94 U	< 75 U	< 76 U
Diethylphthalate	84-66-2	ug/kg	160000	< 68 U	< 79 U	< 72 U	< 75 U	< 76 U	< 70 U	< 96 U	< 70 U	< 73 U	< 72 U	< 83 U	< 94 U	< 75 U	< 76 U
Di-n-butylphthalate	84-74-2	ug/kg	1500000	< 68 U	< 79 U	< 72 U	< 75 U	< 76 U	< 70 U	< 96 U	< 70 U	< 73 U	< 72 U	< 83 U	< 94 U	< 75 U	< 76 U
Di-n-octylphthalate	117-84-0	ug/kg	4400000	< 68 U	< 79 U	< 72 U	< 75 U	< 76 U	< 70 U	< 96 U	< 70 U	< 73 U	< 72 U	< 83 U	< 94 U	< 75 U	< 76 U
Ethylene glycol	107-21-1	mg/kg	170	< 0.29 UL	< 0.35 UL	< 0.32 UL	< 0.33 UL	< 0.34 UL	< 0.30 UL	< 0.42 UL	< 0.31 UL	< 0.32 UL	< 0.31 UL	< 0.36 UL	< 0.41 UL	< 0.33 UL	< 0.33 UL
Fluoranthene	206-44-0	ug/kg	3200000	< 34 U	< 40 U	< 36 U	< 38 U	< 38 U	< 35 U	< 48 U	< 35 U	40.2	< 36 U	< 42 U	< 47 U	< 38 U	< 38 U
Fluorene	86-73-7	ug/kg	3000000	< 34 U	< 40 U	< 36 U	< 38 U	< 38 U	< 35 U	< 48 U	< 35 U	< 36 U	< 36 U	< 42 U	< 47 U	< 38 U	< 38 U
FORMALDEHYDE	50-00-0	ug/kg	12000	339 J	8510	8570 L	16300 L	9810	10800 L	12000 L	13600 L	23400	17800 L	9210	6790	23800	19800
Hexachlorobenzene	118-74-1	ug/kg	960	< 68 U	< 79 U	< 72 U	< 75 U	< 76 U	< 70 U	< 96 U	< 70 U	< 73 U	< 72 U	< 83 U	< 94 U	< 75 U	< 76 U
Hexachlorobutadiene	87-68-3	ug/kg	1200	< 34 U	< 40 U	< 36 U	< 38 U	< 38 U	< 35 U	< 48 U	< 35 U	< 36 U	< 36 U	< 42 U	< 47 U	< 38 U	< 38 U
Hexachlorocyclo-pentadiene	77-47-4	ug/kg	91000	< 680 U	< 790 U	< 720 U	< 750 U	< 760 U	< 700 U	< 960 U	< 700 U	< 730 U	< 720 U	< 830 U	< 940 U	< 750 U	< 760 U
Hexachloroethane	67-72-1	ug/kg	560	< 170 U	< 200 U	< 180 U	< 190 U	< 190 U	< 180 U	< 240 U	< 170 U	< 180 U	< 180 U	< 210 U	< 240 U	< 190 U	< 190 U
Indeno(1,2,3-cd)pyrene	193-39-5	ug/kg	25000	< 34 U	< 40 U	< 36 U	< 38 U	< 38 U	< 35 U	< 48 U	< 35 U	< 36 U	< 36 U	< 42 U	< 47 U	< 38 U	< 38 U
Isophorone	78-59-1	ug/kg	1900	< 68 U	< 79 U	< 72 U	< 75 U	< 76 U	< 70 U	< 96 U	< 70 U	< 73 U	< 72 U	< 83 U	< 94 U	< 75 U	< 76 U
METHANAMINE, N-METHYL-N-NITROSO	62-75-9	ug/kg	0.041	< 68 U	< 79 UJ	< 72 U	< 75 U	< 76 UJ	< 70 U	< 96 U	< 70 U	< 73 UJ	< 72 U	< 83 UJ	< 94 UJ	< 75 UJ	< 76 UJ
Naphthalene	91-20-3	ug/kg	25000	< 34 U	< 40 U	< 36 U	< 38 U	< 38 U	< 35 U	< 48 U	< 35 U	< 36 U	< 36 U	< 42 U	< 47 U	< 38 U	< 38 U
Nitrobenzene	98-95-3	ug/kg	790	< 68 U	< 79 U	< 72 U	< 75 U	< 76 U	< 70 U	< 96 U	< 70 U	< 73 U	< 72 U	< 83 U	< 94 U	< 75 U	< 76 U
N-Nitroso-di-n-propylamine	621-64-7	ug/kg	1.3	< 68 U	< 79 U	< 72 U	< 75 U	< 76 U	< 70 U	< 96 U	< 70 U	< 73 U	< 72 U	< 83 U	< 94 U	< 75 U	< 76 U
N-Nitrosodiphenylamine	86-30-6	ug/kg	20000	< 170 U	< 200 U	< 180 U	< 190 U	< 190 U	< 180 U	< 240 U	< 170 U	< 180 U	< 180 U	< 210 U	< 240 U	< 190 U	< 190 U
Pentachlorophenol	87-86-5	ug/kg	5000	< 340 U	< 400 U	< 360 U	< 380 U	< 380 U	< 350 U	< 480 U	< 350 U	< 360 U	< 360 U	< 420 U	< 470 U	< 380 U	< 380 U
Phenanthrene	85-01-8	ug/kg	10000000	< 34 U	< 40 U	< 36 U	< 38 U	< 38 U	< 35 U	< 48 U	< 35 U	22.9 J	< 36 U	< 42 U	< 47 U	< 38 U	< 38 U
Phenol	108-95-2	ug/kg	66000	< 68 U	< 79 U	< 72 U	< 75 U	< 76 U	< 70 U	< 96 U	< 70 U	< 73 U	< 72 U	< 83 U	< 94 U	< 75 U	< 76 U
Pyrene	129-00-0	ug/kg	2200000	< 34 U	16.7 J	< 36 U	< 38 U	< 38 U	< 35 U	19.6 J	< 35 U	42.0	< 36 U	< 42 U	< 47 U	< 38 U	< 38 U
PYRIDINE	110-86-1	ug/kg	110	< 68 U	< 79 U	< 72 U	< 75 U	< 76 U	< 70 U	< 96 U	< 70 U	< 73 U	< 72 U	< 83 U	< 94 U	< 75 U	< 76 U
Quinoline	91-22-5	ug/kg	18	< 170 U	< 200 U	< 180 U	< 190 U	< 190 U	< 180 U	< 240 U	< 170 U	< 180 U	< 180 U	< 210 U	< 240 U	< 190 U	< 190 U
VOCs																	
1,1,1,2-TETRACHLOROETHANE	630-20-6	ug/kg	18000	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 U
1,1,1-Trichloroethane	71-55-6	ug/kg	7200	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 U
1,1,2,2-Tetrachloroethane	79-34-5	ug/kg	9.3	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 UJ
1,1,2-Trichloroethane	79-00-5	ug/kg	150	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 U
1,1-Dichloroethane	75-34-3	ug/kg	650	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 U
1,1-Dichloroethene	75-35-4	ug/kg	190	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 U
1,2,4-TRIMETHYLBENZENE	95-63-6	ug/kg	9000	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 UJ
1,2-Dibromo-3-chloropropane	96-12-8	ug/kg	9.2	< 6.0 U	< 7.6 U	< 5.7 U	< 7.3 U	< 6.8 U	< 6.9 U	< 9.5 U	< 5.9 U	< 6.9 U	< 6.9 UJ	< 6.3 U	< 8.5 U	< 7.2 U	< 6.1 UJ
1,2-Dibromoethane	106-93-4	ug/kg	1.2	< 0.60 U	< 0.76 U	< 0.57 U	< 0.73 U	< 0.68 U	< 0.69 U	< 0.95 U	< 0.59 U	< 0.69 U	< 0.69 UJ	< 0.63 U	< 0.85 U	< 0.72 U	< 0.61 UJ
1,2-Dichloroethane	107-06-2	ug/kg	100	< 0.60 UJ	< 0.76 UJ	< 0.57 UJ	< 0.73 UJ	< 0.68 UJ	< 0.69 UJ	< 0.95 UJ	< 0.59 UJ	< 0.69 UJ	< 0.69 UJ	< 0.63 U	< 0.85 UJ	< 0.72 UJ	< 0.61 UJ
1,2-Dichloropropane	78-87-5	ug/kg	110	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 U
1,3,5-TRICHLOROBENZENE	108-70-3	ug/kg	31000	< 3.0 U	< 3.8 UJ	< 2.8 U	< 3.6 U	< 3.4 UJ	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 UJ	< 3.4 UJ	< 3.1 U	< 4.3 UJ	< 3.6 UJ	< 3.1 UL
1,4-Dioxane	123-91-1	ug/kg	73	< 76 U	< 95 U	< 71 U	< 91 U	< 85 U	< 86 U	< 120 U	< 73 U	< 86 U	< 86 UJ	< 78 U	< 110 U	< 90 U	< 77 U
1-CHLORO-2,3-EPOXYPROPANE	106-89-8	ug/kg	56	< 60 UL	< 76 UL	< 57 UL	< 73 UL	< 68 UL	< 69 UL	< 95 UL	< 59 UL	< 69 UL	< 69 UL	< 63 U	< 85 UL	< 72 UL	< 61 U
2-Butanone	78-93-3	ug/kg	54000	< 6.0 UL	5.7 L	< 5.7 UL	< 7.3 UL	1.5 L	< 6.9 UL	< 9.5 UL	< 5.9 UL	< 6.9 UL	< 6.9 UL	< 6.3 U	< 8.5 UL	< 7.2 UL	< 6.1 U
2-CHLOR-1,3-BUTADIENE	126-99-8	ug/kg	450	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 UJ
2-CHLOROTOLUENE	95-49-8	ug/kg	20000	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 UJ
2-METHYL-1-PROPANOL	78-83-1	ug/kg	76000	< 30 R	< 38 U	< 28 R	< 36 R	< 34 U	< 35 R	< 47 R	< 29 R	< 34 U	< 34 R	< 31 U	< 43 U	< 36 U	< 31 U
2-NITROPROPANE	79-46-9	ug/kg	0.26	< 6.0 R	< 7.6 R	< 5.7 R	< 7.3 R	< 6.8 R	< 6.9 R	< 9.5 R	< 5.9 R	< 6.9 R	< 6.9 R	< 7.1 U	< 8.5 R	< 7.2 R	< 6.2 U

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U - Undetected
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Table 3-1 Project Sediment Texture and Chemistry Results (dry units)

			Sample ID	CW15-C	CW16-C	CW17-C	CW18-C	CW19-C	CW20-C	CW20-C-FD	CW21-C	CW22-C	CW23-C	D1-C	D1-CFD	D2	R-C
4-Methyl-2-pentanone	108-10-1	ug/kg	2900	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 UJ	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 U
Acetone	67-64-1	ug/kg	41000	< 6.0 UL	33.1 L	< 5.7 UL	< 7.3 UL	24.7 L	9.3 L	12.2 L	< 5.9 UL	< 6.9 UL	< 6.9 UL	< 6.3 U	< 8.5 UL	< 7.2 UL	< 6.1 UJ
ACETONITRILE	75-05-8	ug/kg	1900	< 60 UL	< 76 UL	< 57 UL	< 73 UL	< 68 UL	< 69 UL	< 95 UL	< 59 UL	< 69 UL	< 69 UL	< 63 U	< 85 UL	< 72 UL	< 61 U
ACRYLONITRILE	107-13-1	ug/kg	8.7	< 30 U	< 38 UL	< 28 U	< 36 U	< 34 UL	< 35 U	< 47 U	< 29 U	< 34 UL	< 34 UJ	< 31 UL	< 43 UL	< 36 UL	< 31 UL
Benzene	71-43-2	ug/kg	130	< 0.60 U	< 0.76 U	< 0.57 U	< 0.73 U	< 0.68 U	< 0.69 U	< 0.95 U	< 0.59 U	< 0.69 U	< 0.69 UJ	< 0.63 U	< 0.85 U	< 0.72 U	< 0.61 U
BENZYL CHLORIDE	100-44-7	ug/kg	51	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 UJ
Bromochloromethane	74-97-5	ug/kg	1600	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 U
Bromodichloromethane	75-27-4	ug/kg	3400	< 3.0 U	< 3.8 UJ	< 2.8 U	< 3.6 U	< 3.4 UJ	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 UJ	< 3.4 UJ	< 3.1 U	< 4.3 UJ	< 3.6 UJ	< 3.1 UJ
Bromoform	75-25-2	ug/kg	4400	< 3.0 UJ	< 3.8 UJ	< 2.8 UJ	< 3.6 UJ	< 3.4 UJ	< 3.5 UJ	< 4.7 UJ	< 2.9 U	< 3.4 UJ	< 3.4 UJ	< 3.1 U	< 4.3 UJ	< 3.6 UJ	< 3.1 UJ
Bromomethane	74-83-9	ug/kg	540	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 U
BUTYLBENZENE, N-	104-51-8	ug/kg	950000	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 UJ
BUTYLEBENZENE, TERT-	98-06-6	ug/kg	270000	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 U
Carbon Disulfide	75-15-0	ug/kg	160000	0.31 J	< 3.8 U	< 2.8 U	< 3.6 U	0.61 J	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	2.1 K
Carbon Tetrachloride	56-23-5	ug/kg	260	< 3.0 U	< 3.8 UJ	< 2.8 U	< 3.6 U	< 3.4 UJ	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 UJ	< 3.4 UJ	< 3.1 U	< 4.3 UJ	< 3.6 UJ	< 3.1 UJ
CHLORO-1-PROPENE, 3- (ALLYL CHLORIDE)	107-05-1	ug/kg	65	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 U
Chlorobenzene	108-90-7	ug/kg	6100	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 UJ
CHLORODIFLUOROMETHANE	75-45-6	ug/kg	2.6	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	1.0 J	< 3.5 U	< 4.3 U	< 3.6 U	< 3.1 U
Chloroethane	75-00-3	ug/kg	5000	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 U
Chloroform	67-66-3	ug/kg	2500	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 U
Chloromethane	74-87-3	ug/kg	38	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 U
cis-1,2-Dichloroethylene	156-59-2	ug/kg	1600	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 U
Dibromochloromethane	124-48-1	ug/kg	3200	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 U
DIBROMOMETHANE	74-95-3	ug/kg	3700	< 3.0 UJ	< 3.8 UJ	< 2.8 UJ	< 3.6 UJ	< 3.4 UJ	< 3.5 UJ	< 4.7 UJ	< 2.9 U	< 3.4 UJ	< 3.4 UJ	< 3.1 U	< 4.3 UJ	< 3.6 UJ	< 3.1 UJ
ETHYL ACETATE	141-78-6	ug/kg	220000	< 3.0 UL	< 3.8 UL	< 2.8 UL	< 3.6 UL	< 3.4 UL	< 3.5 UL	< 4.7 UL	< 2.9 UL	< 3.4 UL	< 3.4 UL	< 3.1 U	< 4.3 UL	< 3.6 UL	< 3.1 U
ETHYL ETHER	60-29-7	ug/kg	53000	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 U
ETHYL METHACRYLATE	97-63-2	ug/kg	14000	< 6.0 U	< 7.6 U	< 5.7 U	< 7.3 U	< 6.8 U	< 6.9 U	< 9.5 U	< 5.9 U	< 6.9 U	< 6.9 UJ	< 6.3 U	< 8.5 U	< 7.2 U	< 6.1 U
Ethylbenzene	100-41-4	ug/kg	46000	< 0.60 U	< 0.76 U	< 0.57 U	< 0.73 U	< 0.68 U	< 0.69 U	< 0.95 U	< 0.59 U	< 0.69 U	< 0.69 UJ	< 0.63 U	< 0.85 U	< 0.72 U	< 0.61 U
HEXANE	110-54-3	ug/kg	500000	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 UJ
Isopropylbenzene	98-82-8	ug/kg	780000	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 UJ
Methyl Acetate	79-20-9	ug/kg	690000	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 U
METHYL METHACRYLATE	80-62-6	ug/kg	26000	< 6.0 U	< 7.6 U	< 5.7 U	< 7.3 U	< 6.8 U	< 6.9 U	< 9.5 U	< 5.9 U	< 6.9 U	< 6.9 UJ	< 6.3 U	< 8.5 U	< 7.2 U	< 6.1 UJ
Methyl tert-Butyl Ether (MTBE)	1634-04-4	ug/kg	280	< 0.60 U	< 0.76 U	< 0.57 U	< 0.73 U	< 0.68 U	< 0.69 U	< 0.95 U	< 0.59 U	< 0.69 U	< 0.69 UJ	< 0.63 U	< 0.85 U	< 0.72 U	< 0.61 U
Methylene Chloride	75-09-2	ug/kg	76	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 U
N-BUTYL ALCOHOL	71-36-3	ug/kg	12000	< 150 R	< 190 R	< 140 R	< 180 R	< 170 R	< 170 R	< 240 R	< 150 R	< 170 R	< 170 R	< 180 UL	< 210 R	< 180 R	< 150 UL
PROPYLBENZENE, N-	103-65-1	ug/kg	290000	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 UJ
SEC-BUTYLBENZENE	135-98-8	ug/kg	350000	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 UJ
Styrene	100-42-5	ug/kg	24000	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 UJ
Tetrachloroethylene	127-18-4	ug/kg	430	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 U
Toluene	108-88-3	ug/kg	44000	< 0.60 U	< 0.76 U	< 0.57 U	< 0.73 U	< 0.68 U	< 0.69 U	< 0.95 U	< 0.59 U	< 0.69 U	< 0.69 UJ	< 0.63 U	1.1	< 0.72 U	< 0.61 U
trans-1,2-Dichloroethene	156-60-5	ug/kg	2300	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 UL
Trichloroethene	79-01-6	ug/kg	170	< 3.0 U	< 3.8 UJ	< 2.8 U	< 3.6 U	< 3.4 UJ	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 UJ	< 3.4 UJ	< 3.1 U	< 4.3 UJ	< 3.6 UJ	< 3.1 UJ
TRICHLOROPROPANE, 1,2,3-	96-18-4	ug/kg	1600	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 UJ
TRIMETHYLBENZENE, 1,3,5-	108-67-8	ug/kg	2800	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 UJ
VINYL ACETATE	108-05-4	ug/kg	6500	< 6.0 UL	< 7.6 UL	< 5.7 UL	< 7.3 UL	< 6.8 UL	< 6.9 UL	< 9.5 UL	< 5.9 UL	< 6.9 UL	< 6.9 UL	< 6.3 U	< 8.5 UL	< 7.2 UL	< 6.1 UJ
Vinyl Chloride	75-01-4	ug/kg	30	< 3.0 U	< 3.8 U	< 2.8 U	< 3.6 U	< 3.4 U	< 3.5 U	< 4.7 U	< 2.9 U	< 3.4 U	< 3.4 UJ	< 3.1 U	< 4.3 U	< 3.6 U	< 3.1 U
XYLENES (TOTAL)	1330-20-7	ug/kg	990000	< 1.2 U	< 1.5 U	< 1.1 U	< 1.5 U	< 1.4 U	< 1.4 U	< 1.9 U	< 1.2 U	< 1.4 U	< 1.4 UJ	< 1.3 U	< 1.7 U	< 1.4 U	< 1.2 U

[1] CAS - Chemical Abstracts service

U - Undetected
J - Estimated; below RL or Validation Action
L - Biased Low
R - Datapoint Rejected
N - Value represents an EMPC value (Estimated Maximum Possible Concentration)

Table 3-2 Additional Project Sediment Chemistry Results - Screening Level Data (dry wt. units)

			Sample ID	CW1-C	CW2-C	CW3-C	CW4-C	CW5-C	CW6-C	CW7-C	CW8-C	CW9-C	CW9-FD	CW10-C	CW11-C	CW12-C	CW13-C	CW14-C	CW15-C
Analyte	CAS	Unit	CLEANFILL																
SVOCs																			
1-NAPHTHYLAMINE	134-32-7	ug/kg	300	< 180 UJX	< 170 UJX	< 170 UJX	NR	< 170 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 180 UJX	< 170 UJX	< 180 UJX	< 170 UJX	< 170 UJX	< 230 UJX	< 170 UJX	< 170 UJX
2-ACETYLAMINOFLUORENE	53-96-3	ug/kg	69	< 180 UJX	< 170 UJX	< 170 UJX	NR	< 170 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 180 UJX	< 170 UJX	< 180 UJX	< 170 UJX	< 170 UJX	< 230 UJX	< 170 UJX	< 170 UJX
4-DIMETHYLAMINOAZOBENZENE	60-11-7	ug/kg	37	< 180 UJX	< 170 UJX	< 170 UJX	NR	< 170 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 180 UJX	< 170 UJX	< 180 UJX	< 170 UJX	< 170 UJX	< 230 UJX	< 170 UJX	< 170 UJX
AMINOBIPHENYL, 4-	92-67-1	ug/kg	1.2	< 180 UJX	< 170 UJX	< 170 UJX	NR	< 170 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 180 UJX	< 170 UJX	< 180 UJX	< 170 UJX	< 170 UJX	< 230 UJX	< 170 UJX	< 170 UJX
CHLORDECONE (KEPONE)	143-50-0	ug/kg	560	< 1100 UJX	< 1000 UJX	< 1000 UJX	NR	< 1000 UJX	< 1000 UJX	< 1100 UJX	< 1100 UJX	< 1100 UJX	< 1000 UJX	< 1100 UJX	< 1000 UJX	< 1000 UJX	< 1400 UJX	< 1000 UJX	< 1000 UJX
CHLOROBENZILATE	510-15-6	ug/kg	1600	< 180 UJX	< 170 UJX	< 170 UJX	NR	< 170 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 180 UJX	< 170 UJX	< 180 UJX	< 170 UJX	< 170 UJX	< 230 UJX	< 170 UJX	< 170 UJX
CRESOL(S)	1319-77-3	ug/kg	3100	< 180 UJX	< 170 UJX	< 170 UJX	NR	< 170 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 180 UJX	< 170 UJX	< 180 UJX	< 170 UJX	< 170 UJX	< 230 UJX	< 170 UJX	< 170 UJX
DIALLATE	2303-16-4	ug/kg	150	< 180 UJX	< 170 UJX	< 170 UJX	NR	< 170 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 180 UJX	< 170 UJX	< 180 UJX	< 170 UJX	< 170 UJX	< 230 UJX	< 170 UJX	< 170 UJX
DIPHENYLAMINE	122-39-4	ug/kg	12000	< 180 UJX	< 170 UJX	< 170 UJX	NR	< 170 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 180 UJX	< 170 UJX	< 180 UJX	< 170 UJX	< 170 UJX	< 230 UJX	< 170 UJX	< 170 UJX
M-DINITROBENZENE	99-65-0	ug/kg	49	< 180 UJX	< 170 UJX	< 170 UJX	NR	< 170 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 180 UJX	< 170 UJX	< 180 UJX	< 170 UJX	< 170 UJX	< 230 UJX	< 170 UJX	< 170 UJX
METHYL METHANESULFONATE	66-27-3	ug/kg	83	< 180 UJX	< 170 UJX	< 170 UJX	NR	< 170 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 180 UJX	< 170 UJX	< 180 UJX	< 170 UJX	< 170 UJX	< 230 UJX	< 170 UJX	< 170 UJX
METHYLENE BIS(2-CHLOROANILINE), 4,4'-	101-14-4	ug/kg	3900	< 180 UJX	< 170 UJX	< 170 UJX	NR	< 170 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 180 UJX	< 170 UJX	< 180 UJX	< 170 UJX	< 170 UJX	< 230 UJX	< 170 UJX	< 170 UJX
NAPHTHYLAMINE, 2-	91-59-8	ug/kg	10	< 180 UJX	< 170 UJX	< 170 UJX	NR	< 170 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 180 UJX	< 170 UJX	< 180 UJX	< 170 UJX	< 170 UJX	< 230 UJX	< 170 UJX	< 170 UJX
N-NITROSODIETHYLAMINE	55-18-5	ug/kg	0.018	< 180 UJX	< 170 UJX	< 170 UJX	NR	< 170 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 180 UJX	< 170 UJX	< 180 UJX	< 170 UJX	< 170 UJX	< 230 UJX	< 170 UJX	< 170 UJX
N-NITROSODI-N-BUTYLAMINE	924-16-3	ug/kg	3.3	< 180 UJX	< 170 UJX	< 170 UJX	NR	< 170 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 180 UJX	< 170 UJX	< 180 UJX	< 170 UJX	< 170 UJX	< 230 UJX	< 170 UJX	< 170 UJX
O-TOLUIDINE	95-53-4	ug/kg	320	< 180 UJX	< 170 UJX	< 170 UJX	NR	< 170 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 180 UJX	< 170 UJX	< 180 UJX	< 170 UJX	< 170 UJX	< 230 UJX	< 170 UJX	< 170 UJX
PENTACHLOROBENZENE	608-93-5	ug/kg	180000	< 180 UJX	< 170 UJX	< 170 UJX	NR	< 170 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 180 UJX	< 170 UJX	< 180 UJX	< 170 UJX	< 170 UJX	< 230 UJX	< 170 UJX	< 170 UJX
PENTACHLORONITROBENZENE	82-68-8	ug/kg	5000	< 180 UJX	< 170 UJX	< 170 UJX	NR	< 170 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 180 UJX	< 170 UJX	< 180 UJX	< 170 UJX	< 170 UJX	< 230 UJX	< 170 UJX	< 170 UJX
PHENACETIN	62-44-2	ug/kg	12000	< 180 UJX	< 170 UJX	< 170 UJX	NR	< 170 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 180 UJX	< 170 UJX	< 180 UJX	< 170 UJX	< 170 UJX	< 230 UJX	< 170 UJX	< 170 UJX
PROPYZAMIDE	23950-58-5	ug/kg	3100	< 180 UJX	< 170 UJX	< 170 UJX	NR	< 170 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 180 UJX	< 170 UJX	< 180 UJX	< 170 UJX	< 170 UJX	< 230 UJX	< 170 UJX	< 170 UJX
VOCs																			
CYCLOHEXANONE	108-94-1	ug/kg	1400000	< 110 UJX	< 110 UJX	< 110 UJX	< 80 UJX	< 130 UJX	< 120 UJX	< 120 UJX	< 120 UJX	< 110 UJX	< 110 UJX	< 100 UJX	< 110 UJX	< 120 UJX	< 170 UJX	< 120 UJX	< 120 UJX
DICHLOROPROPENE, 1,3-	542-75-6	ug/kg	120	< 2.7 UJX	< 2.7 UJX	< 2.7 UJX	< 2.0 UJX	< 3.2 UJX	< 2.9 UJX	< 3.1 UJX	< 2.9 UJX	< 2.8 UJX	< 2.8 UJX	< 2.6 UJX	< 2.8 UJX	< 2.9 UJX	< 4.2 UJX	< 3.1 UJX	< 3.0 UJX
ETHYL ACRYLATE	140-88-5	ug/kg	120	< 2.7 UJX	< 2.7 UJX	< 2.7 UJX	< 2.0 UJX	< 3.2 UJX	< 2.9 UJX	< 3.1 UJX	< 2.9 UJX	< 2.8 UJX	< 2.8 UJX	< 2.6 UJX	< 2.8 UJX	< 2.9 UJX	< 4.2 UJX	< 3.1 UJX	< 3.0 UJX
METHYL ACRYLATE	96-33-3	ug/kg	27000	< 2.7 UJX	< 2.7 UJX	< 2.7 UJX	< 2.0 UJX	< 3.2 UJX	< 2.9 UJX	< 3.1 UJX	< 2.9 UJX	< 2.8 UJX	< 2.8 UJX	< 2.6 UJX	< 2.8 UJX	< 2.9 UJX	< 4.2 UJX	< 3.1 UJX	< 3.0 UJX
METHYL STYRENE (MIXED ISOMERS)	25013-15-4	ug/kg	120000	< 2.7 UJX	< 2.7 UJX	< 2.7 UJX	< 2.0 UJX	< 3.2 UJX	< 2.9 UJX	< 3.1 UJX	< 2.9 UJX	< 2.8 UJX	< 2.8 UJX	< 2.6 UJX	< 2.8 UJX	< 2.9 UJX	< 4.2 UJX	< 3.1 UJX	< 3.0 UJX
N-BUTYL CHLORIDE	109-69-3	ug/kg	2300000	< 2.7 UJX	< 2.7 UJX	< 2.7 UJX	< 2.0 UJX	< 3.2 UJX	< 2.9 UJX	< 3.1 UJX	< 2.9 UJX	< 2.8 UJX	< 2.8 UJX	< 2.6 UJX	< 2.8 UJX	< 2.9 UJX	< 4.2 UJX	< 3.1 UJX	< 3.0 UJX

U - Undetected
J - Estimated; below RL or Validation Action
X - Data generated using non standard quantitation method and extract analyzed between 40 and 80 days after extraction; for screening purposes only
NR - not reported; dried extract

Table 3-2 Additional Project Sediment Chemistry Results - Screening Level Data (dry wt. units)

			Sample ID	CW16-C	CW17-C	CW18-C	CW19-C	CW20-C	CW20-C-FD	CW21-C	CW22-C	CW23-C	D1-C	D1-CFD	D2	R-C
Analyte	CAS	Unit	CLEANFILL													
SVOCs																
1-NAPHTHYLAMINE	134-32-7	ug/kg	300	NR	< 180 UJX	< 190 UJX	NR	< 180 UJX	< 240 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 210 UJX	< 240 UJX	< 190 UJX	NR
2-ACETYLAMINOFLUORENE	53-96-3	ug/kg	69	NR	< 180 UJX	< 190 UJX	NR	< 180 UJX	< 240 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 210 UJX	< 240 UJX	< 190 UJX	NR
4-DIMETHYLAMINOAZOBENZENE	60-11-7	ug/kg	37	NR	< 180 UJX	< 190 UJX	NR	< 180 UJX	< 240 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 210 UJX	< 240 UJX	< 190 UJX	NR
AMINOBIPHENYL, 4-	92-67-1	ug/kg	1.2	NR	< 180 UJX	< 190 UJX	NR	< 180 UJX	< 240 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 210 UJX	< 240 UJX	< 190 UJX	NR
CHLORDECONE (KEPONE)	143-50-0	ug/kg	560	NR	< 1100 UJX	< 1100 UJX	NR	< 1100 UJX	< 1400 UJX	< 1000 UJX	< 1100 UJX	< 1100 UJX	< 1200 UJX	< 1400 UJX	< 1100 UJX	NR
CHLOROBENZILATE	510-15-6	ug/kg	1600	NR	< 180 UJX	< 190 UJX	NR	< 180 UJX	< 240 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 210 UJX	< 240 UJX	< 190 UJX	NR
CRESOL(S)	1319-77-3	ug/kg	3100	NR	< 180 UJX	< 190 UJX	NR	< 180 UJX	< 240 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 210 UJX	< 240 UJX	< 190 UJX	NR
DIALLATE	2303-16-4	ug/kg	150	NR	< 180 UJX	< 190 UJX	NR	< 180 UJX	< 240 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 210 UJX	< 240 UJX	< 190 UJX	NR
DIPHENYLAMINE	122-39-4	ug/kg	12000	NR	< 180 UJX	< 190 UJX	NR	< 180 UJX	< 240 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 210 UJX	< 240 UJX	< 190 UJX	NR
M-DINITROBENZENE	99-65-0	ug/kg	49	NR	< 180 UJX	< 190 UJX	NR	< 180 UJX	< 240 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 210 UJX	< 240 UJX	< 190 UJX	NR
METHYL METHANESULFONATE	66-27-3	ug/kg	83	NR	< 180 UJX	< 190 UJX	NR	< 180 UJX	< 240 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 210 UJX	< 240 UJX	< 190 UJX	NR
METHYLENE BIS(2-CHLOROANILINE), 4,4'-	101-14-4	ug/kg	3900	NR	< 180 UJX	< 190 UJX	NR	< 180 UJX	< 240 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 210 UJX	< 240 UJX	< 190 UJX	NR
NAPHTHYLAMINE, 2-	91-59-8	ug/kg	10	NR	< 180 UJX	< 190 UJX	NR	< 180 UJX	< 240 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 210 UJX	< 240 UJX	< 190 UJX	NR
N-NITROSODIETHYLAMINE	55-18-5	ug/kg	0.018	NR	< 180 UJX	< 190 UJX	NR	< 180 UJX	< 240 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 210 UJX	< 240 UJX	< 190 UJX	NR
N-NITROSODI-N-BUTYLAMINE	924-16-3	ug/kg	3.3	NR	< 180 UJX	< 190 UJX	NR	< 180 UJX	< 240 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 210 UJX	< 240 UJX	< 190 UJX	NR
O-TOLUIDINE	95-53-4	ug/kg	320	NR	< 180 UJX	< 190 UJX	NR	< 180 UJX	< 240 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 210 UJX	< 240 UJX	< 190 UJX	NR
PENTACHLOROBENZENE	608-93-5	ug/kg	180000	NR	< 180 UJX	< 190 UJX	NR	< 180 UJX	< 240 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 210 UJX	< 240 UJX	< 190 UJX	NR
PENTACHLORONITROBENZENE	82-68-8	ug/kg	5000	NR	< 180 UJX	< 190 UJX	NR	< 180 UJX	< 240 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 210 UJX	< 240 UJX	< 190 UJX	NR
PHENACETIN	62-44-2	ug/kg	12000	NR	< 180 UJX	< 190 UJX	NR	< 180 UJX	< 240 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 210 UJX	< 240 UJX	< 190 UJX	NR
PROPYZAMIDE	23950-58-5	ug/kg	3100	NR	< 180 UJX	< 190 UJX	NR	< 180 UJX	< 240 UJX	< 170 UJX	< 180 UJX	< 180 UJX	< 210 UJX	< 240 UJX	< 190 UJX	NR
VOCs																
CYCLOHEXANONE	108-94-1	ug/kg	1400000	< 150 UJX	< 110 UJX	< 150 UJX	< 140 UJX	< 140 UJX	< 190 UJX	< 120 UJX	< 140 UJX	< 140 UJX	< 140 UJX	< 170 UJX	< 140 UJX	< 120 UJX
DICHLOROPROPENE, 1,3-	542-75-6	ug/kg	120	< 3.8 UJX	< 2.8 UJX	< 3.6 UJX	< 3.4 UJX	< 3.5 UJX	< 4.7 UJX	< 2.9 UJX	< 3.4 UJX	< 3.4 UJX	< 3.5 UJX	< 4.3 UJX	< 3.6 UJX	< 3.1 UJX
ETHYL ACRYLATE	140-88-5	ug/kg	120	< 3.8 UJX	< 2.8 UJX	< 3.6 UJX	< 3.4 UJX	< 3.5 UJX	< 4.7 UJX	< 2.9 UJX	< 3.4 UJX	< 3.4 UJX	< 3.5 UJX	< 4.3 UJX	< 3.6 UJX	< 3.1 UJX
METHYL ACRYLATE	96-33-3	ug/kg	27000	< 3.8 UJX	< 2.8 UJX	< 3.6 UJX	< 3.4 UJX	< 3.5 UJX	< 4.7 UJX	< 2.9 UJX	< 3.4 UJX	< 3.4 UJX	< 3.5 UJX	< 4.3 UJX	< 3.6 UJX	< 3.1 UJX
METHYL STYRENE (MIXED ISOMERS)	25013-15-4	ug/kg	120000	< 3.8 UJX	< 2.8 UJX	< 3.6 UJX	< 3.4 UJX	< 3.5 UJX	< 4.7 UJX	< 2.9 UJX	< 3.4 UJX	< 3.4 UJX	< 3.5 UJX	< 4.3 UJX	< 3.6 UJX	< 3.1 UJX
N-BUTYL CHLORIDE	109-69-3	ug/kg	2300000	< 3.8 UJX	< 2.8 UJX	< 3.6 UJX	< 3.4 UJX	< 3.5 UJX	< 4.7 UJX	< 2.9 UJX	< 3.4 UJX	< 3.4 UJX	< 3.5 UJX	< 4.3 UJX	< 3.6 UJX	< 3.1 UJX

U - Undetected
J - Estimated; below RL or Validation Action
X - Data generated using non standard quantitation method and extract analyzed between 40 and 80 days after extraction; for screening purposes only
NR - not reported; dried extract

4.0 Data Quality

The majority of the QC results associated with the analytical parameters met the measurement objectives presented in the project SAP. A full set of QC sample findings (method blanks, duplicate precision results, laboratory control sample results, and MS results) is provided in Appendix G, Data Validation Memos. Tabular data is provided at the end of this section.

4.1 Analytical Sensitivity

The sensitivity of program chemical measurements can sometimes dictate the ultimate usefulness of the final data. The project required RLs were specified in project SAP to detect sedimentary contaminants at relevant concentrations and most reporting limit specifications were achieved during project performance. In some cases, chemical parameters were detected below the actual RL values but were above the laboratory method detection limits. In these cases, the data have been J-qualified (estimated) at the lower levels.

4.2 Contamination Indicators

Sample contamination can sometimes affect sample results, particularly when measuring chemical parameters at very low concentrations. In this study, potential contamination has been monitored using method blank, equipment blank, and trip blank QC samples. As discussed in the validation memos, only one compound (bis-(2-Ethylhexyl) phthalate was detected (in one of two equipment blanks) at a very low concentration/below the corresponding laboratory RL. None of the volatile compounds were detected in the corresponding VOC trip blanks. Actual equipment blank and trip blank results are provided in Table 4-1.

4.3 Data Accuracy and Precision

Analytical accuracy and precision was measured at the laboratory level using spiked project and laboratory control samples, as well as field and laboratory duplicates, matrix spike (MS) duplicates (MSDs) and laboratory control sample (LCS) duplicates. Most parameters met precision requirements set forth in the project SAP. Further detail is provided in Table 4-2 and in the validation memo summaries (Appendix G).

Field precision (field duplicate results) was excellent and generally less than 50 percent (as relative percent difference [RPD]) for all target chemical parameters where calculable (i.e., detected).

4.4 Rejected Data

Selected data associated with five compounds were rejected as a result of severe instrumental or QC sample failures. These included the compounds Benzidene, 2-Methyl-1-Propanol, 2-Nitropropane, Dalapon, and n-Butyl Alcohol. In the case of Benzidene, a nondetect value associated with one sample was rejected because the corresponding MS recovery was less than 10 percent. Non-detects associated with the herbicide Dalapon were rejected for one of the two sample batches because the corresponding laboratory control sample recovery was far below the corresponding quality threshold. Lastly, non-detects associated with 2-Methyl-1-Propanol, 2-Nitropropane, and N-Butyl Alcohol were also rejected because instrument response factors were below acceptable sensitivity thresholds.

Table 4-1 Project Equipment and Trip Blank Results

		Sample ID	BBNPP-C-EB	BBNPP-PB	T101410	TRIP BLANK
Analyte	CAS	Unit				
Ancillary Parameters						
Chloride	16887-00-6	mg/l	< 2.0 U	< 2.0 U	-	-
Sulfate AS SO_4	14808-79-8	mg/l	< 10 U	< 10 U	-	-
Total Organic Carbon	-	mg/l	< 1.0 U	< 1.0 U	-	-
Metals						
Antimony	7440-36-0	ug/l	< 6.0 U	< 6.0 U	-	-
Arsenic	7440-38-2	ug/l	< 3.0 U	< 3.0 U	-	-
Barium	7440-39-3	ug/l	< 200 U	< 200 U	-	-
Beryllium	7440-41-7	ug/l	< 1.0 U	< 1.0 U	-	-
Boron	7440-42-8	ug/l	< 100 U	< 100 U	-	-
Cadmium	7440-43-9	ug/l	< 3.0 U	< 3.0 U	-	-
Chromium	7440-47-3	ug/l	< 10 U	< 10 U	-	-
Chromium, Trivalent	-	mg/l	< 0.020 U	< 0.020 U	-	-
Chromium, hexavalent	18540-29-9	mg/l	< 0.010 U	< 0.010 U	-	-
Cobalt	7440-48-4	ug/l	< 50 UL	< 50 UL	-	-
Copper	7440-50-8	ug/l	< 10 UL	< 10 UL	-	-
Lead	7439-92-1	ug/l	< 3.0 UL	< 3.0 UL	-	-
Manganese	7439-96-5	ug/l	< 15 U	< 15 U	-	-
Mercury	7439-97-6	ug/l	< 0.20 U	< 0.20 U	-	-
Nickel	7440-02-0	ug/l	< 10 U	< 10 U	-	-
Selenium	7782-49-2	ug/l	< 10 UL	< 10 UL	-	-
Silver	7440-22-4	ug/l	< 10 U	< 10 U	-	-
Thallium	7440-28-0	ug/l	< 2.0 U	< 2.0 U	-	-
TIN	7440-31-5	ug/l	< 10 U	< 10 U	-	-
Titanium	7440-32-6	ug/l	< 10 U	< 10 U	-	-
Vanadium	7440-62-2	ug/l	< 50 U	< 50 U	-	-
Zinc	7440-66-6	ug/l	< 20 U	< 20 U	-	-
Organometallics						
Tetraethyl Lead	78-00-2	ug/l	< 0.548 U	< 0.543 U	-	-
Pesticides/Herbicides						
4,4'-DDD	72-54-8	ug/l	< 0.022 U	< 0.022 U	-	-
4,4'-DDE	72-55-9	ug/l	< 0.022 U	< 0.022 U	-	-
4,4'-DDT	50-29-3	ug/l	< 0.022 U	< 0.022 U	-	-
Aldrin	309-00-2	ug/l	< 0.022 U	< 0.022 U	-	-
alpha-BHC	319-84-6	ug/l	< 0.022 U	< 0.022 U	-	-
alpha-Chlordane	5103-71-9	ug/l	< 0.022 U	< 0.022 U	-	-
beta-BHC	319-85-7	ug/l	< 0.022 U	< 0.022 U	-	-
Chlordane	12789-03-6	ug/l	< 0.55 U	< 0.56 U	-	-
delta-BHC	319-86-8	ug/l	< 0.022 U	< 0.022 U	-	-
Dieldrin	60-57-1	ug/l	< 0.022 U	< 0.022 U	-	-
Endosulfan I	959-98-8	ug/l	< 0.022 U	< 0.022 U	-	-
Endosulfan II	33213-65-9	ug/l	< 0.022 U	< 0.022 U	-	-
Endosulfan Sulfate	1031-07-8	ug/l	< 0.022 U	< 0.022 U	-	-
Endrin	72-20-8	ug/l	< 0.022 U	< 0.022 U	-	-
Endrin Aldehyde	7421-93-4	ug/l	< 0.022 U	< 0.022 U	-	-
Endrin ketone	53494-70-5	ug/l	< 0.022 U	< 0.022 U	-	-
gamma-BHC (Lindane)	58-89-9	ug/l	< 0.022 U	< 0.022 U	-	-
gamma-Chlordane	5103-74-2	ug/l	< 0.022 U	< 0.022 U	-	-
Heptachlor	76-44-8	ug/l	< 0.022 U	< 0.022 U	-	-
Heptachlor Epoxide	1024-57-3	ug/l	< 0.022 U	< 0.022 U	-	-
Methoxychlor	72-43-5	ug/l	< 0.022 U	< 0.022 U	-	-
Toxaphene	8001-35-2	ug/l	< 0.27 U	< 0.28 U	-	-
CHLORPYRIFOS	2921-88-2	ug/l	< 2.1 U	< 2.0 U	-	-
Diazinon	333-41-5	ug/l	< 2.1 U	< 2.0 U	-	-
Dichlorvos	62-73-7	ug/l	< 2.1 U	< 2.0 U	-	-

CAS: Chemical Abstracts Service
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L - Biased Low
R - Datapoint Rejected
X - Data are for screening purposes only

Table 4-1 Project Equipment and Trip Blank Results

		Sample ID	BBNPP-C-EB	BBNPP-PB	T101410	TRIP BLANK
Analyte	**CAS**	**Unit**				
Dimethoate	60-51-5	ug/l	< 2.1 U	< 2.0 U	-	-
Disulfoton	298-04-4	ug/l	< 2.1 U	< 2.0 U	-	-
Ethyl Parathion	56-38-2	ug/l	< 2.1 U	< 2.0 U	-	-
MALATHION	121-75-5	ug/l	< 2.1 U	< 2.0 U	-	-
Methyl parathion	298-00-0	ug/l	< 2.1 U	< 2.0 U	-	-
Phorate	298-02-2	ug/l	< 2.1 U	< 2.0 U	-	-
RONNEL	299-84-3	ug/l	< 2.1 U	< 2.0 U	-	-
Sulfotep	3689-24-5	ug/l	< 2.1 U	< 2.0 U	-	-
2,4,5-T	93-76-5	ug/l	< 0.11 U	< 0.14 U	-	-
2,4,5-TP (Silvex)	93-72-1	ug/l	< 0.11 U	< 0.14 U	-	-
2,4-D	94-75-7	ug/l	< 0.56 U	< 0.68 U	-	-
Dalapon	75-99-0	ug/l	< 0.11 U	< 0.14 U	-	-
Dinoseb	88-85-7	ug/l	< 0.56 U	< 0.68 U	-	-
Polychlorinated Biphenyls						
Aroclor-1016	12674-11-2	ug/l	< 0.55 U	< 0.56 U	-	-
Aroclor-1221	11104-28-2	ug/l	< 0.55 U	< 0.56 U	-	-
Aroclor-1232	11141-16-5	ug/l	< 0.55 U	< 0.56 U	-	-
Aroclor-1242	53469-21-9	ug/l	< 0.55 U	< 0.56 U	-	-
Aroclor-1248	12672-29-6	ug/l	< 0.55 U	< 0.56 U	-	-
Aroclor-1254	11097-69-1	ug/l	< 0.55 U	< 0.56 U	-	-
Aroclor-1260	11096-82-5	ug/l	< 0.55 U	< 0.56 U	-	-
Dioxin						
2,3,7,8-TCDD	1746-01-6	pg/l	< 0.547 U	< 0.539 U	-	-
SVOCs						
1,1'-Biphenyl	92-52-4	ug/l	< 1.1 U	< 1.2 U	-	-
1,2,4,5-Tetrachlorobenzene	95-94-3	ug/l	< 2.1 U	< 2.4 U	-	-
1,2,4-Trichlorobenzene	120-82-1	ug/l	< 1.1 U	< 1.2 U	-	-
1,2-Dichlorobenzene	95-50-1	ug/l	< 1.1 U	< 1.2 U	-	-
1,2-DIPHENYLHYDRAZINE	122-66-7	ug/l	< 1.1 U	< 1.2 U	-	-
1,3-Dichlorobenzene	541-73-1	ug/l	< 1.1 U	< 1.2 U	-	-
1,4-Dichlorobenzene	106-46-7	ug/l	< 1.1 U	< 1.2 U	-	-
2,2'-oxybis(1-Chloropropane)	108-60-1	ug/l	< 2.1 U	< 2.4 U	-	-
2,3,4,6-Tetrachlorophenol	58-90-2	ug/l	< 5.3 U	< 6.0 U	-	-
2,4,5-Trichlorophenol	95-95-4	ug/l	< 5.3 U	< 6.0 U	-	-
2,4,6-Trichlorophenol	88-06-2	ug/l	< 5.3 U	< 6.0 U	-	-
2,4-Dichlorophenol	120-83-2	ug/l	< 5.3 U	< 6.0 U	-	-
2,4-Dimethylphenol	105-67-9	ug/l	< 5.3 U	< 6.0 U	-	-
2,4-Dinitrophenol	51-28-5	ug/l	< 21 U	< 24 U	-	-
2,4-Dinitrotoluene	121-14-2	ug/l	< 2.1 U	< 2.4 U	-	-
2,6-Dinitrotoluene	606-20-2	ug/l	< 2.1 U	< 2.4 U	-	-
2-Chlorophenol	95-57-8	ug/l	< 5.3 U	< 6.0 U	-	-
2-Methylnaphthalene	91-57-6	ug/l	< 1.1 U	< 1.2 U	-	-
2-Methylphenol	95-48-7	ug/l	< 2.1 U	< 2.4 U	-	-
2-Nitroaniline	88-74-4	ug/l	< 5.3 U	< 6.0 U	-	-
2-Nitrophenol	88-75-5	ug/l	< 5.3 U	< 6.0 U	-	-
3- and 4-Methylphenol Coelution	-	ug/l	< 2.1 U	< 2.4 U	-	-
3,3'-Dichlorobenzidine	91-94-1	ug/l	< 5.3 U	< 6.0 U	-	-
3-Nitroaniline	99-09-2	ug/l	< 5.3 U	< 6.0 U	-	-
4,6-Dinitro-2-methylphenol	534-52-1	ug/l	< 21 U	< 24 U	-	-
4-Bromophenyl-phenylether	101-55-3	ug/l	< 2.1 U	< 2.4 U	-	-
4-Chloro-3-methylphenol	59-50-7	ug/l	< 5.3 U	< 6.0 U	-	-
4-Chloroaniline	106-47-8	ug/l	< 5.3 U	< 6.0 U	-	-
4-Chlorophenyl-phenylether	7005-72-3	ug/l	< 2.1 U	< 2.4 U	-	-
4-Nitroaniline	100-01-6	ug/l	< 5.3 U	< 6.0 U	-	-
4-Nitrophenol	100-02-7	ug/l	< 11 U	< 12 U	-	-

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Table 4-1 Project Equipment and Trip Blank Results

		Sample ID	BBNPP-C-EB	BBNPP-PB	T101410	TRIP BLANK
Analyte	CAS	Unit				
Acenaphthene	83-32-9	ug/l	< 1.1 U	< 1.2 U	-	-
Acenaphthylene	208-96-8	ug/l	< 1.1 U	< 1.2 U	-	-
Acetaldehyde	75-07-0	ug/l	< 20 U	< 20 U	-	-
Acetophenone	98-86-2	ug/l	< 2.1 U	< 2.4 U	-	-
Aniline	62-53-3	ug/l	< 2.1 U	< 2.4 U	-	-
Anthracene	120-12-7	ug/l	< 1.1 U	< 1.2 U	-	-
Atrazine	1912-24-9	ug/l	< 5.3 U	< 6.0 U	-	-
Benzaldehyde	100-52-7	ug/l	< 5.3 U	< 6.0 U	-	-
Benzidine	92-87-5	ug/l	< 21 UJ	< 24 UJ	-	-
Benzo(a)anthracene	56-55-3	ug/l	< 1.1 U	< 1.2 U	-	-
Benzo(a)pyrene	50-32-8	ug/l	< 1.1 U	< 1.2 U	-	-
Benzo(b)fluoranthene	205-99-2	ug/l	< 1.1 U	< 1.2 U	-	-
Benzo(g,h,i)perylene	191-24-2	ug/l	< 1.1 U	< 1.2 U	-	-
Benzo(k)fluoranthene	207-08-9	ug/l	< 1.1 U	< 1.2 U	-	-
Benzoic Acid	65-85-0	ug/l	< 21 U	< 24 U	-	-
Benzyl Alcohol	100-51-6	ug/l	< 2.1 U	< 2.4 U	-	-
bis-(2-chloroethoxy)methane	111-91-1	ug/l	< 2.1 U	< 2.4 U	-	-
bis-(2-Chloroethyl)ether	111-44-4	ug/l	< 2.1 U	< 2.4 U	-	-
bis-(2-Ethylhexyl)phthalate	117-81-7	ug/l	1.6 J	< 2.4 U	-	-
Butylbenzylphthalate	85-68-7	ug/l	< 2.1 U	< 2.4 U	-	-
Caprolactam	105-60-2	ug/l	< 2.1 U	< 2.4 U	-	-
Carbazole	86-74-8	ug/l	< 1.1 U	< 1.2 U	-	-
Chrysene	218-01-9	ug/l	< 1.1 U	< 1.2 U	-	-
Dibenzo(a,h)anthracene	53-70-3	ug/l	< 1.1 U	< 1.2 U	-	-
Dibenzofuran	132-64-9	ug/l	< 5.3 U	< 6.0 U	-	-
Diethylphthalate	84-66-2	ug/l	< 2.1 U	< 2.4 U	-	-
Dimethylphthalate	131-11-3	ug/l	< 2.1 U	< 2.4 U	-	-
Di-n-butylphthalate	84-74-2	ug/l	< 2.1 U	< 2.4 U	-	-
Di-n-octylphthalate	117-84-0	ug/l	< 2.1 U	< 2.4 U	-	-
Ethylene glycol	107-21-1	mg/l	< 0.25 U	< 0.25 U	-	-
Fluoranthene	206-44-0	ug/l	< 1.1 U	< 1.2 U	-	-
Fluorene	86-73-7	ug/l	< 1.1 U	< 1.2 U	-	-
Formaldehyde	50-00-0	ug/l	< 20 U	< 20 U	-	-
Hexachlorobenzene	118-74-1	ug/l	< 1.1 U	< 1.2 U	-	-
Hexachlorobutadiene	87-68-3	ug/l	< 1.1 U	< 1.2 U	-	-
Hexachlorocyclo-pentadiene	77-47-4	ug/l	< 21 U	< 24 U	-	-
Hexachloroethane	67-72-1	ug/l	< 2.1 U	< 2.4 U	-	-
Indeno(1,2,3-cd)pyrene	193-39-5	ug/l	< 1.1 U	< 1.2 U	-	-
Isophorone	78-59-1	ug/l	< 2.1 U	< 2.4 U	-	-
Methanamine, N-Methyl-N-Nitroso	62-75-9	ug/l	< 2.1 U	< 2.4 U	-	-
Naphthalene	91-20-3	ug/l	< 1.1 U	< 1.2 U	-	-
Nitrobenzene	98-95-3	ug/l	< 2.1 U	< 2.4 U	-	-
N-Nitroso-di-n-propylamine	621-64-7	ug/l	< 2.1 U	< 2.4 U	-	-
N-Nitrosodiphenylamine	86-30-6	ug/l	< 5.3 U	< 6.0 U	-	-
Pentachlorophenol	87-86-5	ug/l	< 11 U	< 12 U	-	-
Phenanthrene	85-01-8	ug/l	< 1.1 U	< 1.2 U	-	-
Phenol	108-95-2	ug/l	< 2.1 U	< 2.4 U	-	-
Pyrene	129-00-0	ug/l	< 1.1 U	< 1.2 U	-	-
Pyridine	110-86-1	ug/l	< 2.1 U	< 2.4 U	-	-
Quinoline	91-22-5	ug/l	< 5.3 U	< 6.0 U	-	-

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Table 4-1 Project Equipment and Trip Blank Results

		Sample ID	BBNPP-C-EB	BBNPP-PB	T101410	TRIP BLANK
Analyte	CAS	Unit				
VOCs						
1,1,1,2-Tetrachloroethane	630-20-6	ug/kg	-	-	< 5.0 U	-
1,1,1-Trichloroethane	71-55-6	ug/kg	-	-	< 5.0 U	-
1,1,2,2-Tetrachloroethane	79-34-5	ug/kg	-	-	< 5.0 U	-
1,1,2-Trichloroethane	79-00-5	ug/kg	-	-	< 5.0 U	-
1,1-Dichloroethane	75-34-3	ug/kg	-	-	< 5.0 U	-
1,1-Dichloroethene	75-35-4	ug/kg	-	-	< 5.0 U	-
1,2,4-Trimethylbenzene	95-63-6	ug/kg	-	-	< 5.0 U	-
1,2-Dibromo-3-chloropropane	96-12-8	ug/kg	-	-	< 10 U	-
1,2-Dibromoethane	106-93-4	ug/kg	-	-	< 1.0 U	-
1,2-Dichloroethane	107-06-2	ug/kg	-	-	< 1.0 U	-
1,2-Dichloropropane	78-87-5	ug/kg	-	-	< 5.0 U	-
1,3,5-Trichlorobenzene	108-70-3	ug/kg	-	-	< 5.0 U	-
1,4-Dioxane	123-91-1	ug/kg	-	-	< 130 U	-
1-Chloro-2,3-Epoxypropane	106-89-8	ug/kg	-	-	< 100 UL	-
2-Butanone	78-93-3	ug/kg	-	-	< 10 UL	-
2-Chlor-1,3-Butadiene	126-99-8	ug/kg	-	-	< 5.0 U	-
2-Chlorotoluene	95-49-8	ug/kg	-	-	< 5.0 U	-
2-Methyl-1-Propanol	78-83-1	ug/kg	-	-	< 50 U	-
2-Nitropropane	79-46-9	ug/kg	-	-	< 10 R	-
4-Methyl-2-pentanone	108-10-1	ug/kg	-	-	< 5.0 U	-
Acetone	67-64-1	ug/kg	-	-	< 10 UL	-
Acetonitrile	75-05-8	ug/kg	-	-	< 100 UL	-
Acrolein	107-02-8	ug/kg	-	-	< 50 U	-
Acrylonitrile	107-13-1	ug/kg	-	-	< 50 U	-
Benzene	71-43-2	ug/kg	-	-	< 1.0 U	-
Benzyl Chloride	100-44-7	ug/kg	-	-	< 5.0 U	-
Bromochloromethane	74-97-5	ug/kg	-	-	< 5.0 U	-
Bromodichloromethane	75-27-4	ug/kg	-	-	< 5.0 U	-
Bromoform	75-25-2	ug/kg	-	-	< 5.0 U	-
Bromomethane	74-83-9	ug/kg	-	-	< 5.0 U	-
Butylbenzene, N-	104-51-8	ug/kg	-	-	< 5.0 U	-
Butylebenzene, TERT-	98-06-6	ug/kg	-	-	< 5.0 U	-
Carbon Disulfide	75-15-0	ug/kg	-	-	< 5.0 U	-
Carbon Tetrachloride	56-23-5	ug/kg	-	-	< 5.0 U	-
Chloro-1-Propene, 3- (Allyl Chloride)	107-05-1	ug/kg	-	-	< 5.0 U	-
Chlorobenzene	108-90-7	ug/kg	-	-	< 5.0 U	-
Chlorodifluoromethane	75-45-6	ug/kg	-	-	< 5.0 U	-
Chloroethane	75-00-3	ug/kg	-	-	< 5.0 U	-
Chloroform	67-66-3	ug/kg	-	-	< 5.0 U	-
Chloromethane	74-87-3	ug/kg	-	-	< 5.0 U	-
cis-1,2-Dichloroethylene	156-59-2	ug/kg	-	-	< 5.0 U	-
cis-1,3-Dichloropropene	10061-01-5	ug/kg	-	-	< 5.0 U	-
Cyclohexanone	108-94-1	ug/kg	-	-	< 200 UJX	-
Dibromochloromethane	124-48-1	ug/kg	-	-	< 5.0 U	-
Dibromomethane	74-95-3	ug/kg	-	-	< 5.0 U	-
Dichloropropene, 1,3-	542-75-6	ug/kg	-	-	< 5.0 UJX	-
Ethyl Acetate	141-78-6	ug/kg	-	-	< 5.0 UL	-
Ethyl Acrylate	140-88-5	ug/kg	-	-	< 5.0 UJX	-
Ethyl Ether	60-29-7	ug/kg	-	-	< 5.0 U	-
Ethyl Methacrylate	97-63-2	ug/kg	-	-	< 10 U	-
Ethylbenzene	100-41-4	ug/kg	-	-	< 1.0 U	-

CAS: Chemical Abstracts Service
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Table 4-1 Project Equipment and Trip Blank Results

		Sample ID	BBNPP-C-EB	BBNPP-PB	T101410	TRIP BLANK
Analyte	CAS	Unit				
Hexane	110-54-3	ug/kg	-	-	< 5.0 U	-
Isopropylbenzene	98-82-8	ug/kg	-	-	< 5.0 U	-
Methyl Acetate	79-20-9	ug/kg	-	-	< 5.0 U	-
Methyl Acrylate	96-33-3	ug/kg	-	-	< 5.0 UJX	-
Methyl Methacrylate	80-62-6	ug/kg	-	-	< 10 U	-
Methyl Styrene (Mixed Isomers)	25013-15-4	ug/kg	-	-	< 5.0 UJX	-
Methyl tert-Butyl Ether (MTBE)	1634-04-4	ug/kg	-	-	< 1.0 U	-
Methylacrylonitrile	126-98-7	ug/kg	-	-	< 10 U	-
Methylene Chloride	75-09-2	ug/kg	-	-	< 5.0 U	-
N-Butyl Alcohol	71-36-3	ug/kg	-	-	< 250 R	-
N-Butyl Chloride	109-69-3	ug/kg	-	-	< 5.0 UJX	-
P-Isopropyltoluene	99-87-6	ug/kg	-	-	< 5.0 U	-
Propylbenzene, N-	103-65-1	ug/kg	-	-	< 5.0 U	-
Sec-Butylbenzene	135-98-8	ug/kg	-	-	< 5.0 U	-
Styrene	100-42-5	ug/kg	-	-	< 5.0 U	-
Tetrachloroethylene	127-18-4	ug/kg	-	-	< 5.0 U	-
Toluene	108-88-3	ug/kg	-	-	< 1.0 U	-
trans-1,2-Dichloroethene	156-60-5	ug/kg	-	-	< 5.0 U	-
trans-1,3-Dichloropropene	10061-02-6	ug/kg	-	-	< 5.0 U	-
trans-1,4-Dichlorobutene	110-57-6	ug/kg	-	-	< 5.0 U	-
Trichloroethene	79-01-6	ug/kg	-	-	< 5.0 U	-
Trichloropropane, 1,2,3-	96-18-4	ug/kg	-	-	< 5.0 U	-
Trimethylbenzene, 1,3,5-	108-67-8	ug/kg	-	-	< 5.0 U	-
Vinyl Acetate	108-05-4	ug/kg	-	-	< 10 UL	-
Vinyl Bromide	593-60-2	ug/kg	-	-	< 5.0 U	-
Vinyl Chloride	75-01-4	ug/kg	-	-	< 5.0 U	-
Xylenes (Total)	1330-20-7	ug/kg	-	-	< 2.0 U	-
1,1,1,2-Tetrachloroethane	630-20-6	ug/l	< 5.0 U	< 5.0 U	-	< 5.0 U
1,1,1-Trichloroethane	71-55-6	ug/l	< 1.0 U	< 1.0 U	-	< 1.0 U
1,1,2,2-Tetrachloroethane	79-34-5	ug/l	< 1.0 U	< 1.0 U	-	< 1.0 U
1,1,2-Trichloroethane	79-00-5	ug/l	< 1.0 U	< 1.0 U	-	< 1.0 U
1,1-Dichloroethane	75-34-3	ug/l	< 1.0 U	< 1.0 U	-	< 1.0 U
1,1-Dichloroethene	75-35-4	ug/l	< 1.0 U	< 1.0 U	-	< 1.0 U
1,2,4-Trimethylbenzene	95-63-6	ug/l	< 5.0 U	< 5.0 U	-	< 5.0 U
1,2-Dibromo-3-chloropropane	96-12-8	ug/l	< 10 U	< 10 U	-	< 10 U
1,2-Dibromoethane	106-93-4	ug/l	< 2.0 U	< 2.0 U	-	< 2.0 U
1,2-Dichloroethane	107-06-2	ug/l	< 1.0 U	< 1.0 U	-	< 1.0 U
1,2-Dichloropropane	78-87-5	ug/l	< 1.0 U	< 1.0 U	-	< 1.0 U
1,3,5-Trichlorobenzene	108-70-3	ug/l	< 5.0 U	< 5.0 U	-	< 5.0 U
1,4-Dioxane	123-91-1	ug/l	< 130 UJ	< 130 UJ	-	< 130 UJ
1-Chloro-2,3-Epoxypropane	106-89-8	ug/l	< 100 UL	< 100 UL	-	< 100 UL
2-Butanone	78-93-3	ug/l	< 10 U	< 10 U	-	< 10 U
2-Chlor-1,3-Butadiene	126-99-8	ug/l	< 5.0 U	< 5.0 U	-	< 5.0 U
2-Chlorotoluene	95-49-8	ug/l	< 5.0 U	< 5.0 U	-	< 5.0 U
2-Methyl-1-Propanol	78-83-1	ug/l	< 50 U	< 50 U	-	< 50 U

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L - Biased Low
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Table 4-1 Project Equipment and Trip Blank Results

		Sample ID	BBNPP-C-EB	BBNPP-PB	T101410	TRIP BLANK
Analyte	CAS	Unit				
2-Nitropropane	79-46-9	ug/l	< 10 UL	< 10 UL	-	< 10 UL
4-Methyl-2-pentanone	108-10-1	ug/l	< 5.0 U	< 5.0 U	-	< 5.0 U
Acetone	67-64-1	ug/l	< 10 UL	< 10 UL	-	< 10 UL
Acetonitrile	75-05-8	ug/l	< 100 UL	< 100 UL	-	< 100 UL
Acrolein	107-02-8	ug/l	< 50 UL	< 50 UL	-	< 50 UL
Acrylonitrile	107-13-1	ug/l	< 50 UL	< 50 UL	-	< 50 UL
Benzene	71-43-2	ug/l	< 1.0 U	< 1.0 U	-	< 1.0 U
Benzyl Chloride	100-44-7	ug/l	< 5.0 UJ	< 5.0 UJ	-	< 5.0 UJ
Bromochloromethane	74-97-5	ug/l	< 5.0 U	< 5.0 U	-	< 5.0 U
Bromodichloromethane	75-27-4	ug/l	< 1.0 U	< 1.0 U	-	< 1.0 U
Bromoform	75-25-2	ug/l	< 4.0 U	< 4.0 U	-	< 4.0 U
Bromomethane	74-83-9	ug/l	< 2.0 U	< 2.0 U	-	< 2.0 U
Butylbenzene, N-	104-51-8	ug/l	< 5.0 U	< 5.0 U	-	< 5.0 U
Butylebenzene, TERT-	98-06-6	ug/l	< 5.0 U	< 5.0 U	-	< 5.0 U
Carbon Disulfide	75-15-0	ug/l	< 2.0 U	< 2.0 U	-	< 2.0 U
Carbon Tetrachloride	56-23-5	ug/l	< 1.0 U	< 1.0 U	-	< 1.0 U
Chloro-1-Propene, 3- (Allyl Chloride)	107-05-1	ug/l	< 5.0 U	< 5.0 U	-	< 5.0 U
Chlorobenzene	108-90-7	ug/l	< 1.0 U	< 1.0 U	-	< 1.0 U
Chlorodifluoromethane	75-45-6	ug/l	< 5.0 U	< 5.0 U	-	< 5.0 U
Chloroethane	75-00-3	ug/l	< 1.0 U	< 1.0 U	-	< 1.0 U
Chloroform	67-66-3	ug/l	< 1.0 U	< 1.0 U	-	< 1.0 U
Chloromethane	74-87-3	ug/l	< 1.0 U	< 1.0 U	-	< 1.0 U
cis-1,2-Dichloroethylene	156-59-2	ug/l	< 1.0 U	< 1.0 U	-	< 1.0 U
cis-1,3-Dichloropropene	10061-01-5	ug/l	< 1.0 U	< 1.0 U	-	< 1.0 U
Cyclohexanone	108-94-1	ug/l	< 50 UJX	< 50 UJX	-	< 50 UJX
Dibromochloromethane	124-48-1	ug/l	< 1.0 U	< 1.0 U	-	< 1.0 U
Dibromomethane	74-95-3	ug/l	< 5.0 U	< 5.0 U	-	< 5.0 U
Dichloropropene, 1,3-	542-75-6	ug/l	< 1.0 UJX	< 1.0 UJX	-	< 1.0 UJX
Ethyl Acetate	141-78-6	ug/l	< 5.0 U	< 5.0 U	-	< 5.0 U
Ethyl Acrylate	140-88-5	ug/l	< 5.0 UJX	< 5.0 UJX	-	< 5.0 UJX
Ethyl Ether	60-29-7	ug/l	< 5.0 U	< 5.0 U	-	< 5.0 U
Ethyl Methacrylate	97-63-2	ug/l	< 10 U	< 10 U	-	< 10 U
Ethylbenzene	100-41-4	ug/l	< 1.0 U	< 1.0 U	-	< 1.0 U
Hexane	110-54-3	ug/l	< 5.0 U	< 5.0 U	-	< 5.0 U
Isopropylbenzene	98-82-8	ug/l	< 2.0 U	< 2.0 U	-	< 2.0 U
Methyl Acetate	79-20-9	ug/l	< 5.0 U	< 5.0 U	-	< 5.0 U
Methyl Acrylate	96-33-3	ug/l	< 5.0 UJX	< 5.0 UJX	-	< 5.0 UJX
Methyl Methacrylate	80-62-6	ug/l	< 10 U	< 10 U	-	< 10 U
Methyl Styrene (Mixed Isomers)	25013-15-4	ug/l	< 5.0 UJX	< 5.0 UJX	-	< 5.0 UJX
Methyl tert-Butyl Ether (MTBE)	1634-04-4	ug/l	< 1.0 U	< 1.0 U	-	< 1.0 U
Methylacrylonitrile	126-98-7	ug/l	< 10 U	< 10 U	-	< 10 U
Methylene Chloride	75-09-2	ug/l	< 2.0 U	< 2.0 U	-	< 2.0 U
N-Butyl Alcohol	71-36-3	ug/l	< 250 R	< 250 R	-	< 250 R
N-Butyl Chloride	109-69-3	ug/l	< 5.0 UJX	< 5.0 UJX	-	< 5.0 UJX
P-Isopropyltoluene	99-87-6	ug/l	< 5.0 U	< 5.0 U	-	< 5.0 U
Propylbenzene, N-	103-65-1	ug/l	< 5.0 U	< 5.0 U	-	< 5.0 U
Sec-Butylbenzene	135-98-8	ug/l	< 5.0 U	< 5.0 U	-	< 5.0 U
Styrene	100-42-5	ug/l	< 5.0 U	< 5.0 U	-	< 5.0 U
Tetrachloroethylene	127-18-4	ug/l	< 1.0 U	< 1.0 U	-	< 1.0 U
Toluene	108-88-3	ug/l	< 1.0 U	< 1.0 U	-	< 1.0 U

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Table 4-1 Project Equipment and Trip Blank Results

		Sample ID	BBNPP-C-EB	BBNPP-PB	T101410	TRIP BLANK
Analyte	CAS	Unit				
trans-1,2-Dichloroethene	156-60-5	ug/l	< 1.0 U	< 1.0 U	-	< 1.0 U
trans-1,3-Dichloropropene	10061-02-6	ug/l	< 1.0 U	< 1.0 U	-	< 1.0 U
trans-1,4-Dichlorobutene	110-57-6	ug/l	< 5.0 U	< 5.0 U	-	< 5.0 U
Trichloroethene	79-01-6	ug/l	< 1.0 U	< 1.0 U	-	< 1.0 U
Trichloropropane, 1,2,3-	96-18-4	ug/l	< 5.0 U	< 5.0 U	-	< 5.0 U
Trimethylbenzene, 1,3,5-	108-67-8	ug/l	< 5.0 U	< 5.0 U	-	< 5.0 U
Vinyl Acetate	108-05-4	ug/l	< 10 U	< 10 U	-	< 10 U
Vinyl Bromide	593-60-2	ug/l	< 1.0 U	< 1.0 U	-	< 1.0 U
Vinyl Chloride	75-01-4	ug/l	< 1.0 U	< 1.0 U	-	< 1.0 U
Xylenes (Total)	1330-20-7	ug/l	< 1.0 U	< 1.0 U	-	< 1.0 U

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Table 4-2 Project QC Matrix Spike and Control Sample Results (percent recovered)

		Sample Type Matrix	BS[1] Solid	BS Solid	BS Aqueous	BS Aqueous		MS[2] Solid	MS Solid	MS Aqueous	QC Sample Labels	Critical Range[3]
Method	**Analyte**	**CAS[4]**	%	%	%	%		%	%	%	Metals except Cr^{6+} and Hg	
Inorganics											MP55422-B1 and -S1	
SW8466010B	Antimony	7440-36-0	95.1	91.7	95.6	99.8		60.3	61.5	101.9	MP55449-B1 and S1	
SW8466010B	Arsenic	7440-38-2	93	89.5	94	100.8		83.7	87.6	100.6	MP55431-B1, LC1 and -S1	
SW8466010B	Barium	7440-39-3	99	93	91.5	101.2		87.2	94.2	94		
SW8466010B	Beryllium	7440-41-7	101	93	92	102.6		86.8	94.7	99.6	Hexavalent Chromium	
SW8466010B	BORON	7440-42-8	94.1	91.5	96	-		83.7	85.2	102.3	GP56056-B1, B2, S1, and S2	
SW8466010B	Cadmium	7440-43-9	96	91	101	99.8		84.9	90.3	106.4	GP56076-B1, B2, S1, and S2	
SW8466010B	Chromium	7440-47-3	102.3	94.5	93.5	91		86.8	97.4	99.6	GP56250-B1, B2, S1, and S2	
SW8467196A	Chromium, hexavalent	18540-29-9	94, 94, 91	106, 95, 97	100	-		**2**, 79, **3**	**64**, **6**, 77	-		75-125
SW8466010B	Cobalt	7440-48-4	98.8	94.5	96.4	104.2		86.1	91.1	101	Mercury	
SW8466010B	Copper	7440-50-8	94.6	88.8	88	99.4		84.9	90.3	95.6	MP55517-LCS, MP55478-LCS and	
SW8466010B	Lead	7439-92-1	94.2	91	90.6	96.2		86.5	91	93.6	-S1, MP55530-S1	
SW8466010B	Manganese	7439-96-5	104	96.4	95.6	99.2		90.2	88.5	102.6		
SW8467471A	Mercury	7439-97-6	98	-	100	-		95.1	83.9	-	Chloride and Sulfate	
SW8466010B	Nickel	7440-02-0	96.7	92.6	93.4	99.2		87.7	94.9	97.7	GP56061-B1, S1, and -S2	
SW8466010B	Selenium	7782-49-2	90.3	89.5	92.5	98.6		83.4	84.9	85.4	GP56125-B1 and -S1	
SW8466010B	Silver	7440-22-4	100	97	92.6	91.5		91	95	100.4	GP56100-B1 and -S1	
SW8466010B	Thallium	7440-28-0	92.3	89.5	91.5	96.8		84.1	88.4	94.9		
SW8466010B	TIN	7440-31-5	99.7	94	97	-		82.6	87.7	101	Cyanide (all solid QC Samples)	
SW8466010B	Titanium	7440-32-6	99.2	93.5	93	100.4		79.7	101.9	99	GP55943-B2 and -S1	
SW8466010B	Vanadium	7440-62-2	94.2	89.4	87.2	92.6		83.8	88.8	93.8	GP55945-B1, S1 and -S2	
SW8466010B	Zinc	7440-66-6	99.5	93.6	94.8	102.2		84.6	94.1	97.7	GP55987-B1 and -S1	
EPA300/SW8469056	CHLORIDE	16887-00-6	100.3	102.4	102.1	-		101.1	100.7, 100	102.1	GP56007-B1 and -S2	
EPA300/SW8469056	SULFATE AS SO_4	14808-79-8	102.9	107.6	101.8	-		105, 105	102.3	107		
SW8469012M	Cyanide	57-12-5	98.6, 94.9	95.4, 98.6	-	--		102, 120	94, 102,89	-	Inorganic Nitrogen	
EPA3532M	Nitrogen, Inorganic	NO_3NO_2	100	97.5	-	-		106	89.6	-	GP55966-B1 and -S1	
CI and OP Pesticides											GP56059-B1 and -S1	
SW8081A	4,4'-DDD	72-54-8	86	86	88	-		71	76	98		
SW8081A	4,4'-DDE	72-55-9	76	87	92	-		64	76	76	Pesticides	
SW8081A	4,4'-DDT	50-29-3	76	81	96	-		72	71	100	OP46352-BS1 and -MS	
SW8081A	Aldrin	309-00-2	77	84	88	-		55	71	64	OP46373-BS1 and -MS	
SW8081A	alpha-BHC	319-84-6	77	76	92	-		65	77	96	OP46260-BS1 and -MS	
SW8081A	alpha-Chlordane	5103-71-9	74	81	92	-		57	71	90		
SW8081A	beta-BHC	319-85-7	78	82	88	-		61	70	108		
SW8081A	delta-BHC	319-86-8	83	83	96	-		60	69	112		
SW8081A	Dieldrin	60-57-1	79	82	96	-		63	73	86		
SW8081A	Endosulfan I	959-98-8	79	80	92	-		61	71	88		
SW8081A	Endosulfan II	33213-65-9	85	84	92	-		64	68	94		
SW8081A	Endosulfan Sulfate	1031-07-8	82	82	80	-		32	53	86		
SW8081A	Endrin	72-20-8	78	86	104	-		64	75	96		
SW8081A	Endrin Aldehyde	7421-93-4	80	78	76	-		28	49	88		
SW8081A	Endrin ketone	53494-70-5	78	74	88	-		49	57	112	OP Pesticides	
SW8081A	gamma-BHC (Lindane)	58-89-9	78	78	92	-		55	68	90	OP37475-BS, -MS, -MSD	
SW8081A	gamma-Chlordane	5103-74-2	78	83	92	-		60	72	76	OP34758-BS, -MS, -MSD	

[1] BS: Blank Spike

[2] MS: Matrix Spike (bolded values exceed target range)

[3] Critical Range: target quality range (provided for exceeded parameters only)

[4] CAS: Chemical Abstracts Service

*LCS range for cis-1,2-Dichloroethylene 73-121%; Vinyl Acetate 58-131 %

Table 4-2 Project QC Matrix Spike and Control Sample Results (percent recovered)

		Sample Type Matrix	BS[1] Solid	BS Solid	BS Aqueous	BS Aqueous		MS[2] Solid	MS Solid	MS Aqueous	QC Sample Labels	Critical Range[3]
Method	Analyte	CAS[4]	%	%	%	%		%	%	%	Metals except Cr^{6+} and Hg	
SW8081A	Heptachlor	76-44-8	75	76	92	-		55	74	80	OP34761-BS	
SW8081A	Heptachlor Epoxide	1024-57-3	78	80	92	-		61	70	86		
SW8081A	Methoxychlor	72-43-5	76	85	100	-		74	68	98		
SW8141B	Chlorpyrifos	2921-88-2	**121**	**133, 146**	-	-		98, 116	**126, 123**	-		51-119
SW8141B	Diazinon	333-41-5	**115**	**132, 146**	-	-		99, 114	**126, 121**	-		50-120
SW8141B	Dichlorvos	62-73-7	67	76, 90	-	-		55, 65	76, 75	-		47-102
SW8141B	Disulfoton	298-04-4	**103**	**118, 140**	-	-		90, 105	**117, 114**	-		33-107
SW8141B	Methyl Parathion	298-00-0	**122**	**136, 150**	-	-		100, 124	**133**, 127	-		57-128
SW8141B	Phorate	298-02-2	**112**	**124, 144**	-	-		85, 107	**119, 119**	-		53-114
SW8141B	Ronnel	299-84-3	**119**	**130, 142**	-	-		95, 114	**122, 121**	-		53-120
Herbicides												
SW8151	2,4,5-T	93-76-5	92	12	100	-		107	87	78	Herbicides	
SW8151	2,4,5-TP (Silvex)	93-72-1	112	81	125	-		127	91	91	OP46195-BS1 and -MS	
SW8151	2,4-D	94-75-7	88	16	100	-		107	74	78	OP46377-BS1 and -MS	
SW8151	Dalapon	75-99-0	116	**0**	90	-		**485**	85	71	OP46107-BS1 and -MS	4-188
SW8151	Dinoseb	88-85-7	110	65	70	-		134	93	78		
PCBs												
SW8082	Aroclor-1016	12674-11-2	101	105, 115	110	-		89, 89	116	70	PCBs	
SW8082	Aroclor-1260	11096-82-5	106	111, 116	100	-		99, 116	118	78	OP46323-BS2 and MS	
SVOCs											OP46353-BS1 and MS	
SW8270C	1,1'-Biphenyl	92-52-4	85	86	86	-		50	56	84	OP46374-BS1 and MS	
SW8270C	1,2,4,5-Tetrachlorobenzene	95-94-3	78	78	87	-		47	56	93	OP46259-BS1 and MS	
SW8270C	1,2,4-Trichlorobenzene	120-82-1	79	88	68	-		48	63	71		
SW8270C	1,2-Dichlorobenzene	95-50-1	79	78	65	-		48	56	67		
SW8270C	1,2-DIPHENYLHYDRAZINE	122-66-7	104	81	92	-		59	48	95	SVOCs	
SW8270C	1,3-Dichlorobenzene	541-73-1	78	79	60	-		47	56	63	OP46301-BS1 and -MS	
SW8270C	1,4-Dichlorobenzene	106-46-7	79	78	61	-		48	54	63	OP46332-BS1 and -MS	
SW8270C	2,2'-oxybis(1-Chloropropane)	108-60-1	83	81	87	-		51	59	87	OP46278-BS1 and -MS	
SW8270C	2,3,4,6-Tetrachlorophenol	58-90-2	77	83	83	-		42	59	76		
SW8270C	2,4,5-Trichlorophenol	95-95-4	86	85	89	-		50	62	84		
SW8270C	2,4,6-Trichlorophenol	88-06-2	82	84	88	-		45	63	80		
SW8270C	2,4-Dichlorophenol	120-83-2	79	78	89	-		47	61	80		
SW8270C	2,4-Dimethylphenol	105-67-9	91	89	94	-		55	61	101		
SW8270C	2,4-Dinitrophenol	51-28-5	76	85	92	-		25	67	95		
SW8270C	2,4-Dinitrotoluene	121-14-2	91	90	105	-		50	66	103		
SW8270C	2,6-Dinitrotoluene	606-20-2	96	90	101	-		54	66	103		
SW8270C	2-Chlorophenol	95-57-8	79	76	82	-		49	54	81		
SW8270C	2-Methylnaphthalene	91-57-6	86	80	75	-		52	58	76		
SW8270C	2-Methylphenol	95-48-7	82	70	77	-		50	52	89		
SW8270C	2-Nitroaniline	88-74-4	99	81	95	-		55	49	97		
SW8270C	2-Nitrophenol	88-75-5	77	76	94	-		44	57	92		
SW8270C	3- AND 4-METHYLPHENOL COELUTION	MEPH1314	79	72	71	-		48	51	84		
SW8270C	3,3'-Dichlorobenzidine	91-94-1	87	99	64	-		57	70	38		
SW8270C	3-Nitroaniline	99-09-2	68	74	90	-		45	54	75		
SW8270C	4,6-Dinitro-2-methylphenol	534-52-1	76	72	89	-		30	53	88		
SW8270C	4-Bromophenyl-phenylether	101-55-3	88	95	91	-		50	70	94		
SW8270C	4-Chloro-3-methylphenol	59-50-7	89	85	90	-		51	62	95		

[1] BS: Blank Spike

[2] MS: Matrix Spike (bolded values exceed target range)

[3] Critical Range: target quality range (provided for exceeded parameters only)

[4] CAS: Chemical Abstracts Service

*LCS range for cis-1,2-Dichloroethylene 73-121%; Vinyl Acetate 58-131 %

Table 4-2 Project QC Matrix Spike and Control Sample Results (percent recovered)

		Sample Type Matrix	BS[1] Solid	BS Solid	BS Aqueous	BS Aqueous		MS[2] Solid	MS Solid	MS Aqueous	QC Sample Labels	Critical Range[3]
Method	**Analyte**	**CAS[4]**	%	%	%	%		%	%	%	Metals except Cr^{6+} and Hg	
SW8270C	4-Chloroaniline	106-47-8	62	72	86	-		46	49	76		
SW8270C	4-Chlorophenyl-phenylether	7005-72-3	88	92	88	-		51	69	89		
SW8270C	4-Nitroaniline	100-01-6	90	76	94	-		47	50	90		
SW8270C	4-Nitrophenol	100-02-7	85	63	40	-		36	31	62		
SW8270C	Acenaphthene	83-32-9	89	85	101	-		52	58	104		
SW8270C	Acenaphthylene	208-96-8	85	83	84	-		50	56	86		
SW8270C	Acetophenone	98-86-2	89	85	95	-		52	58	96		
SW8270C	ANILINE	62-53-3	71	87	76	-		52	50	78		
SW8270C	Anthracene	120-12-7	93	90	106	-		54	63	109		
SW8270C	Atrazine	1912-24-9	90	97	105	-		54	73	105		
SW8270C	Benzaldehyde	100-52-7	82	113	95	-		54	73	92		
SW8270C	BENZIDINE	92-87-5	59	78	57	-		20	**0**	**0**		1-100
SW8270C	Benzo(a)anthracene	56-55-3	88	84	91	-		50	62	94		
SW8270C	Benzo(a)pyrene	50-32-8	97	89	94	-		54	59	99		
SW8270C	Benzo(b)fluoranthene	205-99-2	95	91	95	-		51	58	100		
SW8270C	Benzo(g,h,i)perylene	191-24-2	94	113	91	-		45	64	97		
SW8270C	Benzo(k)fluoranthene	207-08-9	102	84	99	-		58	65	104		
SW8270C	BENZOIC ACID	65-85-0	74	74	38	-		26	64	73		
SW8270C	BENZYL ALCOHOL	100-51-6	79	82	79	-		48	55	97		
SW8270C	bis-(2-chloroethoxy)methane	111-91-1	89	89	97	-		53	59	99		
SW8270C	bis-(2-Chloroethyl)ether	111-44-4	87	76	85	-		53	49	83		
SW8270C	bis-(2-Ethylhexyl)phthalate	117-81-7	101	76	96	-		52	62	103		
SW8270C	Butylbenzylphthalate	85-68-7	101	78	95	-		51	56	103		
SW8270C	Caprolactam	105-60-2	90	71	17	-		45	45	35		
SW8270C	Carbazole	86-74-8	92	86	93	-		54	61	94		
SW8270C	Chrysene	218-01-9	96	84	103	-		54	67	108		
SW8270C	Dibenzo(a,h)anthracene	53-70-3	95	113	96	-		47	69	103		
SW8270C	Dibenzofuran	132-64-9	87	89	89	-		51	61	90		
SW8270C	Diethylphthalate	84-66-2	93	88	91	-		53	62	91		
SW8270C	Dimethylphthalate	131-11-3	90	88	88	-		56	52	87		
SW8270C	Di-n-butylphthalate	84-74-2	98	83	95	-		57	57	97		
SW8270C	Di-n-octylphthalate	117-84-0	100	82	102	-		51	58	113		
SW8270C	Fluoranthene	206-44-0	93	90	91	-		54	62	91		
SW8270C	Fluorene	86-73-7	94	92	91	-		55	64	90		
SW8270C	Hexachlorobenzene	118-74-1	85	95	94	-		51	70	94		
SW8270C	Hexachlorobutadiene	87-68-3	81	89	57	-		48	70	66		
SW8270C	Hexachlorocyclo-pentadiene	77-47-4	101	118	101	-		49	73	110		
SW8270C	Hexachloroethane	67-72-1	78	79	51	-		47	59	57		
SW8270C	Indeno(1,2,3-cd)pyrene	193-39-5	95	118	95	-		46	64	103		
SW8270C	Isophorone	78-59-1	92	90	94	-		55	58	97		
SW8270C	METHANAMINE, N-METHYL-N-NITROSO	62-75-9	83	77	43	-		51	36	60		
SW8270C	Naphthalene	91-20-3	81	84	78	-		49	58	78		
SW8270C	Nitrobenzene	98-95-3	81	87	90	-		50	61	92		
SW8270C	N-Nitroso-di-n-propylamine	621-64-7	92	78	90	-		56	51	88		
SW8270C	N-Nitrosodiphenylamine	86-30-6	91	88	94	-		52	62	97		
SW8270C	Pentachlorophenol	87-86-5	60	70	93	-		33	47	94		
SW8270C	Phenanthrene	85-01-8	89	88	104	-		53	63	107		

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*LCS range for cis-1,2-Dichloroethylene 73-121%; Vinyl Acetate 58-131 %

Table 4-2 Project QC Matrix Spike and Control Sample Results (percent recovered)

		Sample Type Matrix	BS[1] Solid	BS Solid	BS Aqueous	BS Aqueous		MS[2] Solid	MS Solid	MS Aqueous	QC Sample Labels	Critical Range[3]
Method	Analyte	CAS[4]	%	%	%	%		%	%	%	Metals except Cr^{6+} and Hg	
SW8270C	Phenol	108-95-2	84	65	41	-		52	50	61		
SW8270C	Pyrene	129-00-0	95	84	88	-		53	62	92	Dioxin	
SW8270C	PYRIDINE	110-86-1	72	75	36	-		45	42	48	LCS_12002001, LCS_12002022	
SW8270C	Quinoline	91-22-5	95	93	99	-		55	66	103	LCS_12002074	
Dioxin											JA58750_10/13/2010MS	
SW846 8290A	2,3,7,8-TCDD	1746-01-6	114	108	106	-		115	105	-	JA58900-3 MS/MSD_10/14/2010MS	
VOCs Series I												
SW8468260B	1,1,1,2-TETRACHLOROETHANE	630-20-6	93	108	107	-		83	76	-		
SW8468260B	1,1,1-Trichloroethane	71-55-6	88	104	113	-		63	52	-	VOCs Series I	
SW8468260B	1,1,2,2-Tetrachloroethane	79-34-5	103	101	98	-		131	**138**	-	VG6318-BS	35-136
SW8468260B	1,1,2-Trichloroethane	79-00-5	102	107	111	-		82	82	-	VX4578-BS	
SW8468260B	1,1-Dichloroethane	75-34-3	100	94	111	-		59	50	-	JA58750-11MS	
SW8468260B	1,1-Dichloroethene	75-35-4	111	91	101	-		51	41	-	JA8900-3MS	
SW8468260B	1,2,4-TRIMETHYLBENZENE	95-63-6	93	98	94	-		88	72	-		
SW8468260B	1,2-Dibromo-3-chloropropane	96-12-8	88	106	119	-		145	153	-		
SW8468260B	1,2-Dibromoethane	106-93-4	103	106	108	-		71	72	-		
SW8468260B	1,2-Dichloroethane	107-06-2	79	112	128	-		77	81	-		
SW8468260B	1,2-Dichloropropane	78-87-5	101	102	110	-		69	61	-		
SW8468260B	1,3,5-TRICHLOROBENZENE	108-70-3	97	111	102	-		83	63	-		
SW8468260B	1,4-Dioxane	123-91-1	114	110	114	-		76	66	-		
SW8468260B	1-CHLORO-2,3-EPOXYPROPANE	106-89-8	116	72	115	-		55	58	-		
SW8468260B	2-Butanone	78-93-3	97	94	125	-		**161**	125	-		32-159
SW8468260B	2-CHLOR-1,3-BUTADIENE	126-99-8	114	108	91	-		53	34	-		
SW8468260B	2-CHLOROTOLUENE	95-49-8	100	102	97	-		88	73	-		
SW8468260B	2-METHYL-1-PROPANOL	78-83-1	112	108	98	-		47	44	-		
SW8468260B	2-NITROPROPANE	79-46-9	**256**	**191**	114	-		**204**	**221**	-		9-183
SW8468260B	4-Methyl-2-pentanone	108-10-1	111	103	113	-		111	107	-		
SW8468260B	Acetone	67-64-1	87	82	108	-		**224**	**186**	-		26-178
SW8468260B	ACETONITRILE	75-05-8	112	84	119	-		74	68	-		
SW8468260B	ACROLEIN	107-02-8	125	108	127	-		74	68	-		
SW8468260B	ACRYLONITRILE	107-13-1	112	82	120	-		74	82	-		
SW8468260B	Benzene	71-43-2	96	96	108	-		59	50	-		
SW8468260B	BENZYL CHLORIDE	100-44-7	-	-	130	-		-	-	-		
SW8468260B	Bromochloromethane	74-97-5	109	103	105	-		67	67	-		
SW8468260B	Bromodichloromethane	75-27-4	94	113	115	-		76	70	-		
SW8468260B	Bromoform	75-25-2	81	115	110	-		94	99	-		
SW8468260B	Bromomethane	74-83-9	120	80	93	-		55	45	-		
SW8468260B	BUTYLBENZENE, N-	104-51-8	97	108	110	-		65	40	-		
SW8468260B	BUTYLEBENZENE, TERT-	98-06-6	93	101	97	-		99	85	-		
SW8468260B	Carbon Disulfide	75-15-0	108	92	111	-		45	37	-		
SW8468260B	Carbon Tetrachloride	56-23-5	77	116	119	-		72	57	-		
SW8468260B	CHLORO-1-PROPENE, 3-	107-05-1	118	94	102	-		53	45	-		
SW8468260B	Chlorobenzene	108-90-7	100	102	104	-		58	50	-		
SW8468260B	Chloroethane	75-00-3	129	74	98	-		62	45	-		
SW8468260B	Chloroform	67-66-3	93	98	105	-		63	56	-		
SW8468260B	Chloromethane	74-87-3	95	83	93	-		57	41	-		
SW8468260B	cis-1,2-Dichloroethylene	156-59-2	**127***	90	114	-		51	47	-		

[1] BS: Blank Spike

[2] MS: Matrix Spike (bolded values exceed target range)

[3] Critical Range: target quality range (provided for exceeded parameters only)

[4] CAS: Chemical Abstracts Service

*LCS range for cis-1,2-Dichloroethylene 73-121%; Vinyl Acetate 58-131 %

Table 4-2 Project QC Matrix Spike and Control Sample Results (percent recovered)

		Sample Type Matrix	BS[1] Solid	BS Solid	BS Aqueous	BS Aqueous		MS[2] Solid	MS Solid	MS Aqueous	QC Sample Labels	Critical Range[3]
Method	**Analyte**	**CAS[4]**	%	%	%	%		%	%	%	Metals except Cr^{6+} and Hg	
SW8468260B	cis-1,3-Dichloropropene	10061-01-5	103	107	115	-		58	57	-		
SW8468260B	Dibromochloromethane	124-48-1	91	109	103	-		84	82	-		
SW8468260B	DIBROMOMETHANE	74-95-3	98	116	114	-		75	79	-		
SW8468260B	DICHLOROPROPENE, 1,3-	542-75-6	109	106	118	-				-		
SW8468260B	ETHYL ACETATE	141-78-6	119	98	99	-		85	89	-		
SW8468260B	ETHYL ETHER	60-29-7	114	100	110	-		77	75	-		
SW8468260B	ETHYL METHACRYLATE	97-63-2	116	95	109	-		77	75	-		
SW8468260B	Ethylbenzene	100-41-4	94	96	105	-		58	45	-		
SW8468260B	HEXANE	110-54-3	102	93	94	-		36	19	-		
SW8468260B	Isopropylbenzene	98-82-8	98	97	94	-		89	72	-		
SW8468260B	Methyl Acetate	79-20-9	117	79	104	-		72	73	-		
SW8468260B	METHYL METHACRYLATE	80-62-6	104	96	107	-		79	87	-		
SW8468260B	Methyl tert-Butyl Ether (MTBE)	1634-04-4	97	88	100	-		74	74	-		
SW8468260B	METHYLACRYLONITRILE	126-98-7	101	82	107	-		71	74	-		
SW8468260B	Methylene Chloride	75-09-2	105	91	85	-		59	55	-		
SW8468260B	N-BUTYL ALCOHOL	71-36-3	126	104	120	-		93	89	-		
SW8468260B	P-ISOPROPYLTOLUENE	99-87-6	103	102	104	-		90	70	-		
SW8468260B	PROPYLBENZENE, N-	103-65-1	94	92	93	-		70	53	-		
SW8468260B	SEC-BUTYLBENZENE	135-98-8	96	100	98	-		91	73	-		
SW8468260B	Styrene	100-42-5	104	96	100	-		51	43	-		
SW8468260B	Tetrachloroethylene	127-18-4	87	108	83	-		64	49	-		
SW8468260B	Toluene	108-88-3	105	98	97	-		56	46	-		
SW8468260B	trans-1,2-Dichloroethene	156-60-5	98	85	91	-		40	**36**	-		37-140
SW8468260B	trans-1,3-Dichloropropene	10061-02-6	98	106	121	-		48	53	-		
SW8468260B	TRANS-1,4-DICHLOROBUTENE	110-57-6	92	108	116	-		75	79	-		
SW8468260B	Trichloroethene	79-01-6	96	111	109	-		56	46	-		
SW8468260B	TRICHLOROPROPANE, 1,2,3-	96-18-4	90	97	99	-		137	**149**	-		38-143
SW8468260B	TRIMETHYLBENZENE, 1,3,5-	108-67-8	94	96	95	-		92	79	-		
SW8468260B	VINYL ACETATE	108-05-4	**139***	125	94	-		93	88	-		
SW8468260B	Vinyl Bromide	593-60-2	87	90	103	-		60	**43**	-		50-150
SW8468260B	Vinyl Chloride	75-01-4	117	86	103	-		53	39	-		
SW8468260B	XYLENES (TOTAL)	1330-20-7	103	98	105	-		60	49	-		
VOCs Series II												
SW8468260B	1,1,1,2-TETRACHLOROETHANE	630-20-6	100	105	-	-		97	**29**	-	VOCs Series II	36-147
SW8468260B	1,1,1-Trichloroethane	71-55-6	108	108	-	-		106	54	-	VX4577-BS	
SW8468260B	1,1,2,2-Tetrachloroethane	79-34-5	107	103	-	-		106	79	-	VX4579-BS and -BS2	
SW8468260B	1,1,2-Trichloroethane	79-00-5	111	112	-	-		107	**35**	-	JA59322-1MS	37-147
SW8468260B	1,1-Dichloroethane	75-34-3	105	92	-	-		100	73	-		
SW8468260B	1,1-Dichloroethene	75-35-4	95	91	-	-		91	86	-		
SW8468260B	1,2,4-TRIMETHYLBENZENE	95-63-6	97	95	-	-		87	**-28**	-		13-158
SW8468260B	1,2-Dibromo-3-chloropropane	96-12-8	122	117	-	-		124	34	-		
SW8468260B	1,2-Dibromoethane	106-93-4	101	108	-	-		99	48	-		
SW8468260B	1,2-Dichloroethane	107-06-2	118	121	-	-		116	**26**	-		44-143
SW8468260B	1,2-Dichloropropane	78-87-5	107	100	-	-		102	46	-		
SW8468260B	1,3,5-TRICHLOROBENZENE	108-70-3	106	111	-	-		97	**10**	-		60-140
SW8468260B	1,4-Dioxane	123-91-1	88	90	-	-		83	150	-		
SW8468260B	1-CHLORO-2,3-EPOXYPROPANE	106-89-8	97	102	-	-		102	80	-		

[1] BS: Blank Spike

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*LCS range for cis-1,2-Dichloroethylene 73-121%; Vinyl Acetate 58-131 %

Table 4-2 Project QC Matrix Spike and Control Sample Results (percent recovered)

		Sample Type	BS[1]	BS	BS	BS		MS[2]	MS	MS		Critical Range[3]
		Matrix	Solid	Solid	Aqueous	Aqueous		Solid	Solid	Aqueous	QC Sample Labels	
Method	**Analyte**	**CAS[4]**	%	%	%	%		%	%	%	Metals except Cr^{6+} and Hg	
SW8468260B	2-Butanone	78-93-3	118	102	-	-		**165**	**270**	-		32-159
SW8468260B	2-CHLOR-1,3-BUTADIENE	126-99-8	114	102	-	-		111	70	-		
SW8468260B	2-CHLOROTOLUENE	95-49-8	96	99	-	-		90	54	-		
SW8468260B	2-METHYL-1-PROPANOL	78-83-1	93	89	-	-		88	63	-		
SW8468260B	2-NITROPROPANE	79-46-9	142	**290**	-	-		146		-		9-183
SW8468260B	4-Methyl-2-pentanone	108-10-1	123	115	-	-		130	98	-		
SW8468260B	Acetone	67-64-1	121	83	-	-		**235**	**518**	-		26-178
SW8468260B	ACETONITRILE	75-05-8	111	88	-	-		114	92	-		
SW8468260B	ACROLEIN	107-02-8	104	93	-	-		85	23	-		
SW8468260B	ACRYLONITRILE	107-13-1	105	89	-	-		109	**173**	-		37-147
SW8468260B	Benzene	71-43-2	94	94	-	-		93	**26**	-		41-136
SW8468260B	BENZYL CHLORIDE	100-44-7	-	-	-	-		-	-	-		
SW8468260B	Bromochloromethane	74-97-5	104	104	-	-		100	72	-		
SW8468260B	Bromodichloromethane	75-27-4	114	115	-	-		109	**36**	-		37-150
SW8468260B	Bromoform	75-25-2	108	123	-	-		106	**23**	-		31-153
SW8468260B	Bromomethane	74-83-9	73	76	-	-		74	107	-		
SW8468260B	BUTYLBENZENE, N-	104-51-8	107	101	-	-		100	68	-		
SW8468260B	BUTYLEBENZENE, TERT-	98-06-6	98	99	-	-		92	80	-		
SW8468260B	Carbon Disulfide	75-15-0	95	88	-	-		94	65	-		
SW8468260B	Carbon Tetrachloride	56-23-5	113	122	-	-		108	34	-		
SW8468260B	CHLORO-1-PROPENE, 3-	107-05-1	105	94	-	-		97	77	-		
SW8468260B	Chlorobenzene	108-90-7	95	101	-	-		93	**12**	-		33-140
SW8468260B	Chloroethane	75-00-3	75	89	-	-		74	98	-		
SW8468260B	Chloroform	67-66-3	106	99	-	-		102	**2**	-		44-135
SW8468260B	Chloromethane	74-87-3	82	77	-	-		90	**220**	-		27-149
SW8468260B	cis-1,2-Dichloroethylene	156-59-2	104	89	-	-		91	71	-		
SW8468260B	cis-1,3-Dichloropropene	10061-01-5	108	107	-	-		106	**34**	-		37-143
SW8468260B	CYCLOHEXANONE	108-94-1	-	-	-	-		-	-	-		
SW8468260B	Dibromochloromethane	124-48-1	99	109	-	-		98	**33**	-		35-154
SW8468260B	DIBROMOMETHANE	74-95-3	114	120	-	-		112	**43**	-		46-137
SW8468260B	ETHYL ACETATE	141-78-6	110	108	-	-		122	144	-		
SW8468260B	ETHYL ACRYLATE	140-88-5	0	0	-	-		-	-	-		
SW8468260B	ETHYL ETHER	60-29-7	110	99	-	-		112	128	-		
SW8468260B	ETHYL METHACRYLATE	97-63-2	110	104	-	-		109	54	-		
SW8468260B	Ethylbenzene	100-41-4	90	94	-	-		92	**-6**	-		28-147
SW8468260B	HEXANE	110-54-3	81	75	-	-		77	**251**	-		4-166
SW8468260B	Isopropylbenzene	98-82-8	95	94	-	-		88	42	-		
SW8468260B	Methyl Acetate	79-20-9	91	87	-	-		97	**346**	-		40-177
SW8468260B	METHYL ACRYLATE	96-33-3	-	-	-	-		-	-	-		
SW8468260B	METHYL METHACRYLATE	80-62-6	105	106	-	-		111	**186**	-		37-157
SW8468260B	METHYL STYRENE (MIXED ISOMERS)	25013-15-4	-	-	-	-		-	-	-		
SW8468260B	Methyl tert-Butyl Ether (MTBE)	1634-04-4	103	94	-	-		102	**209**	-		48-135
SW8468260B	METHYLACRYLONITRILE	126-98-7	103	90	-	-		109	64	-		
SW8468260B	Methylene Chloride	75-09-2	97	90	-	-		93	54	-		
SW8468260B	N-BUTYL ALCOHOL	71-36-3	114	105	-	-		131	-	-		
SW8468260B	P-ISOPROPYLTOLUENE	99-87-6	101	99	-	-		93	56	-		
SW8468260B	PROPYLBENZENE, N-	103-65-1	90	90	-	-		84	27	-		

[1] BS: Blank Spike

[2] MS: Matrix Spike (bolded values exceed target range)

[3] Critical Range: target quality range (provided for exceeded parameters only)

[4] CAS: Chemical Abstracts Service

*LCS range for cis-1,2-Dichloroethylene 73-121%; Vinyl Acetate 58-131 %

Table 4-2 Project QC Matrix Spike and Control Sample Results (percent recovered)

		Sample Type Matrix	BS[1] Solid	BS Solid	BS Aqueous	BS Aqueous		MS[2] Solid	MS Solid	MS Aqueous	QC Sample Labels	Critical Range[3]
Method	**Analyte**	**CAS[4]**	%	%	%	%		%	%	%	Metals except Cr^{6+} and Hg	
SW8468260B	SEC-BUTYLBENZENE	135-98-8	98	98	-	-		90	31	-		
SW8468260B	Styrene	100-42-5	90	96	-	-		88	29	-		
SW8468260B	Tetrachloroethylene	127-18-4	89	105	-	-		89	**11**	-		27-164
SW8468260B	Toluene	108-88-3	94	99	-	-		89	**-6**	-		32-145
SW8468260B	trans-1,2-Dichloroethene	156-60-5	77	84	-	-		84	70	-		
SW8468260B	trans-1,3-Dichloropropene	10061-02-6	112	110	-	-		109	**26**	-		34-148
SW8468260B	TRANS-1,4-DICHLOROBUTENE	110-57-6	134	114	-	-		126	**603**	-		15-164
SW8468260B	Trichloroethene	79-01-6	100	110	-	-		97	**31**	-		34-149
SW8468260B	TRICHLOROPROPANE, 1,2,3-	96-18-4	106	105	-	-		108	**193**	-		38-143
SW8468260B	TRIMETHYLBENZENE, 1,3,5-	108-67-8	96	94	-	-		88	**367**	-		15-157
SW8468260B	VINYL ACETATE	108-05-4	**135***	**134**	-	-		141	**145**	-		20-144
SW8468260B	Vinyl Bromide	593-60-2	91	93	-	-		88	-	-		
SW8468260B	Vinyl Chloride	75-01-4	81	82	-	-		86	114	-		
SW8468260B	XYLENES (TOTAL)	1330-20-7	91	94	-	-		88	**-34**	-		24-150

[1] BS: Blank Spike

[2] MS: Matrix Spike (bolded values exceed target range)

[3] Critical Range: target quality range (provided for exceeded parameters only)

[4] CAS: Chemical Abstracts Service

*LCS range for cis-1,2-Dichloroethylene 73-121%; Vinyl Acetate 58-131 %

5.0 Conclusions

The sediment to be dredged from the portion of the Susquehanna River located adjacent to the SSES (Figure 1-1) is generally ½ coarse grained and ½ fine grained and as such, is expected to contain very low concentrations of any potential contaminant of concern. Furthermore, direct chemical analysis of the material has verified the absence of contaminants, with few possible exceptions. As discussed in Section 3, cobalt was detected in selected samples above the Standard, although cobalt's 95% UCL is less than background/global mean sediment concentrations reported elsewhere (Buchman, 1999; Bowen, 1979). Formaldehyde was also detected in the project samples, but formaldehyde measured in all samples, regardless of texture or location and less than the gravel-rich reference sample by 95% UCL statistical testing, is incongruent with normal environmental trends and raises questions regarding the validity of the formaldehyde dataset.

Overall, the data presented in this report provides a large body of evidence indicating that the sediment proposed to be dredged from the Bell Bend project site is of high quality and will support agency decision-making regarding the suitability of the material for use as clean fill.

6.0 References

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Buchman, M.F. 1999. NOAA Screening Quick Reference Tables, NOAA HAZMAT Report 99-1, Seattle, WA, Coastal Protection and Restoration Division, National Oceanic and Atmospheric Administration, 12 pages.

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Attachment 1

Project Regulatory Conference Call Minutes

AECOM
30 Knightsbridge Road, Suite 520
Piscataway, NJ 08854
[Phone] 732-564-3600
[Fax] 732-389-0116

Meeting Minutes

Client:	UniStar Nuclear Development Company LLC
Project Name:	Bell Bend Dredge Support
AECOM Project Number:	60160208
Date:	18 August 2010
Location:	Multiple Locations by Conference Call
Meeting Purpose:	SAP Pre-Preparation Regulatory Meeting
Prepared By:	Capt. Alek Modjeski

In Attendance

Name	Company	Telephone	E-mail Address
Bradley Wise	PPL	610-774-6508	bawise@pplweb.com
David Klinch	UNE	410-336-6745	David.Klinch @constellation.com
Dion Lewis	AECOM	978-589-3036	Dion.lewis@aecom.com
Al Modjeski	AECOM	732-564-3626	Aleksandr.modjeski@aecom.com
Paul Jarecki	PaDep	570- 826-2474 pjar	ecki@state.pa.us
Jamie Davis	USEPA	215-814-5569	davis.jamie@epa.gov
Paula Ballaron*	SRBC	717-238-0423	pballaron@srbc.net

**Accepted meeting Invite but was unable to make call at last minute due to other obligations*

Action Item Number	Action Item	Responsibility
0001 Introductio	ns	Bradley Wise
0002	Project Purpose and Background	David Klinch
0003	Sediment Characterization/Data Collection Needs	Al Modjeski/Dion Lewis
0004	Initial Sampling Design/SAP Approval Process	Dion Lewis/Al Modjeski
0005	Dredge Material Management and Placement Alternatives	David Klinch
0006	Path Forward/Tentative Schedule	David Klinch

Summary

The conference call began slightly after 1500. Brad Wise of PPL introduced the participants and then Dave Klinch gave description of the project. He explained that the location of the proposed in-water work (installation of a Cooling Water Intake Structure (CWIS) and blow down diffuser) was slightly south of the current steam generating plant's CWIS along the western bank of the Susquehanna River and that though dredging could be somewhat significant within the proposed CWIS footprint, a good portion of the structure would be within the river bank. The structure would not impede navigation but would need to be positioned below the water line and within portions of the substrate. Depth of bedrock below the river's substrate was not known. A moment was allowed for questions from the regulatory agencies. No questions were asked.

After a brief pause, Alek Modjeski then described the proposed approach for Sediment Characterization/Data Collection as per the proposal technical approach previously provided to the participants via e-mail. The meeting agenda with figures and attached technical approach was resubmitted to Ms. Davis and Mr. Jarecki at that time to give visuals needed to better understand the approach and collection protocol. The area of sample collection (dredge envelope vs. background) and proposed methods of sample collection were described. Samples would be collected by vibracore in the CWIS dredge footprint and by grab sample in the slowdown diffuser footprint. Four samples within the CWIS and four samples within the diffuser footprint would be collected. There were no objections on sample approach or proposed depth of cores from PaDEP or EPA.

Dion Lewis began the discussion on the proposed analytical approach. He indicated that final sediment placement may include either beneficial re-use or as fill on PPL properties and so the proposed analytical approach will combine the parameter tables associated with both the PA clean fill and BU regulations. In cases where parameters are duplicated, the lower of the two reporting limits would be targeted.

Since VOCs diffuse and rapidly dissipate in water/air, he suggested that VOC samples would not be collected given their volatile nature relative to the subaqueous sediment environment. In addition, it was understood that this area was clean. At that time, Mr. Lewis inquired if there were any analytes other than those listed by DEP that would need to be analyzed that were specific to the Susquehanna River. It was determined that analyte selection would be deferred to DEP and that EPA would concur with their decisions.

Mr. Jarecki indicated that a due diligence of the area was very important in identifying parameters. He stated that the Clean Fill List of Analytes had a list of parameters extensive to SVOCs and VOCs. Typically, not all parameters are analyzed on the list, but a due diligence would need to be completed to reduce analytes and parameters to be tested. By completing a due diligence, a workable plan and reduced list of parameters could be justified. It was understood that the US Army Corps generally considers shorter priority pollutant lists for dredging projects. Mr. Jarecki clarified that due diligence would be an acceptable means to reduce the list as that is the policy and that is how they determine clean fill. He did mention that some compounds on the list do not have methods available that can actually reach the thresholds presented and the analysis of other compounds may only be performed by research facilities. .

Mr. Lewis then continued with discussion on the proposed preparation of samples for analysis. Four to five cores collected to project depth in the small area of interest would be collected and if stratigraphy (from a grain size perspective) was uniform, then the cores would be pooled together to form a single composite representing the material to be dredged. If clear stratigraphy is encountered then the cores would l be sectioned accordingly (e.g., tops of the four cores would be composited and the four bottoms would be composited to characterize the area under a 2-layer system). AECOM also proposed that four grab samples be taken along the diffuser pathway and composited together to represent the surficial sediment along the diffuser pathway/construction area. Mr. Modjeski noted that the proposed volume of dredge material was between 17,000 and 25,000 cubic yards. Mr. Jarecki added that if we were to follow the policy of Clean Fill, 12 discrete samples per 3,000 cubic yards would need to be accomplished to make 3 composite samples. That equates to 1 composite per every 1,000 cubic yards. He added that a review of the exact requirements could be accomplished but overall, approximate 25 composite samples would be required. Discussion on how to segment the proposed cores to meet the requirements of Clean Fill was discussed and it was determined that core segmentation may produce the necessary number of samples.

Next, Mr. Lewis discussed the approach to the SAP and asked if there was any specific SAP format that PaDEP preferred or if the EPA 2000 format was satisfactory. That format was deemed acceptable unless there was another format that could be located when other regulators involved were back from vacation. Laboratory selection – Accutest Proposed (PA Certification #68-408) was considered satisfactory by PaDEP and EPA. Project QA/QC requirements were discussed and it was given for every 10 samples, 1 set of QA/QC samples would be needed to include a field duplicate, an equipment blank, and MSDs. Mr. Jarecki stated that concentrations would need to be reported in dry weight. There were no further questions or clarifications.

Mr. Klinch then discussed placement options of the dredge material. He described dredge type, ensured that all dredging activities would be performed within a temporary coffer dam, and placement of material would be on upland PPL property. He also discussed the dredge material storage and dewatering plan. There were no questions. Mr. Klinch also suggested that perhaps a reference sample would be useful to the program. Mr. Lewis acknowledged that reference sediments are commonly included in dredged material evaluation projects but comparisons to the state guidance table thresholds might cover decision-making without an added reference site.

Mr. Klinch asked how long the review period would be for the SAP. Ms Davis and Mr. Jarecki were unsure but would try and find out the average time of review. It was determined that no regulations say SAP approval is necessary, but it is always good to have PaDEP approve prior to sampling. Mr. Jarecki stated that it is good to have a "sanity check" before starting work. Draft final SAP for review would be ready for regulatory review by mid-September.

Brad Wise provided a summary wrap-up of the conference call and confirmed that 1 composite sample per 1,000 cubic yards of material was needed and that a due diligence would need to be performed to reduce the analyte and parameter list and disregard VOCs. The EPA SAP format was satisfactory. Mr. Lewis asked if SAP schedule would change based on the potential need for a due diligence. Schedule would not be changed.

Conference call ended at approximately 4PM.

Appendix A

Sampling and Analysis Plan

AECOM Environment

Prepared for:
UniStar Nuclear Energy
Baltimore, MD

Prepared by:
AECOM
Piscataway, NJ
60160208
November 2010
Revision 1

Sampling and Analysis Plan for Dredge Management Support at the Bell Bend Nuclear Power Plant

Final

AECOM Environment

Prepared for:
UniStar Nuclear Energy
Baltimore, MD

Prepared by:
AECOM
Piscataway, NJ
60160208
November 2010
Revision 1

Sampling and Analysis Plan for Dredge Management Support at the Bell Bend Nuclear Power Plant

Final

Alek

Prepared By: Alek Modjeski, Project Manager

Alan J Finio

Reviewed By: Alan Finio, Program Manager

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Appendix A Vibracore Standard Operating Procedures

Appendix B Grab Sampling Standard Operating Procedures

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List of Acronyms

ac – acres

ASI – Aqua Surveys, Inc.

BBNPP – Bell Bend Nuclear Power Plant

BWR – Boiling Water Reactor

CWIS – Cooling Water Intake Structure

DGPS – Differential Global Positioning System

DQI – Data Quality Indicator

DQO – Data Quality Objective

EDD – Electronic Data Deliverable

FTL – Field Task Leader

HASP – Health and Safety Plan

km – kilometers

LCS – Laboratory Control Samples

MDL – Method Detection Limit

MS – Matrix Spike

MSD – Matrix Spike Duplicate

MSL – Mean Sea Level

NSSS – Nuclear Steam Supply System

PA – Pennsylvania

PADEP – Pennsylvania Department of Environmental Protection

PID – Photo-ionization Detector

PM – Project Manager

PPE – Personal Protective Equipment

PPL – PPL Nuclear Development, LLC

PPL BB – PPL Belle Bend, LLC

QA – Quality Assurance

QA/QC – Quality Control/Quality Assurance

QC – Quality Control

RFI – Request for Information

RL – Reporting Limit

RPD – Relative Percent Difference

SAP – Sampling and Analysis Plan

SOP – Standard Operating Procedure

SRBC – Susquehanna River Basin Commission

SSES – Susquehanna Steam Electric Station

TSA – Technical Surveillance Audit

UNE – UniStar Nuclear Energy

USEPA – United States Environmental Protection Agency

VHF – Very High Frequency

VOC – Volatile Organic Compound

1.0 Introduction

PPL Bell Bend, LLC (PPL BB) is proposing to construct and operate a new nuclear power generation facility adjacent to and west of the existing PPL Corporation's Susquehanna Steam Electric Station (SSES) located in Luzerne County, Salem Township, Pennsylvania. In order to accommodate the new cooling water intake structure (CWIS) and blowdown discharge diffuser for the proposed power station (Bell Bend Nuclear Power Plant [BBNPP]), dredging of approximately 17,000 to 25,000 cubic yards of material within the Susquehanna River adjacent to the property is anticipated.

In lieu of a due diligence study, AECOM has been contracted by UniStar (on behalf of PPL) to prepare a sampling plan and perform a sediment study based on guidance provided in the Pennsylvania Clean Fill Policy (Clean Fill) in order to characterize the sediment within the CWIS dredge footprint and along the proposed pipeline pathway of the blowdown discharge diffuser. This document represents the sampling and analysis plan (SAP) that will detail our approach. The approach provided is also consistent with PA DEP beneficial reuse guidance and Section 401 of the Federal Water Pollution Control Act and will support Clean Water Act decision-making in the event that the material is to be reused beneficially along the river. A more detailed description of the sampling methodology is provided in Section 6 of this document.

1.1 Site Name

The proposed sampling will be performed at the proposed Bell Bend Nuclear Power Plant (BBNPP).

1.2 Sampling Area Location

The sampling area is located along the western bank of the north branch of the Susquehanna River approximately 0.75 miles (1.22 kilometers) south southwest of the existing Susquehanna Steam Electric Station (SSES) in Salem Township, Luzerne County, Pennsylvania.

1.3 Program Responsibility

UniStar Nuclear Energy (UNE), on behalf of PPL Nuclear Development, LLC (PPL), has contracted AECOM Inc. to perform the sediment collection within the Susquehanna River at the Bell Bend Nuclear Power Plant (BBNPP) site. Additional field and collection support will be provided by Ecology III and Aqua Surveys Inc (ASI). Laboratory Analysis will be provided by Accutest Laboratories, GeoTesting Express, Cape Fear Analytical, and Meta Environmental.

1.4 Project Organization

Table 1-1 lists the staff involved in the planning and implementation of this project. As given in Section 1.3, the AECOM Team (AECOM, Aqua Surveys Inc., and Ecology III) will assist with field collection. Accutest Laboratories will provide sediment analysis. Each of the aforementioned contractors will be managed by AECOM. AECOM support staff are subject to change based on availability. Laboratory contacts are provided in Table 5-1.

Table 1-1 Project Organization

Title/Responsibility	Name	Phone Number
PPL Environmental Manager	Bradley Wise	610-774-6508
UNE Environmental Manager	David Klinch	410-336-6745
Contractor : AECOM		
AECOM Project and Field QA/QC Manager	Alek Modjeski	732-564-3626
AECOM Project Chemist	Dion Lewis	978-589-3036
AECOM Team Support Staff		
Field (AECOM)	Michael Hauser	732-564-3614
Field (AECOM)	Jeff Misuik	732-564-3625
Field (AECOM)	Jonathan Walker	732-564-3643
Field (AECOM)	Jennifer DeBoer	215-244-7162
Field (AECOM)	Rei-Hua Wang	732-564-3213
Field (AECOM)	Ellen Fyock	732-564-3654
GIS (AECOM)	Hans Meyer	978-589-3055
ASI Project Manager	Tom Dolce	908-788-8700
Ecology III Project Manager	Theodore Jacobsen	570-542-2191

1.5 Statement of the Specific Problem

PPL would like to understand if the sediment at BBNPP CWIS and diffuser areas can be classified as clean fill or suitable for beneficial use. In lieu of due diligence, physical and chemical characteristics need to be understood for project planning and permitting.

2.0 Background

The study area is located along the Susquehanna River adjacent to Susquehanna Steam Electric Station (SSES) in Salem Township, Luzerne County, Pennsylvania within the proposed CWIS and pipeline pathway for the proposed blowdown discharge diffuser (Figures 2-1 and 2-2). The sample area consists of two areas, 1) the proposed CWIS location and 2) the pipeline pathway at the proposed location for the blowdown discharge diffuser. To better understand the possible contaminants or influences to sediment quality at the site; it is important to know current and past land use as described below.

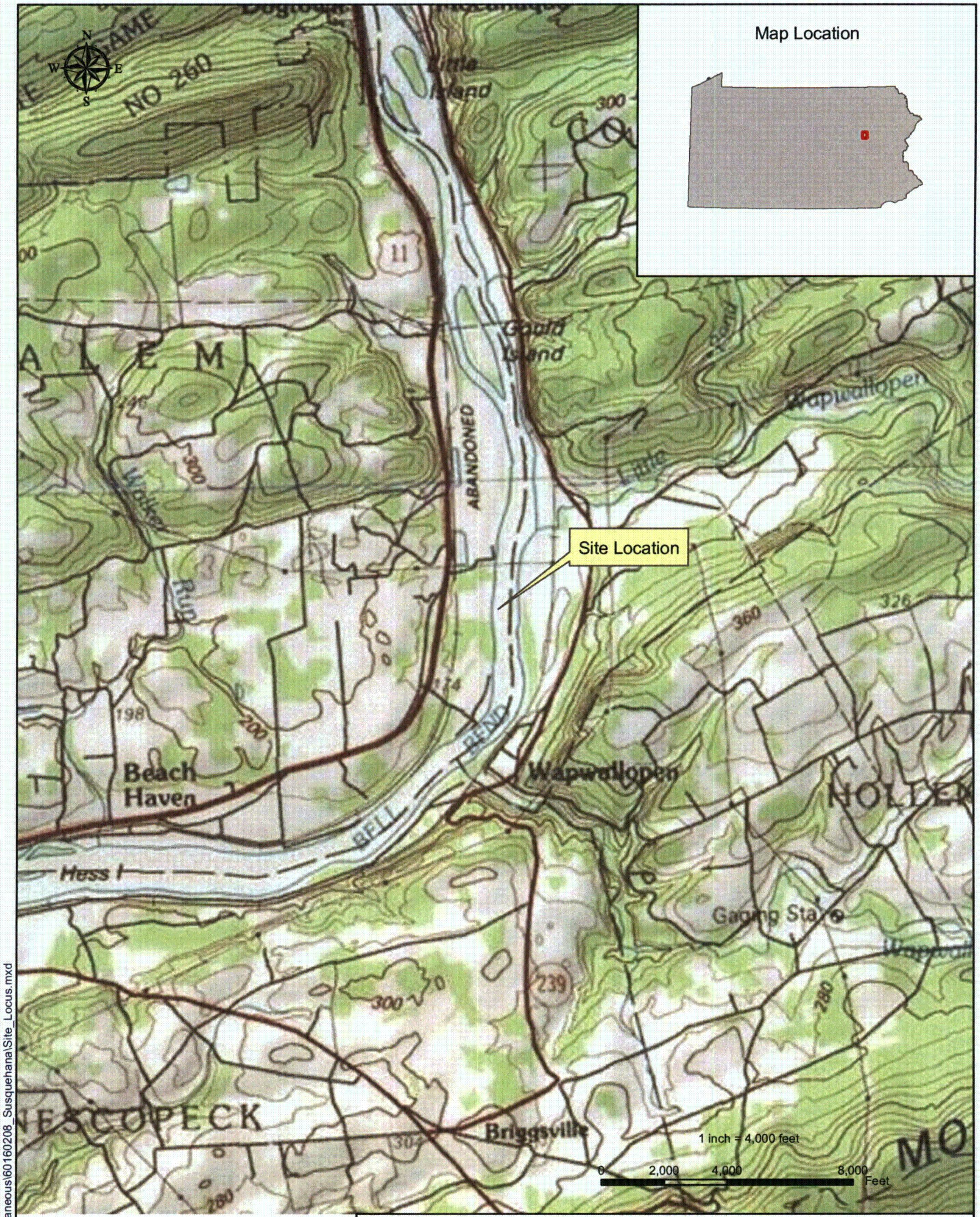
The surrounding land use is predominantly agricultural and consists of open deciduous woodlands interspersed with grasslands, previously cultivated fields, and orchards. The largest community within 10 miles (16 km) of the site is the borough of Berwick, Pennsylvania, approximately 5 mi (8 km) to the southwest. The nearest metropolitan areas are Wilkes-Barre, Pennsylvania, approximately 20 miles (32 km) to the northeast; Allentown, Pennsylvania, approximately 50 mi (80 km) to the southeast; and Harrisburg, Pennsylvania, approximately 70 miles (113 km) southwest of the BBNPP site (PPL, 2006).

The SSES site, operated by PPL Susquehanna LLC, encompasses approximately 2,355 acres and is located adjacent to the study area. Since its first operation in 1983, the SSES has employed a boiling water reactor (BWR) nuclear steam supply system (NSSS) for each of its two units. The Unit 1 reactor is currently licensed for a power output of 3489 megawatts-thermal (MWt), and the Unit 2 reactor is currently licensed for a power output of 3489 MWt. The approximate gross electrical outputs of Unit 1 and Unit 2 are currently 1190 megawatts-electric (MWe) and 1190 MWe, respectively (PPL, 2006). Existing plant structures occupy a developed area of approximately 487 acres (ac) (197 ha), with most of the plant-related structures located west of U.S. Route 11 (PPL, 2006). Additional property is located to the east of SSES on both sides of the Susquehanna River and includes the Riverlands Recreation Area located on 401 ac (162 ha) of land between U.S. Route 11 and the Susquehanna River (PPL, 2006). The existing SSES Intake and Discharge Structures are located on the west bank of the Susquehanna River (Figure 2-3). An Independent Spent Fuel Storage Installation is situated west of the SSES natural draft cooling towers.

2.1 Site Description

The sampling area includes the proposed CWIS dredge footprint and the proposed blowdown discharge diffuser footprint (Figures 2-1 and 2-2) located along the western side of the Susquehanna River adjacent to the SSES. The CWIS sampling area is approximately 0.86 ac (0.003 km^2) and will consist of 23 sample stations. The blowdown discharge diffuser study area is approximately 0.46 ac (0.0019 km^2) and will consist of four (4) grab stations and one (1) core station.

It is anticipated that each coring location will generate approximately one (1) sample composite for a total of 24 composites. The four (4) grab samples collected within the blowdown discharge diffuser footprint will be pooled together to form a 25th composite. In addition, a reference sample will be collected slightly upriver of the CWIS study area (Figure 2-2). Coordinates for each proposed sample site are given in Table 2-1. The sampling area is bordered by the river's open waters to the north and south; the SSES property which consists of an existing CWIS, open fields, and wooded, vegetated shoreline to the west; and large open farm fields and a vegetated riparian shoreline to the east.

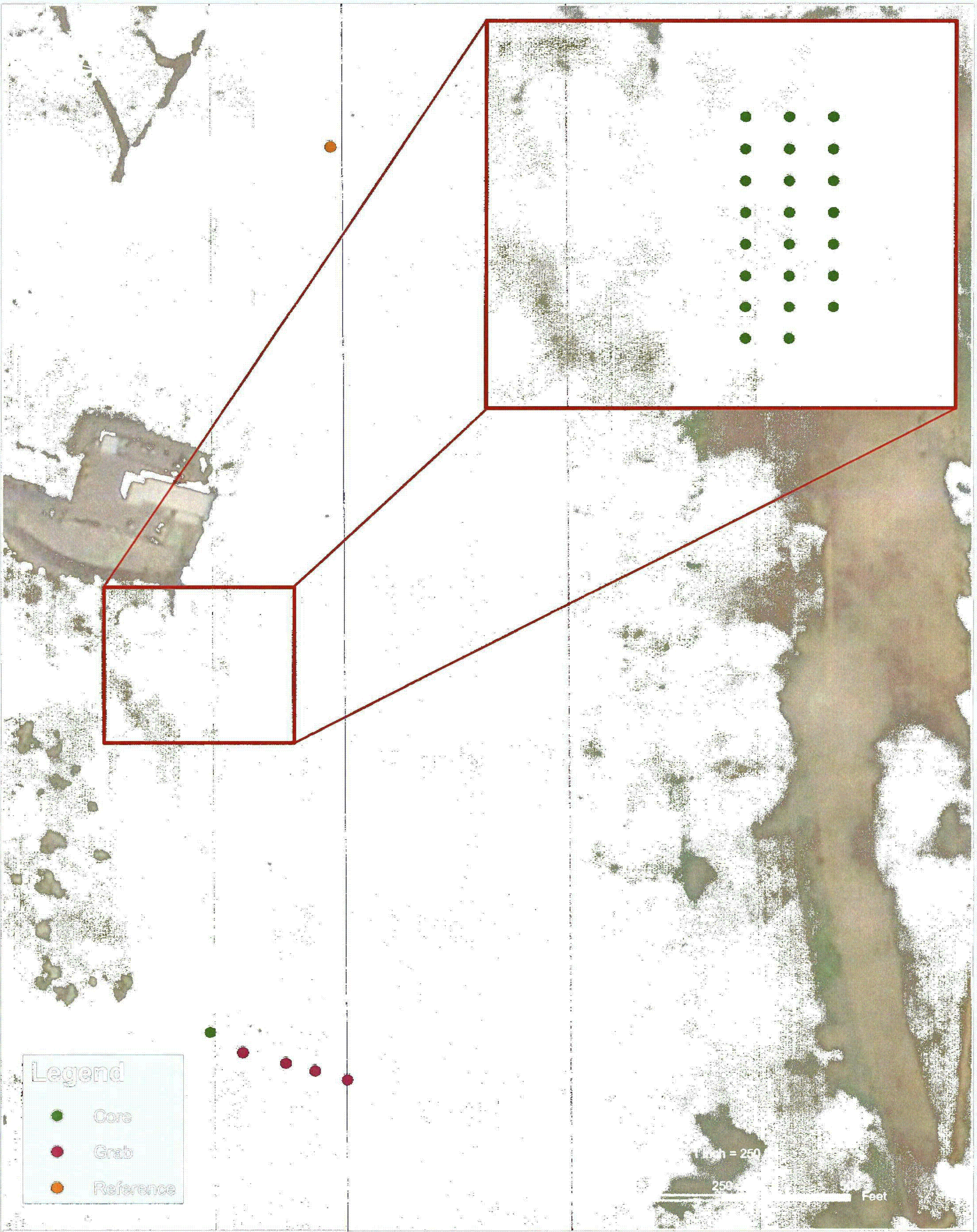


AECOM

PROPOSED BBNP DREDGED MATERIAL SITE LOCATION MAP

DATE: 09/2010	DRWN: H.K.M.		FIGURE 2-1

Y:\Projects\Miscellaneous\60160208_Susquehana\Site_Locus.mxd



Y:\Projects\Miscellaneous\60160208_Susquehanna\Site_Layout.mxd

AECOM

PROPOSED BBNP DREDGED MATERIAL SAMPLING POINTS

DATE: 08/2010 DRWN: H.K.M.

FIGURE 2-2

AECOM

AERIAL VIEW OF EXISTING SSES STRUCTURES AND ADJACENT LAND USE

DATE: 08/2010 DRWN: H.K.M. FIGURE 2-3

Y:\Projects\Miscellaneous\60160208_Susquehana\Aerial_View_of_Existing_SSES_Structures_and_Adjacent_Land_Use.mxd

Table 2-1 **Coordinates for Proposed Sample Stations at the BBNPP Site**

Composite ID	Station	Type	Longitude	Latitude
1	CW-1	Core	-76.1313	41.0874
2	CW-2	Core	-76.1312	41.0874
3	CW-3	Core	-76.1311	41.0874
4	CW-4	Core	-76.1313	41.0873
5	CW-5	Core	-76.1312	41.0873
6	CW-6	Core	-76.1311	41.0873
7	CW-7	Core	-76.1313	41.0873
8	CW-8	Core	-76.1312	41.0873
9	CW-9	Core	-76.1311	41.0873
10	CW-10	Core	-76.1313	41.0872
11	CW-11	Core	-76.1312	41.0872
12	CW-12	Core	-76.1311	41.0872
13	CW-13	Core	-76.1313	41.0871
14	CW-14	Core	-76.1312	41.0871
15	CW-15	Core	-76.1311	41.0871
16	CW-16	Core	-76.1313	41.0871
17	CW-17	Core	-76.1312	41.0871
18	CW-18	Core	-76.1311	41.0871
19	CW-19	Core	-76.1313	41.0870
20	CW-20	Core	-76.1312	41.0870
21	CW-21	Core	-76.1311	41.0870
22	CW-22	Core	-76.1313	41.0869
23	CW-23	Core	-76.1312	41.0869
24	D-1	Core	-76.1314	41.0852
25	D-2	Grab	-76.1311	41.0851
25	D-3	Grab	-76.1308	41.0850
25	D-4	Grab	-76.1306	41.0850
25	D-5	Grab	-76.1304	41.0849
Reference	R-1	Grab	-76.1304	41.0900

2.2 Operational History

As previously mentioned, the surrounding land use (within a 6 km radius) of the site is predominantly agricultural and consists of open deciduous woodlands interspersed with grasslands, previously cultivated fields, and orchards. The sampling area is bordered by the river's open waters to the north and south; the SSES property which consists of an existing CWIS, open fields, and wooded, vegetated shoreline to the west; and large open farm fields and a vegetated riparian shoreline to the east. It is unknown if runoff from adjacent agricultural areas had an effect on the area located adjacent to or within the study site. The largest community within 10 miles (16 km) of the site is the borough of Berwick, Pennsylvania, approximately 5 mi (8 km) to the southwest. The nearest metropolitan areas are Wilkes-Barre, Pennsylvania, approximately 20 miles (32 km) to the northeast; Allentown, Pennsylvania, approximately 50 mi (80 km) to the southeast; and Harrisburg, Pennsylvania, approximately 70 miles (113 km) southwest of the BBNPP site (PPL, 2006). Water quality in the vicinity of Wiles-Barre has been affected by acid mine drainage and is on the 303(d) list. The portion of the Susquehanna River at the BBNPP site is not currently on the 303(d) list. It is unknown if any of the upriver industrial areas have had an effect on the area of the river adjacent to the study site.

The SSES site, located approximately 0.75 miles (1.22 kilometers) north northeast of the proposed study site is approximately 1,700 acres and includes the SSES facility and the 401 acre riparian strip Riverlands Recreation Area. The plant began operation in 1983 and uses a boiling water reactor (BWR) nuclear steam supply system (NSSS) for each of its two units. A cooling water intake structure and discharge pipe are adjacent to the property. Existing plant structures occupy a developed area of approximately 487 acres (ac) (197 ha), with most of the plant-related structures located west of U.S. Route 11. It is unknown if these structures or the plant have had any effect to the surrounding area.

The Riverlands Recreation Area includes natural and recreational areas:

- Riverlands Nature Center - The Nature Center is located in the Susquehanna Energy Information Center at the entrance to the Recreation Area.
- Riverlands Recreation Area - This recreation area on the west side of the river is a popular spot for picnicking, group outings, hiking, sports, and playing.
- Lake Took-A-While - A 30 ac (12 ha) fishing lake and a restored section of the North Branch Canal provide fishing opportunities and are open to the public. Boating is Allowed, but no gasoline engines are permitted.
- Wetlands Nature Area - This 94 ac (38 ha) tract of riverine forest, marsh, swamp, and vernal pools has been set aside as an area for nature study and education. A portion of the long-abandoned North Branch Canal runs north-south across the property (PPL, 2006).

2.3 Previous Investigations and Regulatory Involvement

A request for information (RFI) was submitted to UNE on July 27, 2010 to identify any studies that would assist in the desktop characterization of the sediment within the proposed CWIS and blowdown discharge diffuser footprint adjacent to the existing SSES. Based on our research, there has not been any new sediment data from PPL's existing Susquehanna Steam Electric Station (SSES) or in the vicinity of the site within the past 10 years that would provide insights to the existing sediment condition at Bell Bend along the Susquehanna River. Additional discussion with PADEP, USEPA, and the SRBC did not reveal any studies that would assist with the characterization of river sediment adjacent to or in the vicinity of the proposed study area. In lieu of performing a due diligence and to better characterize the sediment within the proposed CWIS and blowdown discharge diffuser footprints, it was determined that a sediment sampling program based on Pennsylvania Clean Fill Policy guidelines would be performed.

2.4 Geological Information

The sample area is located within the Susquehanna River where the river elbows around the proposed BBNPP site (to the west) in a south to west direction and is approximately 7,000 ft (1.33 miles or 2.14 km) from the proposed BBNPP site (at the closest point) and 0.75 miles (1.22 kilometers) south southwest of the existing Susquehanna Steam Electric Station (SSES). The area lies within the Susquehanna Lowland Section of the Ridge and Valley Physiographic Province (Inners, 1978; Fenneman, 2002) and is bordered by the Anthracite Valley Section to the north, and the Anthracite Upland Section to the south.

The overall area is canvassed by glacio fluvial deposits, and was subjected to both glacial and periglacial events during the Quaternary period. In addition to glacial till, the site area has also been impacted by stratified drift. Stratified drift, as defined by Sevon (2000) is sand and gravel in eskers, kame terraces, and outwash. Stratified drift has been impacting the site area since the Late Illinoian (Sevon, 2000), during glacial melts/retreats, and continues to deposit along the banks of the Susquehanna River from upstream (Inners, 1978). Underneath this glacio fluvial overburden lies middle Devonian bedrock. Erosion and down-cutting from the Susquehanna River, and its tributary streams, have dissected the overburden, leaving many isolated outcrops onshore. The topography within 5 mi (8 km) of the site consists of low to moderately high, linear ridges and valleys that primarily follow structural trends of the local geologic formations. Local elevations range from about 260 ft (79 m) to nearly 2,368 ft (722 m) MSL with average elevation at the BBNPP site being approximately 660 ft (201 m). The highest land feature within a 5 mi (8 km) radius of the site is Nescopeck Mountain, to the southeast of the site, which reaches an elevation of approximately 2,342 ft (714 m) (DeLorme, 2006). The floodplain adjacent to the sampling site, on average, is about 0.75 mi (1.2 km) wide, with an average surface elevation of about 513 ft (156 m) MSL. The nominal Susquehanna River level is 500 ft (152 m) MSL.

The area between the BBNPP site and the Susquehanna River is only slightly dissected by tributaries due to the relatively thin layer of overburden. These tributaries include primarily an unnamed tributary south of the site and Walker Run, which traverses and drains the site, and has a gradient drop of almost 290 ft (88 m) within a distance of approximately 4 mi (6 km). The most recent geologic influence on the site is the Wisconinan glaciation that deposited glacial materials (including kame terrace, moraines and outwash) on the bedrock surface in a layer approximately 40 feet thick.

2.5 Environmental and/or Human Impact

Since it is assumed that the material to be removed is "clean", the removal of 17,000 to 25,000 cubic yards of sediment at Bell Bend will have minimal temporary impacts to the environmental and no human impact. The construction of a coffer dam prior to proposed work will alleviate impacts to river communities associated with elevated turbidity from dredging and construction. All dredging and water-related work will be performed within the temporary cofferdam. Loss of benthic habitat will occur within the footprint of the CWIS and discharge pipe.

3.0 Project Data Quality Objectives

3.1 Project Task and Problem Definition

The project task is to characterize the sediment quality at the BBNPP site where the proposed CWIS and blowdown discharge diffuser will be constructed/installed.

Problem: The project team would like to understand if the sediment at BBNPP CWIS and diffuser areas can be classified as clean fill or suitable for beneficial use by Pennsylvania (PA) standards. In lieu of a due diligence study, physical and chemical characteristics need to be understood for project planning and final placement alternative permitting.

3.2 Data Quality Objectives (DQOs)

Project data quality objectives including decision statements, data needs, and study boundaries are detailed in the DQO attachment (Attachment 1):

3.3 Data Quality Indicators (DQIs)

DQIs, as minimum detection limit goals, are summarized in Section 5. Table 3-1 presents the DQIs for precision and accuracy. Section 10 summarizes the field QC sample frequency specified for the project.

Precision

Precision is a measure of the degree to which two or more measurements are in agreement. Field precision will be measured through the calculation of relative percent difference (RPD) between field duplicates with an objective of 50% RPD. Laboratory precision will be assessed through the calculation of RPD for laboratory duplicate samples, either as matrix spike/matrix spike duplicates (MS/MSDs) or as laboratory duplicates. Laboratory precision control limits are provided in Table 3-1.

Accuracy

Accuracy is the degree of agreement between the observed value and an accepted reference or true value. Field accuracy will be assessed through the use of equipment rinseate blanks and through the adherence to all sample handling, preservation, and holding time requirements. Laboratory accuracy will be assessed through the analysis of MS/MSDs, laboratory control samples (LCSs), and surrogate compounds, and the subsequent determination of percent recoveries (%Rs). Accuracy control limits are provided in Table 3-1.

Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. "Normal conditions" are defined as the conditions expected if the sampling plan was implemented as planned.

Field completeness is a measure of the amount of valid samples obtained during all sampling for the project. The field completeness objective is greater than 95%.

Laboratory completeness is a measure of the amount of valid measurements obtained from all the measurements taken in the project. The laboratory completeness objective is greater than 95%.

Section 10 provides equations for calculating RPD and completeness

3.4 Data Review and Validation

All data generated through field activities or through the analytical program will be reviewed prior to reporting. No data will be disseminated by AECOM until it has been subjected to the procedures summarized below.

3.4.1 Field Data

Field data will be reviewed daily by the Field Survey Task Leader to ensure that the records are complete, accurate, and legible and to verify that the sampling procedures are in accordance with the protocols specified in the SAP.

3.4.2 Internal Laboratory Review

Prior to the release of any data from the laboratories, the data will be reviewed and approved by laboratory personnel. The review will consist of a tiered approach that will include reviews by the person performing the work, by a qualified peer, and by supervisory and/or QA personnel.

3.4.3 Validation of Analytical Data

If requested by the PM, validation of the laboratory deliverables will be performed by AECOM. The laboratory data will be reviewed for the following, as appropriate to the method:

- Completeness of deliverable;
- Technical holding times;
- Laboratory and field blank contamination;
- Surrogate spike recoveries;
- MS/MSD recoveries and relative percent differences (RPDs);
- Laboratory duplicate RPDs;
- LCS recoveries; and
- Field duplicate.

The evaluation will consist of a review of the data package narrative and QC result. If data are considered usable, no data qualification will occur. In the event that serious deficiencies in data quality are noted, the data may be rejected and considered unusable.

3.5 Verification and Validation Methods

3.5.1 Field Data Verification

Field records will be reviewed by the Field Survey Task Leader to ensure that:

- Logbooks and standardized forms have been filled out completely and that the information recorded accurately reflects the activities that were performed.
- Records are legible and in accordance with good recordkeeping practices, i.e., entries are signed and dated, data are not obliterated, changes are initialed, dated, and explained.
- Sample collection, handling, preservation, and storage procedures were conducted in accordance with the protocols described in the SAP and SOPs, and that any deviations were documented and approved by the appropriate personnel.

3.5.2 Laboratory Data Verification

Prior to being released as final, laboratory data will proceed through a tiered review process. Data verification starts with the analyst who performs a 100% review of the data to ensure the work was done correctly the first time. The data reduction and initial verification process must ensure that:

- Sample preparation and analysis information is correct and complete,
- Analytical results are correct and complete,
- The appropriate SOPs have been followed and are identified in the project records,
- Proper documentation procedures have been followed, and
- All non-conformances have been documented.

Following the completion of the initial verification by the analyst performing the data reduction, a systematic check of the data will be performed by an experienced peer or supervisor. This check will be performed to ensure that initial review has been completed correctly and thoroughly and will include a review of

- Adherence to the requested analytical method SOP;
- Correct interpretation of chromatograms, mass spectra, etc;
- Correctness of numerical input when computer programs are used (checked randomly);
- Correct identification and quantitation of constituents with appropriate qualifiers;
- Numerical correctness of calculations and formulas (checked randomly);
- Acceptability of QC data;
- Documentation that instruments were operating according to method specifications (calibrations, performance checks, etc.);
- Documentation of dilution factors, standard concentrations, etc.; and
- Sample holding time assessment.

A third-level review will be performed by the Laboratory Project Manager before results are submitted to clients. This review serves to verify the completeness of the data report and to ensure that project requirements are met for the analyses performed. A narrative to accompany the final report will be prepared by the Laboratory Project Manager.

3.5.3 Validation of Laboratory Deliverables

If requested by the PM, data will be reviewed as described in Section 3.4.3. Upon completion of the validation, a brief report will be prepared discussing the acceptability of the data.

3.5.4 Verification during Data Management

All manually entered data (e.g., field data) will be proofed 100% against the original. Electronic data will be checked 100% after loading against laboratory data sheets for completeness and spot checked for accuracy.

3.6 Reconciliation with User Requirements

The field and laboratory data collected during this investigation will be used to achieve the objectives identified in the DQO process (Attachment 1). The QC results associated with each analytical parameter for each matrix will be compared to the measurement objectives presented in Table 3-1.

3.7 Data Management

The data management strategy for this program comprises the following elements:

- Assignment of unique sample codes. This code is used to track the sample from collection, through the analysis, to reporting.
- Data retention. Data will be retained in an electronic database established for this project.

3.7.1 Project Files

The project files will be the central repository for all documents that constitute evidence relevant to sampling and analysis activities as described in this SAP. Project files, including all relevant records, reports, logs, field logbooks, pictures, subcontractor reports, and data reviews, will be stored in a secured, limited access area and under custody of the Task Manager.

The project files will include at a minimum:

- Field logbooks;
- Field data and data deliverables;
- Photographs;
- Drawings;
- Sample collection logs;
- Laboratory data deliverables;
- Data assessment reports;
- Progress reports, QA reports, interim project reports, final reports, etc.; and
- All custody documentation (tags, forms, air bills, bottle certifications, etc.).

Records will be retained for a minimum of 6 years.

3.7.2 Field Records

Field logbooks will provide the means of recording the data collection activities performed during the investigation. As such, entries will be described in as much detail as possible so that persons going to the site could reconstruct a particular situation without reliance on memory.

Field logbooks will be bound field survey books or notebooks. Logbooks will be assigned to field personnel, but will be stored in the project files when not in use. Each logbook will be identified by the project-specific document number.

The title page of each logbook will contain the following:

- Person to whom the logbook is assigned,
- The logbook number,
- Project name and number,
- Project start date, and
- End date.

Entries into the logbook will contain a variety of information. At the beginning of each entry, the date, start time, weather, names of all sampling team members present, and the signature of the person making the entry will be entered. The names of any visitors, and the purpose of their visit, will also be recorded in the field logbook.

Field logbooks will be supplemented by standardized forms. All measurements made and samples collected will be promptly recorded. All entries will be made in permanent ink, signed, and dated, and no erasures or obliterations will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark that is signed and dated by the sampler. Whenever a sample is collected, or a measurement is made, the coordinates will be recorded. The number of photographs taken of the sampling location, if any, will be noted. All equipment used to make measurements will be identified, along with the date of calibration.

Entries in field logbooks and on standardized forms will be reviewed for outliers and omissions prior to leaving the sampling site.

3.7.3 Laboratory Records and Deliverables

Laboratory data reduction procedures will be performed according to the following protocol. All information related to analysis will be documented in controlled laboratory logbooks, instrument printouts, or other approved forms. All entries that are not generated by an automated data system will be made neatly and legibly in permanent, waterproof ink. Information will not be erased or obliterated. Corrections will be made by drawing a single line through the error and entering the correct information adjacent to the cross-out. All changes will be initialed, dated, and, if appropriate, accompanied by a brief explanation. Unused pages or portions of pages will be crossed out to prevent future data entry. Analytical laboratory records will be reviewed by the supervisory personnel on a regular basis, and by the Laboratory QA Coordinator periodically, to verify adherence to documentation requirements.

Sediment data will be reported on a dry weight basis. The detection limits associated with all non-detected results will be corrected for sample-specific factors such as analytical dilutions, percent moisture, sample volume, etc.

All data will be reported down to the project reporting limit (RL). Non-detected results (i.e., values below the RL) will be reported as non-detect at the RL.

Data deliverables will be provided within the turnaround time specified in the contracting documents. The chemistry laboratory will provide at least one hard copy report and one EDD to the Task Manager. The EDD will be provided in EQuIS® (or other mutually agreeable format). The hard copy data package will include the information summarized below:

- Case narrative (see description below);
- Cross reference of field sample IDs and laboratory IDs;
- Method summary;
- COC documentation;
- Dates of sample extraction and analysis;
- Description of any data qualifiers used;
- Sample results, including units;
- Sample preparation information;
- Results for MS/MSDs, method or preparation/calibration blanks, LCSs, surrogate spikes, and laboratory duplicates; and
- Matrix-specific MDLs and RLs.

The case narrative will include the client name, project name and number, date of issuance, and a discussion of any deviations from analytical strategy, technical problems, and QC failures or non-conformances. The report will be signed by the Laboratory Project Manager.

Physical testing results will be provided as a hard copy report with grain size curves and as a simple spreadsheet of results (as percent passing each sieve plus hydrometer). The report will include a summary of results, method citations, and QC summary.

3.7.4 Data Reporting

At the conclusion of all testing, data will be submitted to PPL and UNE for review and inclusion in the relevant 401 Water Quality program permits, and will, with appropriate permitting documentation, include the following information:

- Field activities;
- Sediment grain size curves/data tables; and
- Chemistry results.

The data report will include a summary of the sampling design, methods used, a summary of the in-situ data collected (i.e., PID measurements), all sample logs and sketches, digital images obtained, sample COC records, and project base maps with sample locations and initial (raw) data.

The grain size/chemistry results will include all grain size information reported on ENG Form 2087 and summarized in table form with separate summaries of QC lab and field precision. The sediment chemistry results will be discussed in terms of relevant sediment quality thresholds (FP-1a, 1b and WMGR083).

3.8 Assessment Oversight

3.8.1 Assessments

The types of planned assessments pertinent to this program include technical surveillance audits (TSAs) of field and laboratory data package audits.

Field Activity TSA

A TSA of core processing activity will be conducted by the Project Manager who will be on site for vibracoring operations. The TSA will include examination of field sampling records, field measurement results, field instrument operating and calibration records, sample processing/handling, and packaging procedures, QA procedures, COC, sample documentation, etc.

Preliminary results of the audit will be reviewed with the Project Chemist to ensure that deficiencies adversely affecting data quality are immediately identified and corrective measures initiated. Upon completion of the audit, the Project Manager will prepare a written audit report, which summarizes the audit findings, identifies deficiencies and corrective actions.

Laboratory TSA

The primary and specialty dioxin laboratories (Accutest and Cape Fear Analytical) are PA Certified and will not be audited for this project.

Data Package Audits

Audits of analytical data packages will be conducted as part of the data validation process (Section 3.4.3). The review will include an evaluation of the package to ensure that (1) all required deliverables are provided, and (2) the package contains the information necessary to reproduce the reported results. Any deficiencies will be communicated to the laboratory and documented in the project files.

3.8.2 Response Actions

Corrective action is the process of identifying, recommending, approving, and implementing measures to counter unacceptable procedures or out-of-limit QC performance that can affect data quality. Corrective action can occur during field activities, laboratory analyses, data validation, and data assessment. All corrective action proposed and implemented should be documented in the QA reports to management (Section 3.9). Corrective action should only be implemented after approval by the Project Manager or the Task Manager.

Field Corrective Action

Corrective action in the field may be needed when the sample network is changed (i.e., more/less samples, sampling locations other than those specified in the SAP, etc.), or when sampling procedures and/or field analytical procedures require modification, etc. due to unexpected conditions. The field team may identify the need for corrective action. The Field Task Leader (FTL) will approve the corrective action and notify the Project Manager. The PM will approve the corrective measure. The Field Task Leader (FTL) will ensure that the corrective measure is implemented by the field team.

Corrective actions will be implemented and documented in the field logbook. Documentation will include:

- A description of the circumstances that initiated the corrective action,
- The action taken in response,
- The final resolution, and
- Any necessary approvals.

No staff member will initiate corrective action without prior communication of findings through the proper channels.

Laboratory Corrective Action

Corrective action in the laboratory may occur prior to, during, and/or after initial analyses. A number of conditions such as broken sample containers, multiple phases, and unique sample conditions may be identified during sample log-in or analysis. Following consultation with laboratory analysts and supervisory personnel, it may be necessary for the Laboratory QA Coordinator to approve the implementation of corrective action. If the nonconformance causes project objectives not to be achieved, the Analytical/Toxicity Task Leader will be notified.

These corrective actions are performed prior to release of the data from the laboratory. The corrective action will be documented in both the laboratory's corrective action files and in the narrative data report sent from the laboratory to the Analytical Task Leader. If the corrective action does not rectify the situation, the laboratory will contact the Analytical Task Leader, who will determine the action to be taken and inform the appropriate personnel.

Corrective Action During Data Validation and Data Assessment

The need for corrective action may be identified during either data validation or data assessment. Potential types of corrective action may include resampling by the field team or reinjection/reanalysis of samples by the laboratory. These actions are dependent upon the ability to mobilize the field team and whether the data to be collected is necessary to meet the required QA objectives. If the Analytical Task Leader identifies a corrective action situation, the PM will be responsible for informing the appropriate personnel.

3.9 Reports to Management

QA reports will be submitted to the PM to ensure that any problems identified during the sampling and analysis programs are investigated and the proper corrective measures taken in response. The QA reports will include:

- All results of field and laboratory audits,
- Problems noted during data validation and assessment, and
- Significant QA/QC problems, recommended corrective actions, and the outcome of corrective actions.

QA reports will be prepared by the Project QA Officer and submitted on an as-needed basis.

Table 3-1 Data Quality Objectives for Physical and Chemical Measurements[1]

QC Sample	Units	TOC	Grain size	VOCs	Pest	Herbicide	TELead	Metals	PCBs	Dioxin	SVOCs	*Corrective Action*
Sediment												
Method Blank	Conc	< RL	< RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	*1*
Surrogate Spikes	% Rec	-	-	30-150	30-150	30-150	30-150	-	30-150	30-150	30-150	*2*
Matrix Duplicate	% RPD	20	20	50	50	50	50	-	50	50	35	*3*
Matrix Spike	% Rec	-	-	-	30-120	30-120	30-120	75-125	30-120	30-120	30-120	*4*
MSD or LCSD	% RPD	-	-	50	50	50	50	20	50	50	35	*5*
LCS	% Rec	80-120	80-120	50-120	50-120	50-120	50-120	80-120	50-120	50-120	50-120	*6*
CRM	% Rec	WIL	-	WIL	WIL	WIL	-	WIL	WIL	WIL	WIL	
Aqueous/Blank												
Method Blank	Conc	-	-	<RL	<RL	<RL	-	<RL	<RL	<RL	<RL	*1*
Rinseate Blanks	Conc	-	-	<RL	<RL	<RL	-	<RL	<RL	<RL	<RL	*3*
Surrogate Spikes	% Rec	-	-	30-150	30-150	30-150	-	-	30-150	30-150	30-150	*2*
LCS	% Rec	-	-	50-120	50-120	50-120	-	80-120	50-120	50-120	50-120	*4*
LCSD	% RPD	-	-	35	50	50	-	-	50	50	35	*5*

[1] Or within laboratory specific control limits; "-" = Not applicable

Corrective Action Codes:

1 Re-extract and reanalyze the entire batch.
2 Re-extract sample or re-analyze sample
3 Flag results
4 Re-analyze, flag results
5 Investigate, re-analyze or flag results
6 Re-extract/reanalyze entire batch if all analytes outside limits; if selected analytes affected, investigate, provide narrative or re-extract the entire batch

4.0 Sampling Rationale

As indicated, there are two aspects of the project site that require characterization: 1) the CWIS and 2) the blowdown discharge diffuser. Construction of the CWIS will require dredging a thick sediment prism on the riverbank. Construction of the blowdown discharge diffuser will largely be located along the riverbed and secured with anchors that will generally penetrate the sediment about two (2) feet along the pipe/diffuser pathway. At the point where the pipe intersects with the riverbank, a thicker layer of sediment will be removed during construction.

To accommodate this construction arrangement, cores will be collected in thick sediment areas (CWIS location and where the diffuser pipe intersects with the riverbank) and surface grab samples (ca. 6-in penetration) will be collected along the river bottom beneath the pipeline/diffuser pathway.

4.1 Sediment Sampling

Twenty three (23) coring locations have been selected/distributed across the CWIS study site to characterize the sediment scheduled for dredging. One (1) additional core will be collected at the site where the water outfall/diffuser intersects with the riverbank. Cores will be collected to either project depth or to bedrock/refusal, whichever is reached first. Four (4) grab sampling locations have been selected along the cooling water outfall/diffuser area to characterize the surface sediment along the river bottom that will be removed for construction purposes. An additional grab sample will be collected upriver of the CWIS study site (Figure 2-2). Sample coordinates are given in Table 2-1.

4.1.1 Field Measurements

Field measurements will include positioning information (x,y,z) associated with the sampling locations. This will be performed using a Differential Global Positioning System (DGPS) with integrated HYPACK software combined with either an echosounder or a lead line.

VOC sample collections will require an initial PID screening to aid in the selection of the discrete sampling locations. For every 12 discrete samples, the three with the highest PID reading will be selected for laboratory analysis. All measurements will be collected according to the procedures described in the relevant SOPs associated with this project and included as Appendices.

4.1.2 Field Sampling Procedures

During the field program, sediment samples will be collected from the locations identified in Table 2-1. Sediment cores will be collected and transferred to the processing facility nearby where they will be split, classified, sub-sampled, and containerized. Sediment grab samples will be processed on deck, containerized and preserved accordingly. Sample collection and core processing procedures are described in Section 6. Standard operating procedures (SOPs) describing the protocol for vibracore and grab sampling are given in Appendix A and B respectively.

Sample mass, containers, and acceptable storage times are specified in Section 5 for the parameters of interest.

4.1.3 QC Sample Collection

Field QC samples will be collected at a frequency of 1/10 of the final composite sample quantity and include equipment blanks and field duplicates. The duplicates will be collected from one of the sediment cores by alternately filling two sets of identical sample containers from the same depth-integrated homogenate. Additional material will also be collected for laboratory precision and accuracy purposes (e.g., MS/MSDs).

Equipment rinseate blanks will be collected at the start, mid-way, and finish of coring exercises to assess the sample handling/homogenization equipment. The core liners will not be included in this assessment given that fact that only new liners will be used.

Equipment blanks will be collected following the procedures described in Attachment 2 and analyzed for the parameters listed in Section 5.

5.0 Request for Analyses

The project will be served by four (4) laboratories. Accutest Laboratories, located in Exton, PA will serve as the primary laboratory, Cape Fear Analytical, located in Wilmington NC will provide specialty 2,3,7,8-TCDD analyses, Meta Environmental located in Watertown, MA will provide specialty TEL measurements, and GeoTesting Express, located in Boxborough will provide physical (grain size) measurement services.

Laboratory contact information is provided in the following table (Table 5-1).

Table 5-1 Contractor Contact Information

Contact	Phone	Responsibility
Joseph M. Garzio Accutest Laboratories 924 Springdale Drive Exton, PA 19341	610.688.1162	All sediment and aqueous VOC, SVOC, PCB, pesticide, herbicide, and inorganic measurements except as noted below
Christopher Cornwell Cape Fear Analytical, LLC 3306 Kitty Hawk Rd, Ste 120 Wilmington, NC 28405	910.795.0421	Sediment and aqueous 2,3,7,8-TCDDioxin
David M. Mauro META Environmental, Inc. 49 Clarendon Street Watertown MA, 02472	617.923.4662, x110	Sediment TEL
Gary T. Torosian GeoTesting Express, Inc. 1145 Massachusetts Avenue Boxborough, MA 01719	978.635.0424	Grain size determinations

5.1 Analysis Parameters

Project sample quantities, analytical parameters (as general classes), methods, containerization, and storage requirements are detailed in Tables 5-2 and 5-3. Table 5-2 details the sediment requirements and Table 5-3 details the aqueous (equipment and trip blank) requirements. Individual COPCs selected for project analysis are detailed in tables 5-4 (organic) and 5-5 (inorganic).

This list represents the parameters identified in Pennsylvania's Clean Fill guidance (Tables FP-1a and FP-1b) with some needed exceptions as acknowledged by PA DEP (P. Jarecki, pers. comm.). Selected parameters have been omitted from the list in cases where EPA analytical methods for solid and hazardous wastes are not available, perform poorly, cannot be modified to accommodate their determination, are insufficiently sensitive to meet the specification of the regulation or are sufficiently uncommon to require significant research to identify an analytical method for their determination and obtain a pure reference standard to use during the research. Furthermore, several compounds disassociate in the environment into general ionic species which would not be uniquely characteristic of the listed compound. Parameters omitted from the Clean Fill guidance (Table FP-1a) are listed in Attachment 3.

Table 5-2 BBNPP Project Sample Quantity, Parameter, Method, and Storage Requirements - Sediments

Tasks/Parameter	Method Ref	Sample Container[1]	Mass Required (Kg)	Storage Condition	Storage Time (days)	Sample Qty	Ref Sta	Field QC	Lab QC	Total	Lab[2]	Notes
Sediment Physical Tests												
Grain size/Solids	D422	1-L Bag	0.5	Ambient	NA	25	1	3	3	32	GTE	1
Sediment Chemistry												
TELead	3570	250 ml G	0.1	4°C	7	25	1	3	9	38	Meta	2
VOCs	8260B	40 ml G	0.04	4°C	2	25	1	3	3	38	Accu	3
Ethylene Glycol	8260B	40 ml G	0.04	4°C	2	25	1	3	3	32	Accu	3
2,3,7,8 TCDD Dioxin	8290	300 ml G	0.2	4°C	14	25	1	3	9	38	CFA	2
TOC	9060	500 ml G	0.5	4°C	14	25	1	3	3	32	Accu	4
Acid and Base Neutrals	8270C				14	25	1	3	3	32	Accu	2
Herbicides	8151A				14	25	1	3	3	32	Accu	2
TCL Pesticides	8081A				14	25	1	3	3	32	Accu	2
Organophos Pesticides	8141				14	25	1	3	3	32	Accu	2
PCBs Aroclors	8082				14	25	1	3	3	32	Accu	2
Metals List	6010B/7000				180	25	1	3	3	32	Accu	2
Formaldehyde	8315				2	25	1	3	3	32	Accu	3
Cr6+	7196A				1	25	1	3	3	32	Accu	5
Cr3+	7196A				180	25	1	3	3	32	Accu	5
Chloride	9056				180	25	1	3	3	32	Accu	5
Cyanide	9012				30	25	1	3	3	32	Accu	5
Nitrogen inorganic	353.2				7	25	1	3	3	32	Accu	5
Sulfate	300				7	25	1	3	3	32	Accu	5
Sediment Archive	1311/1312	500 ml G	0.5	-20°C	180	25	1	3	-	29	Accu	6

[1] Container Types: P = Plastic; G = Glass; A = Amber Glass

[2] Labs: GTE = GeoTesting Express; Accu = Accutest; CFA = Cape Fear Analytical; Meta = Meta Environmental

Notes:

[1] Field QC Field Duplicate (1/10); Lab QC - Lab Duplicate (1/10)

[2] Field QC Field Duplicate (1/10); Lab QC - MS/MSD, CRM (1/20)

[3] Field QC Field Duplicate (1/10); Lab QC - LCS/LCSD, CRM

[4] Field QC Field Duplicate (1/10); Lab QC - CRM

[5] Field QC Field Duplicate (1/10); Lab QC - LCS/LCSD (1/20)

[6] Freeze archive within 5 days of collection for possible future TCLP/SPLP analysis

Table 5-3 BBNPP Project Sample Quantity, Parameter, Method, and Storage Requirements - Blanks

Sample Tasks	Method Ref	Sample Container[1]	Vol Required(L)	Storage Condition	Storage Time (days)	Field QC	Lab QC	Total	Lab[2]	Notes
Aqueous Rinseate Blanks										
TELead	3570	NA	NA	NA	NA	-	-	-	Meta	1
VOCs	8260B	0.04 L G	0.04	pH<2; 4°C	14	6	2	8	Accu	2
Ethylene Glycol	8260B	0.04 L G	0.04	pH<2; 4°C	7	6	2	8	Accu	2
2,3,7,8 TCDD Dioxin	8290	1-L G		4°C	365	3	2	5	CFA	3
TOC	9060	NA	NA	NA	NA	0	0	0	Accu	3
Acid and Base Neutrals	8270C	2x1-L A	1	4°C	7	3	2	5	Accu	3
Herbicides	8151A	1-L A	1	4°C	7	3	2	5	Accu	3
TCL Pesticides	8081A	1-L A	1	4°C	7	3	2	5	Accu	3
Organophos Pesticides	8141	2x1-L A	1	4°C	7	3	2	5	Accu	3
PCBs Aroclors	8082	1-L A	1	4°C	7	3	2	5	Accu	3
Metals List	6010B/7000	1-L P	1	pH<2	14 Hg, 180 others	3	2	5	Accu	3
Formaldehyde	8315	0.1 L G	0.05	pH<2; 4°C	7	6	2	8	Accu	2
Cr6+	7196A	NA	NA	NA	NA	-	-	-	Accu	4
Cr3+	7196A	NA	NA	NA	NA	-	-	-	Accu	4
Chloride	9056	NA	NA	NA	NA	-	-	-	Accu	5
Cyanide	9012	NA	NA	NA	NA	-	-	-	Accu	5
Nitrogen inorganic	353.2	NA	NA	NA	NA	-	-	-	Accu	5
Sulfate	300	NA	NA	NA	NA	-	-	-	Accu	5

[1] Container Types: P = Plastic; G = Glass; A = Amber Glass

[2] Labs: GTE = GeoTesting Express; Accu = Accutest; CFA = Cape Fear Analytical; Meta = Meta Environmental

Notes:

[1] Total Pb Only.

[2] Field QC EBlank (1/10), Trip blanks (1/10); Lab QC - LCS/LCSD (1/20)

[3] Field QC EBlank (1/10); Lab QC - LCS/LCSD (1/20)

[4] Total metals analysis only

[5] No blanks needed for major elements

Table 5-4 BBNPP Organic COPCs and Reporting Limits

Parameter	CAS#	RL (mg/kg)
ACENAPHTHENE	83-32-9	30
ACENAPHTHYLENE	208-96-8	8
ACETALDEHYDE	75-07-0	0.23
ACETONE	67-64-1	41
ACETONITRILE	75-05-8	1.9
ACETOPHENONE	98-86-2	200
ACETYLAMINOFLUORENE, 2- (2AAF)	53-96-3	0.069
ACROLEIN	10-702-8	0.00062
ACRYLONITRILE	107-13-1	0.0087
ALDRIN	309-00-2	0.1
AMINOBIPHENYL, 4-	92-67-1	0.0012
AMMONIA	7664-41-7	360
ANILINE	62-53-3	0.16
ANTHRACENE	120-12-7	70
ATRAZINE	1912-24-9	0.13
BENZENE	71-43-2	0.13
BENZIDINE	92-87-5	0.078
BENZO[A]ANTHRACENE	56-55-3	6
BENZO[A]PYRENE	50-32-8	1.8
BENZO[B]FLUORANTHENE	205-99-2	6
BENZO[GHI]PERYLENE	191-24-2	180
BENZO[K]FLUORANTHENE	207-08-9	60
BENZOIC ACID	65-85-0	2900
BENZYL ALCOHOL	100-51-6	400
BENZYL CHLORIDE	100-44-7	0.051
BHC, ALPHA-	319-84-6	0.046
BHC, BETA-	319-85-7	0.22
BHC, DELTA-	319-86-8	11
BHC, GAMMA (LINDANE)	58-89-9	0.072
BIPHENYL, 1,1-	92-52-4	790
BIS(2-CHLOROETHYL)ETHER	111-44-4	0.0039
BIS(2-CHLORO-ISOPROPYL)ETHER	108-60-1	8
BIS(CHLOROMETHYL)ETHER	542-88-1	0.00001
BIS[2-ETHYLHEXYL] PHTHALATE	117-81-7	130
BROMOCHLOROMETHANE	74-97-5	1.6
BROMODICHLOROMETHANE	75-27-4	3.4

Parameter	CAS#	RL (mg/kg)
BROMOMETHANE	74-83-9	0.54
BUTYL ALCOHOL, N-	71-36-3	12
BUTYLBENZENE, N-	104-51-8	950
BUTYLEBENZENE, SEC-	135-98-8	350
BUTYLEBENZENE, TERT-	98-06-6	270
BUTYLBENZYL PHTHALATE	85-68-7	100
CARBARYL	63-25-2	41
CARBAZOLE	86-74-8	21
CARBON DISULFIDE	75-15-0	160
CARBON TETRACHLORIDE	56-23-5	0.26
CHLORDANE	57-74-9	49
CHLORO-1-PROPENE, 3- (ALLYL CHLORIDE)	107-05-1	0.065
CHLOROANILINE, P-	106-47-8	19
CHLOROBENZENE	108-90-7	6.1
CHLOROBENZILATE	510-15-6	1.6
CHLORBUTANE, 1-	109-69-3	2300
CHLORODIBROMOMETHANE	124-48-1	3.2
CHLOROETHANE	75-00-3	5
CHLOROFORM	67-66-3	0.5
CHLORONAPHTHALENE, 2-	91-58-7	6200
CHLOROPHENOL, 2-	95-57-8	4.4
CHLOROPRENE	126-99-8	0.45
CHLOROTOLUENE, O-	95-49-8	20
CHLORPYRIFOS	2921-88-2	23
CHRYSENE	218-01-9	230
CRESOL(S)	1319-77-3	3.1
CRESOL, O-(METHYLPHENOL, 2-)	95-48-7	64
CRESOL, M-(METHYLPHENOL, 3-)	108-39-4	36
CRESOL, P-(METHYLPHENOL, 4-)	106-44-5	4.2
CRESOL, P-CHLORO-M-	59-50-7	37
CUMENE (ISOPROPYL BENZENE)*	98-82-8	780
CYCLOHEXANONE	108-94-1	1400
DDD, 4,4'-	72-54-8	6.8
DDE, 4,4'-	72-55-9	10
DDT, 4,4'-	50-29-3	10
DIALLATE	2303-16-4	0.15
DIAZINON	333-41-5	0.082
DIBENZO[A,H]ANTHRACENE	53-70-3	2.5

Parameter	CAS#	RL (mg/kg)
DIBENZOFURAN	132-64-9	30
DIBROMO-3-CHLOROPROPANE, 1,2-	96-12-8	0.0092
DIBROMOETHANE, 1,2- (ETHYLENE DIBROMIDE)	106-93-4	0.0012
DIBROMOMETHANE	74-95-3	3.7
DI-N-BUTYLPHTHALATE, N-	84-74-2	1500
DICHLOROBENZENE, 1,2-	95-50-1	7
DICHLOROBENZENE, 1,3-	541-73-1	61
DICHLOROBENZENE, P-	106-46-7	10
DICHLOROBENZIDINE, 3,3'-	91-94-1	8.3
DICHLOROETHANE, 1,1-	75-34-3	0.65
DICHLOROETHANE, 1,2-	107-06-2	0.1
DICHLOROETHYLENE, 1,1-	75-35-4	0.19
DICHLOROETHYLENE, CIS-1,2-*	156-59-2	1.6
DICHLOROETHYLENE, TRANS-1,2-	156-60-5	2.3
DICHLOROMETHANE (METHYLENE CHLORIDE)	75-09-2	0.076
DICHLOROPHENOL, 2,4-	120-83-2	1
DICHLOROPHENOXYACETIC ACID, 2,4- (2,4-D)	94-75-7	1.8
DICHLOROPROPANE, 1,2-	78-87-5	0.11
DICHLOROPROPENE, 1,3-	542-75-6	0.12
DICHLOROPROPIONIC ACID (DALAPON), 2,2-	75-99-0	5.3
DICHLORVOS	62-73-7	0.012
DIELDRIN	60-57-1	0.11
DIETHYL PHTHALATE	84-66-2	3
DIMETHOATE	60-51-5	0.28
DIMETHYLAMINOAZOBENZENE, P-	60-11-7	0.037
DIMETHYLPHENOL, 2,4-	105-67-9	32
DINITROBENZENE, 1,3-	99-65-0	0.049
DINITROPHENOL, 2,4-	51-28-5	0.21
DINITROTOLUENE, 2,4-	121-14-2	0.05
DINITROTOLUENE, 2, 6,- (2,6-DNT)	606-20-2	1.1
DINOSEB	88-85-7	0.29
DIOXANE, 1,4-	123-91-1	0.073
DIPHENYLAMINE	122-39-4	12
DIPHENYLHYDRAZINE, 1,2-	122-66-7	0.15
DISULFOTON	298-04-4	0.078
ENDOSULFAN	115-29-7	30
ENDOSULFAN I (ALPHA)	959-98-8	60
ENDOSULFAN II (BETA)	33213-65-9	60

Parameter	CAS#	RL (mg/kg)
ENDOSULFAN SULFATE	1031-07-8	70
ENDRIN	72-20-8	5.5
EPICHLOROHYDRIN	106-89-8	0.056
ETHOXYETHANOL, 2-(EGEE)	110-80-5	7.8
ETHYL ACETATE	141-78-6	220
ETHYL ACRYLATE	140-88-5	0.12
ETHYL BENZENE	100-41-4	46
ETHYL ETHER	60-29-7	53
ETHYLMETHACRYLATE	97-63-2	14
ETHYLENE GLYCOL	107-21-1	170
FLUORANTHENE	206-44-0	400
FLUORENE	86-73-7	40
FORMALDEHYDE	50-00-0	12
FURFURAL	98-01-1	1.4
HEPTACHLOR	76-44-8	0.68
HEPTACHLOR EPOXIDE	1024-57-3	0.5
HEXACHLOROBENZENE	118-74-1	0.96
HEXACHLOROBUTADIENE	87-68-3	1.2
HEXACHLOROCYCLOPENTADIENE	77-47-4	91
HEXACHLOROETHANE	67-72-1	0.56
HEXANE	110-54-3	500
INDENO[1,2,3-CD]PYRENE	193-39-5	6
ISOBUTYL ALCOHOL	78-83-1	76
ISOPHORONE	78-59-1	1.9
KEPONE	143-50-0	0.56
MALATHION	121-75-5	34
METHANOL	67-56-1	58
METHOXYCHLOR	72-43-5	200
METHYL ACETATE	79-20-9	690
METHYL ACRYLATE	96-33-3	27
METHYL CHLORIDE	74-87-3	0.038
METHYL ETHYL KETONE (2-BUTANONE)	78-93-3	54
METHYL ISOBUTYL KETONE	108-10-1	2.9
METHYL METHACRYLATE	80-62-6	26
METHYL METHANESULFONATE	66-27-3	0.083
METHYL PARATHION	298-00-0	0.42
METHYL STYRENE (MIXED ISOMERS)	25013-15-4	120
METHYL TERT-BUTYL ETHER (MTBE)	1634-04-4	0.28

Parameter	CAS#	RL (mg/kg)
METHYLENE BIS(2-CHLOROANILINE), 4,4'-	101-14-4	3.9
METHYLNAPHTHALENE, 2-	91-57-6	20
NAPHTHALENE*	91-20-3	8
NAPHTHYLAMINE, 1-	134-32-7	0.3
NAPHTHYLAMINE, 2-	91-59-8	0.01
NITROANILINE, M-	99-09-2	0.033
NITROANILINE, O-	88-74-4	0.038
NITROANILINE, P-	100-01-6	0.031
NITROBENZENE	98-95-3	0.79
NITROPHENOL, 2-	88-75-5	5.9
NITROPHENOL, 4-	100-02-7	0.5
NITROPROPANE, 2-	79-46-9	0.00026
NITROSODIETHYLAMINE, N-	55-18-5	0.000018
NITROSODIMETHYLAMINE, N-	62-75-9	0.000041
NITROSO-DI-N-BUTYLAMINE, N-	924-16-3	0.0033
NITROSODI-N-PROPYLAMINE, N-	621-64-7	0.0013
NITROSODIPHENYLAMINE, N-	86-30-6	20
OCTYL PHTHALATE, DI-N-	117-84-0	500
PARATHION	56-38-2	130
PCB-1016 (AROCLOR)	12674-11-2	1
PCB-1221 (AROCLOR)	11104-28-2	0.63
PCB-1232 (AROCLOR)	11141-16-5	0.5
PCB-1242 (AROCLOR)	53469-21-9	1
PCB-1248 (AROCLOR)	12672-29-6	1
PCB-1254 (AROCLOR)	11097-69-1	1
PCB-1260 (AROCLOR)	11096-82-5	1
PENTACHLOROBENZENE	608-93-5	180
PENTACHLORONITROBENZENE	82-68-8	5
PENTACHLOROPHENOL	87-86-5	5
PHENACETIN	62-44-2	12
PHENANTHRENE	85-01-8	80
PHENOL	108-95-2	66
PHORATE	298-02-2	0.41
PRONAMIDE	23950-58-5	3.1
PROPYLBENZENE, N-	103-65-1	290
PYRENE	129-00-0	300
PYRIDINE	110-86-1	0.11
QUINOLINE	91-22-5	0.018

Parameter	**CAS#**	**RL (mg/kg)**
RONNEL	299-84-3	280
STYRENE	100-42-5	24
TETRACHLOROBENZENE, 1,2,4,5-	95-94-3	5.1
TETRACHLORODIBENZO-P-DIOXIN, 2,3,7,8-(TCDD)	1746-01-6	0.00012
TETRACHLOROETHANE, 1,1,1,2-	630-20-6	18
TETRACHLOROETHANE, 1,1,2,2-	79-34-5	0.0093
TETRACHLOROETHYLENE (PCE)	127-18-4	0.43
TETRACHLOROPHENOL, 2,3,4,6-	58-90-2	450
TETRAETHYL LEAD	78-00-2	0.0046
TETRAETHYLDITHIOPYROPHOSPHATE	3689-24-5	0.73
TOLUENE	108-88-3	44
TOLUIDINE, M-	108-44-1	0.13
TOLUIDINE, O-	95-53-4	0.32
TOLUIDINE, P-	106-49-0	0.32
TOXAPHENE	8001-35-2	1.2
TRIBROMOMETHANE (BROMOFORM)	75-25-2	4.4
TRICHLOROBENZENE, 1,2,4-	120-82-1	20
TRICHLOROBENZENE, 1,3,5-	108-70-3	31
TRICHLOROETHANE, 1,1,1-	71-55-6	7.2
TRICHLOROETHANE, 1,1,2-	79-00-5	0.15
TRICHLOROETHYLENE (TCE)	79-01-6	0.17
TRICHLOROPHENOL, 2,4,5-	95-95-4	2300
TRICHLOROPHENOL, 2,4,6-	88-06-2	3.1
TRICHLOROPHENOXYACETIC ACID, 2,4,5- (2,4,5-T)	93-76-5	1.5
TRICHLOROPHENOXYPROPIONIC ACID, 2,4,5- (2,4,5-TP)(SILV	93-72-1	3
TRICHLOROPROPANE, 1,2,3-	96-18-4	1.6
TRIMEHTYLBENZENE, 1,3,4- (TRIMETHYLBENZENE, 1,2,4-)	95-63-6	9
TRIMETHYLBENZENE, 1,3,5-	108-67-8	2.8
VINYL ACETATE	108-05-4	6.5
VINYL CHLORIDE	75-01-4	0.03
XYLENES (TOTAL)	1330-20-7	990

Table 5-5 BBNPP Inorganic COPCs and Reporting Limits

PARAMETER	RL mg/kg dry
ANTIMONY	27
ARSENIC	12
BARIUM AND COMPOUNDS	5000
BERYLLIUM	2
BORON AND COMPOUNDS	6.7
CADMIUM	20
CHLORIDES	na
CHROMIUM III	190,000
CHROMIUM VI	94
COBALT	8.1
COPPER	700
CYANIDE FREE	20
LEAD	200
MANGANESE	31,000
MERCURY	10
NICKEL	650
NITRATE NITROGEN	na
NITRITE NITROGEN	na
SELENIUM	26
SILVER	5
SULFATE	na
THALLIUM	6
TIN	240
VANADIUM	1,500
ZINC	1000

6.0 Field Methods and Procedures

The following provides the methods and procedures to be used during the field collection of sediment at Bell Bend. For this particular project, a total of twenty six (26) composite samples will be collected within the BBNPP study area. AECOM will use vibracoring to obtain sediment cores at twenty four (24) locations (23 within the CWIS footprint and one (1) within the footprint of the blowdown discharge diffuser footprint) representing 24 composite samples. Surficial grab sampling will also be employed using a Ponar or similar dredge at five (5) locations (four (4) within the blowdown discharge diffuser footprint representing one (1) composite) and one (1) upriver of the CWIS footprint representing the other composite). The field team will wear nitrile gloves when handling the samples and will follow those guidelines pertaining to the preservation, storage, shipping, and packaging as given in Sections 7 and 9. Appendix A and B provide further detail to vibracore and grab sampling collection, respectively. Sample sites are given in Figure 2-2- and sample coordinates are given in Table 2-1. In addition, work will be conducted as given in the Health and Safety Plan (HASP) located in Appendix E.

6.1 Field Equipment

As previously stated, vibracoring and grab sampling will be performed to collect sediment samples at Bell Bend. Appendix A and B provide further detail to vibracore and grab sampling collection, respectively. The following lists that equipment that will be used to support those activities. In the event of equipment failure, tools and spare parts will be on hand to expedite repair in order to continue the sampling program.

6.1.1 List of Field Equipment

The following equipment list contains materials which may be needed in carrying out vibracoring or grab sampling procedures. Not all equipment listed below may be necessary for a specific activity. Additional equipment may be required, pending field conditions.

- personal protective equipment (PPE) and other safety equipment, as required by the HASP;
- navigation charts and Core Locations figure;
- sampling vessel adequate for task at hand and Susquehanna River conditions;
- marine VHF radio;
- positioning equipment;
- vibracoring device;
- Ponar grab sampler or similar device;
- stand (cradle) on which to place the grab while not in deployment;
- siphon tubing and bucket (when applicable);
- deployment equipment (e.g., A-frames, winches, generator);
- decontaminated soft core tube liners;

- decontaminated stainless steel core cutter/catcher;
- assorted nautical equipment (e.g., anchors, lines, personal flotation devices [PFDs);
- waterproof logbooks, data sheets, pens, chain of custody forms, and labels;
- permanent marker or grease pencil;
- echo sounder with a resolution of 0.1 foot;
- depth measuring plate;
- tape measure and ruler;
- submersible pump and hose;
- PID/toxic gas sensor;
- sample containers and encore type sampler for VOCs;
- miscellaneous tools (i.e. wrenches, screw driver, hammer, etc.);
- electrical or duct tape;
- camera; and
- decontamination equipment/supplies (brushes, detergent).

6.1.2 Calibration of Field Equipment

Sediment collection will be conducted from a pontoon vessel and vessel positioning will be completed using DGPS integrated with HYPACK survey software. Prior to use, the DGPS unit will be inspected for functionality and tested daily using triangulation or known geodetic points to ensure accuracy.

A PID will be used to identify the portion of the core where VOCs will be collected. In addition, a PID will also be available on the vessel during grab collection. PIDs will be calibrated daily using those calibration procedures recommended by the manufacturer.

6.2 Field Screening

A PID will be used to screen core samples in order to determine best candidate site along cores for VOC collection. Grabs will also be screened to ensure sample is not contaminated. There will be no other screening processes.

6.3 Sediment Sampling

It is estimated that approximately 17,000 to 25,000 cubic yards of sediment will be removed from the study area. As specified in the Pennsylvania Clean Fill Policy, one composite sample consisting of four (4) discrete samples will need to be collected per 1,000 cubic yards. AECOM will collect twenty five (25) composite sediment samples within the CWIS and blowdown discharge diffuser dredging areas (Figure 2-2) using coring and grab samplers. Twenty three (23) samples within the CWIS footprint and one (1) sample within the diffuser footprint will be collected using vibracoring. Four (4) additional surficial grab samples will be collected within the diffuser study and composited. In addition, a surficial grab sample will also be collected upriver of the CWIS study area at an upriver station representing an additional reference composite sample. The following provides a summary of collection.

Cores and grabs will be collected from a pontoon vessel. A smaller motorized vessel will support the primary sampling vessel by transferring collected samples to the processing station onshore. Prior to sampling, coordinates for each sample site will be uploaded to the pontoon boat's DGPS and the DGPS will be checked for accuracy. Once on-site at the designated coring/grab sampling location, the vessel will be positioned using coordinates uploaded into the DGPS, HYPACK software, and an anchor array. Once positioned, vibracoring or grab sampling will be prepared, deployed, and retrieved as detailed in the SOPs located in Appendices A and B. Cores will be collected to full project depth (assumed ten feet plus two feet over-dredge). Grab samples will collect a surficial sample representing the upper six (6) inches of the substrate. Upon retrieval, cores will prepared (measured, sealed, labeled, and preserved accordingly) for transfer to an onshore processing facility located slightly upriver; whereas grabs samples will be processed onboard.

Upon arrival at the processing area, a hardcopy of the forms initiated for each core during sampling operations will be provided to a representative of the processing team. The proper PPE will be donned and nitrile gloves will be worn. Cores will be placed horizontally on a plastic-lined sheet and core liners will be opened with a cutting tool. Once opened, a PID will be used to assist in the identification of the best candidate area along the core for a discrete VOC sample. Once identified, a VOC sample will be collected using an Encore™® or equivalent sampling device. Each core will then be divided into four (4) segments at the processing station. Length of each segment will be dependent on retrieval length. A discrete sample will be collected from each of the four (4) segments using decontaminated utensils and each sample will be placed together in a decontaminated stainless steel bowl and homogenized representing one composite sample. The appropriate data will be logged in the logbook and/or on corresponding datasheets. Sediment within the bowl will be photographed when applicable.

For grab samples, four (4) surficial grabs will be collected along the pipeline pathway to characterize any potential surficial sediment remobilization that occurs during caisson installation. Each sample will be combined to create one composite. An additional grab sample will be collected as a reference upriver of the CWIS study area. The proper PPE will be donned and nitrile gloves will be worn. Grabs will be placed on deck in a stand, top opened, and once deemed acceptable, a PID will be used to scan the sample. Each sample will be placed in a container, labeled, and iced until all four samples have been collected. Once all four samples have been collected, samples will be combined and homogenized. For both coring and grab sampling activities, gear will be decontaminated between stations as described in Section 6.4.

The analytical program will focus entirely on bulk sediment. In the event TCLP/SPLP testing is requested, unused sediment will be retained and archived in frozen storage in the event that additional samples are needed.

6.4 Decontamination Procedures

6.4.1 Equipment Decontamination

As indicated sediment cores will be collected in flexible polyethylene liners. Liners will be new and inspected for cleanliness prior to use. The following decontamination protocol will be followed for field coring and grab sampling equipment:

1. Field equipment will be rinsed initially with site river water and then washed with a laboratory grade non-phosphate detergent;
2. The equipment will then be rinsed thoroughly with site water before sampling a new site.

The following decontamination protocol will be followed for core processing equipment and related utensils between composite samples (i.e. equipment will not require decontamination between discrete samples that will be pooled to the same composite sample):

1. Processing equipment will be rinsed initially with tap water and then washed with a laboratory grade non-phosphate detergent;
2. The equipment will then be rinsed thoroughly with tap water before sub-sampling a new set of discrete samples that will be grouped to form a sample composite.

Selected EPA guidance recommends the use of isopropanol as a decontamination solvent when organic compounds are included on the COPC list (e.g., EPA 2001). For this project pesticide grade isopropanol will also be on hand in the event that the field or core processing team identifies sediment that has been oiled. In this case, there will be third and fourth steps added to the steps listed above:

3. After the soap and water wash/rinse, rinse the equipment surface with pesticide-grade isopropanol;

4. Rinse again with site or tap water (field or processing area respectively).

If isopropanol is used it will be retained in collection vessels and transferred to the laboratory (Accutest) and dispensed to the facility's appropriate waste stream.

7.0 Sample Containers, Preservative, and Storage

7.1 Sediment Samples

Sediment sample containers, storage conditions and related holding times for each of the project samples are detailed along with analytical methods in Table 5-1. Special handing will be observed for VOC samples. VOCs will be collected using Terra Core™ samplers.

7.2 Aqueous (Blank) Samples

Aqueous sample containers, storage conditions and related holding times for the related project samples are detailed in Table 5-2. .

8.0 Disposal of Residual Materials

The site is expected to meet clean fill standards and strict control of residuals is not warranted. Further, the project team does not anticipate generating any hazardous Investigative Derived Waste (IDW) but if isopropanol (alcohol) is necessary, then this decontamination fluid will be containerized and transferred to state approved waste stream at Accutest Laboratories.

9.0 Sample Documentation and Shipment

9.1 Field Notes

9.1.1 Field Logbooks

At a minimum, the following information will be recorded during the collection of each sample:

- Sample location and description
- Sampler's name(s)
- Date and time of sample collection
- Sample identification
- Designation of sample as composite or grab
- Type of sample (sediment)
- Type of sampling equipment used
- Field instrument readings and calibration (if applicable)
- Field observations and details related to analysis or integrity of samples (e.g., weather conditions, noticeable odors, colors, etc.)
- Preliminary sample descriptions
- Sample preservation
- Shipping arrangements (overnight air bill number)
- Name(s) of recipient laboratory(ies)

In addition to the sampling information, the following specific information will also be recorded in the field logbook for each day of sampling:

- Team members and their responsibilities
- Time of arrival/entry on site and time of site departure
- Other personnel on site
- Summary of any meetings or discussions with tribal, contractor, or federal agency personnel
- Deviations from sampling plans, site safety plans, and SAP procedures
- Changes in personnel and responsibilities with reasons for the changes
- Levels of safety protection
- Calibration readings for any equipment used and equipment model and serial number

9.1.2 Photographs

Photographs may be taken at the sampling locations and at other areas of interest on site or within the sampling area when applicable. They will serve to verify information entered in the field logbook. For each photograph taken, the following information will be written in the logbook or recorded in a separate field photography log:

- Time, date, location;
- Description of the subject photographed;
- Direction photograph is viewing;

- Name of person taking the photograph; and
- Photograph identification number.

9.1.3 Labeling

All samples collected will be labeled in a clear and precise way for proper identification in the field and for tracking in the laboratory. At a minimum, the sample labels will contain the following information: station location, date of collection, analytical parameter(s), and method of preservation. Every sample, including samples collected from a single location but going to separate laboratories, will be assigned a unique sample number.

Each sample will have a pre-assigned, identifiable, and unique number or a sample ID. Sample IDs will be comprised of three (3) components and components will be separated by a hyphen (-).

The first section of the sample ID will describes the Study Area:

BBNPP = Bell Bend Nuclear Power Plant

The second section of the sample ID will describes the sample site and station:

CW 1 through 23 = CWIS (stations 1-23 as given in Table 2-1)

D 1 through 5 = Blowdown Discharge Diffuser (stations 1-5 as given in Table 2-1)

RS-1 = Reference Site One

The third section of the sample ID will describes Gear Type

C = composite

G = grab

The following provides an example sample identification number and description for station 1 located in the CWIS footprint:

BBNPP- CW-1-C;

where BBNPP represents the Study Area, CW-1 represents the CWIS study site station number 1, and C represents Gear Type or “Core”.

For QA/QC samples, an additional suffix will be applied to the root sample number to define type of QA/QC sample.

FD – Field Duplicate

MS – Matrix Spike

MSD – Matrix Spike Duplicate

An example QA/QC field duplicate sample for Station 5 located within the blowdown diffuser area is BBNPP-BDD-5-G-FD where BBNPP represents the Study Area, BDD-5 represents the blowdown discharge diffuser station number 5, G represents Gear Type or "Grab", and FD designates the sample as a field duplicate.

Equipment and processing blanks will be identified by the following:

EB – Equipment Blank

PB – Processing Blank

Equipment and processing blanks will not have sample site numbers. An example of an equipment blank sample ID is BBNPP-C-EB-1 where BBNPP represents the Study Area, C represents Gear Type or Core, and EB-1 designates the sample as equipment blank number one. Processing blanks will not have Gear Type. An example is BBNPP-PB-1 where BBNPP represents the Study Area, PB-1 designates the sample as Processing Blank number one.

9.2 Sample Chain-Of-Custody Forms and Custody Seals

Custody is one of several factors that are necessary for the admissibility of environmental data and help to satisfy the two major requirements for data admissibility: relevance and authenticity. Sample custody is addressed in two parts: field sample collection and laboratory analysis. Refer to AECOM SOP 1007 for further details.

Field custody procedures

The field team is personally responsible for the care and custody of the samples until they are transferred or dispatched properly to the laboratories. Field procedures have been designed such that as few people as possible will handle the samples.

All sample containers will be identified by the use of adhesive sample labels. The sample numbering system is presented above. Sample labels will be completed for each sample using waterproof ink unless prohibited by weather conditions. For example, a logbook notation would explain that a pencil was used to fill out the sample label because the pen would not function in wet weather.

Samples will be accompanied by a properly completed COC form inside the sealed shipping container. The sample codes will be listed on the COC form. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents the transfer of custody of samples from the sampler to another person, to a mobile laboratory, to the permanent laboratory, or to/from a secure storage location.

Sample containers that are transferred by a third party must also have custody seals affixed as outlined in SOP 1007.

9.3 Packaging and Shipping

All sample shipments will be accompanied by the COC record identifying the contents. The original record and one copy will accompany the shipment, and one copy will be retained by the sampler and placed in the project files.

Samples will be properly packaged on ice at 4°C for shipment and dispatched to the laboratory for analysis according to AECOM SOP 7510. A separate signed custody record will be enclosed in and secured to the inside top of each sample box or cooler. Shipping containers will be latched and secured with strapping tape and custody seals for shipment. The custody seals will be attached to the front and back opposite corners of the cooler and covered with clear plastic tape after being signed by field personnel. The cooler will be strapped shut with strapping tape in at least two locations.

If the samples are sent by common carrier, the waybill will be used. Waybills will be retained as part of the permanent documentation. Commercial carriers are not required to sign off on the custody forms since the custody forms will be sealed inside the sample cooler and the custody seals will remain intact.

10.0 Quality Control

10.1 Field Quality Control Samples

A single QC field duplicate will be collected for this effort. The duplicate will be collected from one of the sediment cores by alternately filling two sets of identical sample containers from the same depth-integrated homogenate. QC sampling will also include equipment rinseate blanks and additional material for laboratory precision and accuracy purposes (e.g., MS/MSDs).

10.1.1 Equipment Blanks

Equipment rinseate blanks will be collected from each set of field equipment representing 1) the coring equipment, 2) the grab sampling equipment, and 3) the processing/pooling equipment.

Procedures for the collection of equipment rinseate blanks are described in Attachment 2.

10.1.2 Trip Blanks

VOC analysis requires the collection/analysis of trip blanks to ensure that investigative samples are free from contamination. Three (3) trip blanks are planned for this study representing one per day for the three-day field effort.

Procedures for the collection of VOC samples are described in Attachment 4.

10.1.3 Temperature Blanks

Sample storage conditions will be monitored using temperature blanks. One blank will be contained in each chemical shipping cooler (i.e. not physical/grain size samples which will be stored at ambient temperature).

10.2 Assessment of Sample Variability

The high level of sampling frequency (one composite per 1000 CY) will allow an assessment of field variability. Processing variability will be ascertained using field duplicates collected at a frequency of 1/10. Laboratory precision will be assessed using matrix duplicates, lab control sample/duplicates (LCS/LCSD), and matrix spike/duplicate measurements (MS/MSD).

10.3 Background Samples

One background reference station will be analyzed for this project for comparison purposes. The exact location will be identified in consultation with the agencies (PA DEP and SRBC).

10.4 Field Screening

The collection of VOCs during this investigation requires the use of a PID to determine if detectable levels of VOCs exist in any of the collected samples. If VOCs are detected using this instrument, then the results will be used to guide the sampling team in the collection of VOC samples (i.e., horizons containing the highest VOC levels will be sampled).

10.5 Laboratory Quality Control Samples

In addition to the replicate samples indicated in Section 10.2, accuracy assessments will also be evaluated using method blanks, laboratory control samples, matrix spike samples, and certified reference materials.

10.5.1 Accuracy Assessment

One measure of accuracy will be percent recovery (%Rs), which is calculated for matrix spikes, surrogates, LCSs, and CRMs/SRMs. Percent recoveries for matrix spike results will be determined according to the following equation:

$$\%R = \frac{(Amount\ in\ Spiked\ Sample - Amount\ in\ Sample)}{Known\ Amount\ Added} x100$$

Percent recoveries for LCS, CRM/SRM, and surrogate compound results will be determined according to the following equation:

$$\%R = \frac{Experimental\ Concentration}{Known\ Amount\ Added} x100$$

An additional measure of accuracy is blank contamination. The blanks associated with this project include laboratory method blanks and equipment rinseate blanks. The results of the laboratory and field blanks will be compared to the objectives in Section 3. Failure to meet these objectives may indicate a systematic laboratory or field problem that should be investigated and resolved immediately. Associated data may have limitations placed on its use, depending on the magnitude of the problem.

10.5.2 Precision Assessment

The RPD between field replicates is calculated to compare to precision objectives (Table 3-3). The RPD will be calculated according to the following formula.

$$RPD = \frac{(Amount\ in\ Sample\ 1 - Amount\ in\ Sample\ 2)}{0.5\ (Amount\ in\ Sample\ 1 + Amount\ in\ Sample\ 2)} x100$$

Failure to achieve precision objectives may result in the associated data having limitations placed upon its use.

10.5.2.1 Completeness Assessment

Completeness is the ratio of the number of valid sample results to the total number of samples analyzed with a specific matrix and/or analysis. Following completion of the analytical testing, the percent completeness will be calculated by the following equation:

$$Completeness = \frac{(number\ of\ valid\ measurements)}{(number\ of\ measurements\ planned)} x\,100$$

Failure to meet the completeness objective will require an assessment to determine if the missing or invalid data are critical to achieving the project objectives. Corrective actions may include re-sampling or re-analysis, depending on the type of problem, logistical constraints, etc.

10.5.3 Comparison to Project Objectives

In addition, the data obtained will be both qualitatively and quantitatively assessed on a project-wide, matrix-specific, and parameter-specific basis. Factors to be considered in this assessment of field and laboratory data will include, but not necessarily be limited to, the following:

- Conformance to the field methodologies proposed in the SAP,
- Conformance to the analytical methodologies provided in the SAP,
- Adherence to proposed sampling strategy,
- Presence of elevated detection limits due to matrix interferences or contaminants present at high concentrations,
- Unusable data sets based on the data review results,
- Data sets identified as usable for limited purposes based on the data review results,
- Status of all issues requiring corrective action, as presented in the QA reports to management,
- Effect of nonconformance (procedures or requirements) on project objectives,
- Adequacy of the data as a whole in meeting the project objectives, and
- Identification of any remaining data gaps and need to reevaluate project decision rules.

This assessment will be performed by the technical team, in conjunction with the Project QA Officer, and the results presented in the final report.

11.0 Field Variances

Corrective action is the process of identifying, recommending, approving, and implementing measures to counter unacceptable procedures or poor performance that can affect data quality. Corrective action proposed and implemented should be documented in QA reports to management. Corrective action should only be implemented after approval by the Task Manager or designee.

Field corrective action

Corrective action in the field may be needed when the sample network is changed (i.e., more/less samples, sampling locations other than those specified in the SAP, etc.), or when sampling procedures and/or field analytical procedures require modification, etc., due to unexpected conditions. The field team may identify the need for corrective action. The Field Task Leader will notify the Task Manager who will approve the corrective measure. The Field Task Leader will ensure that the corrective measure is implemented by the field team.

Corrective actions will be implemented and documented in the field record book. Documentation will include:

- A description of the circumstances that initiated the corrective action;
- The action taken in response;
- The final resolution; and
- Any necessary approvals.

No staff member will initiate corrective action without prior communication of findings through the proper channels. If uncertainties arise in the field, the Field Survey Task Leader may suspend field activities until clarification is obtained from the Task Manager.

12.0 Field Health and Safety Procedures

The tasks described within this SAP will be conducted in accordance with the companion site-specific Health and Safety Plan (HASP) located in Appendix E. The HASP includes Personal protective equipment (PPE) and that may be required, an explanation of potential hazards that may be encountered, and location and route to the nearest hospital or medical treatment facility.

13.0 References

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Attachment 1

BBNPP Project Data Quality Objectives

Data Quality Objective: Determine if the sediment targeted for dredging at the proposed Bell Bend Nuclear Power Plant (BBNPP) can be classified as clean fill or suitable for beneficial use.

DQO Step	Description
STEP 1 **State the problem**	PPL would like to understand if the sediment at BBNPP CWIS and diffuser areas can be classified as clean fill or suitable for beneficial use. In lieu of due diligence, physical and chemical characteristics need to be understood for project planning and final placement alternative permitting.
STEP 2 **Identify the goals of the study**	**Principal Study Questions** • Can the site sediment be classified as clean fill or suitable for beneficial use? • Do COPC statistics exceed clean fill thresholds as identified in Tables FP-1a and 1b? Do they exceed quality thresholds established for beneficial reuse (WMGR083)? • What is the physical character (grain size) of the material as defined by sieving and settling (hydrometer) properties? **Program Goals** Program goals were developed during a conference call with PA DEP and the US EPA. Due diligence was recommended and the collection of new data shall require the analysis of 1 composite sample for every 1000 CY of material targeted for dredging. Data collection will include analysis of: • Grain size, Total organic carbon (TOC) • Percent moisture • VOCs • SVOCs • Herbicides • Pesticides, PCBs • 2,3,7,8 TCDDioxin • Metals **Alternative Actions** The following alternative actions could result in resolution of the principal study questions:

DQO Step	Description
	• Identify through due diligence which COPCs are not expected to be on site and omit or reduce the analytical parameter list accordingly. • Analyze the sediment for the COPCs to verify quality relative to state clean fill and beneficial use standards. **<u>Decision Statements on Sediment Characteristics</u>** • If historical information provides a good basis for evaluating the quality of the sediment in lieu of additional testing, then an evaluation of the sediment characteristics will proceed without added data collection efforts. • If new data statistics meet the state's clean fill standards, then the sediment to be dredged can be classified as clean fill. • If new data statistics meet the state's beneficial use standards, then the sediment to be dredged can be classified as suitable for beneficial use projects. • If sediment chemistry exceeds regulated thresholds or portions of the sediment are intended for a beneficial re-use, then (future) TCLP/SPLP testing may be performed.
STEP 3 **Identify the information inputs**	Information required to answer the decision statement will include any available historical data and data to be obtained from the planned sampling events (See Step 5 of DQO 1), as summarized below. **<u>New Data Needed</u>** A field program that includes coring within the CWIS and diffuser riverbank areas will be collected. Grab samples from the riverbed where the diffuser and connector pipes are supported. Chemistry and physical parameters are detailed below in DQO Step 5. **<u>Existing Field Data</u>** None have been identified to date. **<u>Existing Reports</u>** None

DQO Step	Description
STEP 4 **Define the boundaries of the study**	**Geographic Area** The study area will include the anticipated dredging prism at the new CWIS and the outflow/diffuser pathway **Time Frame** New data will be collected during October, 2010 **Sample Type** Sediment from the river bank will be collected by coring to the project depth or refusal; Additional grab samples will be collected from the river bottom in areas where construction activities affect only the surface sediment areas (i.e. diffuser pipe anchor areas)
STEP 5 **Develop the analytical approach**	**Approach for Collecting Sediment Samples** Vibracoring will be used to collect the deep sediment samples from the river bank areas. Sample processing and transfer to sample containers will be performed at the processing facility nearby (Ecology III). A grab sampler will be used to collect the surface sediment along the diffuser/pipeline path. Sediments will be processed and containerized aboard the collection vessel. **Anticipated Analytical Methods for Sediment Cores and grab samples** The following lists the analytical methods for sediment sampling: • Grain size using ASTM Method D422 or D4464 • Percent moisture using ASTM Method D2974-07A • TOC using the Lloyd Kahn Method • Total sulfide using EPA Method 9030 mod. • VOCs using method 8260B • Acid and Base Neutrals by method 8270C • Herbicides by method 8151A • Chlorinated pesticides by method 8081A • Organophosphorus Pesticides by method 8141 • Polychlorinated biphenyls by method 8082 • Formaldehyde by method 8315 • Ethylene Glycol by method 8260B • 2,3,7,8, TCDDioxin by method 8290 • Metals by method 6010B and 7000 • Tetraethyl lead by method 8270 • Cr6+ and Cr3+ by method 7196A and 6010B • Sulfate by method 9056

DQO Step	Description
	- Chloride by method 9056 - Cyanide by method 9012 (total) - Inorganic nitrogen (NO_2 and NO_3) Additionally, a subsample of each composite will be archived for possible future TCLP/SPLP analysis **Project Quantification Limits** The reporting limits are included in SAP Tables 5-3 and 5-4. **Quality Assurance/Quality Control Program (QA/QC)** QA/QC samples will be analyzed with the sediment samples appropriate for each analytical test, such as field replicates, laboratory duplicates, lab control and matrix control spikes (optional), and performance samples. SAP Table 3-1 provides performance criteria of these precision and accuracy measurements. Tables 5-1 and 5-2 provide the frequency of field replicates and blanks. Data verification and validation protocols are detailed in Section 3 of the SAP. **Anticipated Data Evaluations** - Assessment of sediment grain size and TOC to identify the general sediment characteristics - Evaluation of sediment COPCs relative to clean fill and beneficial reuse quality thresholds - Evaluation of site sediment COPCs relative to reference sediment concentrations
STEP 6 **Specify performance or acceptance criteria**	Uncertainty is always present in the measurement and interpretation of environmental data. In this case, the focus is on collecting and interpreting data to understand the physical characteristics of the sediment in the study area. The introduction of errors will be controlled by preparing and following SOPs, and establishing appropriate controls for data quality. These controls apply to field procedures (e.g., adherence to SOPs, field equipment blanks, field equipment calibration, and field duplicates), laboratory analytical errors (e.g., calibration standard, internal standard, surrogate recoveries, and laboratory control sample), and data validation. Laboratory performance criteria established for this project is provided in Section 3 of the SAP.

DQO Step	Description
STEP 7 **Develop the detailed plan for obtaining data**	**<u>Sediment Sampling at the BBNPP</u>** The total sampling program will consist of: • 23 vibracoring locations in the CWIS footprint area • 1 coring locations at the shoreline in the diffuser pipe area • 4 grab sampling stations along the diffuser pathway • 1 reference grab sampling station Collected grab samples will represent the surface 0–6 inch sediment surface. Collected vibracores will represent the full project depth or depth above rock/refusal. Cores will be segmented at a processing facility to obtain several discrete samples along the core profile. Samples for VOC analysis will be collected first. Discrete samples for the remaining parameter set will be collected second. Three discrete samples will then be pooled to form a single composite for every 1000 CY of material to better represent the dredging prism. Sample volumes will be collected to ensure sufficient mass for the full suite of analytes Samples will be analyzed by the laboratory team outlined in Section 5 of the SAP. An environmental database will be established to capture the laboratory data (via EDDs). Full laboratory reports will be obtained, validated and reported. The final report will provide a comparison between clean fill standards and the sediment concentrations observed at the site.

Attachment 2

Equipment Rinseate Blank Collection Procedure

1. Decontaminate the sample handling utensils and basins/bowls according to procedures detailed in SAP Section 6.
2. Rinse the utensils with de-ionized water (DIW), collect the rinse water in the decontaminated basin/bowl, and pour it into laboratory-provided containers. Sample volume, container type, preservatives, and storage details are provided in Table 5-2. QC sample blank containers should be pre-preserved by the laboratory that provides them as appropriate. Note: equipment blanks may not be appropriate for each parameter Refer to Section 5 of the SAP.
3. Label each container with the sample ID (refer to Section 9), cover the label with clear packing tape and fill out the custody and
4. Store the samples in a cooler on ice until they are transported to the field facility for shipment to the corresponding analytical laboratory.

Table A-1 Equipment blank containerization, preservation and storage.

Analytical Group	Containers (number, size, and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Volatile Organics	3-40 ml glass vials with Teflon-lined septum cap	HCl to pH < 2; 0-4°C; store in the dark	14 days to analysis
Semivolatile Organics	2 x 1 Liter amber glass with Teflon-lined lid	0-4°C; store in the dark	7 days prep; 40 days analysis
PAHs	2 x 1 Liter amber glass with Teflon-lined lid	0-4°C; store in the dark	7 days prep; 40 days analysis
Organochlorine Pesticides	2 x 1 Liter amber glass with Teflon-lined lid	0-4°C; store in the dark	7 days prep; 40 days analysis
PCBs (Aroclors)	2 x 1 Liter amber glass with Teflon-lined lid	0-4°C; store in the dark	14 days prep; 40 days analysis
Herbicides	2 x 1 Liter amber glass with Teflon-lined lid	0-4°C; store in the dark	7 days prep; 40 days analysis
Dioxins/Furans	1 x 500 ml amber glass with Teflon-lined lid	0-4°C; store in the dark	365 days if stored in the dark at 0-4°C
Metals	500 ml plastic	HNO3 to pH < 2; 0-4°C	180 days (6 months)
Cyanide	500 ml glass or plastic	NaOH to pH > 14; 0-4°C	14 days.
TOC	3-40 ml glass vials with Teflon-lined septum cap	HCl to pH < 2; 0-4°C; store in the dark	28 days

[1] Equipment rinseate blanks will not be collected for physical testing parameters or major inorganics.

Attachment 3

Table FP-1a Parameters Omitted from the BBNPP Program

Parameter	**CASRN**
ACEPHATE	30560-19-1
ACRYLAMIDE	79-06-1
ACRYLIC ACID	79-10-7
ALACHLOR	15972-60-8
ALDICARB	116-06-3
ALLYL ALCOHOL	107-18-6
AMITROLE	61-82-5
AMMONIUM SULPHAMATE	7773-06-0
BAYGON (PROPOXUR)	114-26-1
BENOMYL	17804-35-2
BENTAZON	25057-89-0
BENZOTRICHLORIDE	98-07-7
BISPHENOL A	80-05-7
BROMACIL (BROMAX)	314-40-9
BROMOXYNIL	1689-84-5
BROMOXYNIL OCTANOATE	1689-99-2
BUTADIENE, 1,3-	106-99-0
BUTYLATE	2008-41-5
CAPTAN	133-06-2
CARBOFURAN	1563-66-2
CARBOXIN	5234-68-4
CHLORAMBEN	133-90-4
CHLORO-1, 1-DIFLUOROETHANE, 1- (FREON 142)	75-68-3
CHLOROACETOPHENONE, 2-	532-27-4
CHLORODIFLUOROMETHANE (FREON 22)	75-45-6
CHLORO[DI]NITROBENZENE, [2-]P-	100-00-5
CHLROPROPANE, 2-	75-29-6
CHLOROTHALONIL	1897-45-6
CHLORSULFURON	64902-72-3
CHLORTHAL-DIMETHYL (DACTHAL) (DCPA)	1861-32-1
CROTONALDEHYDE	4170-30-3
CROTONALDEHYDE, TRANS-	123-73-9
CYFLUTHRIN	68359-37-5
CYROMAZINE	66215-27-8
DI(2-ETHYLHEXYL)ADIPATE	103-23-1

Parameter	**CASRN**
DIAMINOTOLUENE, 2,4-	95-80-7
DIBROMOBENZENE, 1,4-	106-37-6
DICHOLOR-2-B[Y]UTENE, 1,4-	764-41-0
DICHLORODIFLUOROMETHANE (FREON 12)	75-71-8
DICYCLOPENTADIENE	77-73-6
DIFLUBENZIRON	35367-38-5
DIMETHOXYBENZIDINE, 3,3-	119-90-4
DIMETHYLANILINE, N,N-	121-69-7
DIMETHYLBENZIDINE, 3,3-	119-93-7
DIPHENAMID	957-51-7
DIQUAT	85-00-7
DIURON	330-54-1
ENDOTHALL	145-73-3
ETHEPHON	16672-87-0
ETHION	563-12-2
ETHYL DIPROPYL THIOCARBAMATE, S-(EPTC)	759-94-4
ETHYLENE THIOUREA (ETU)	96-45-7
ETHYL P-NITROPHENYL PHENYLPHOSPHOROTHIOATE	2104-64-5
FENAMIPHOS	22224-92-6
FENVALERATE (PYDRIN)	51630-58-1
FLUOMETURON (FLUORNETRON IN EPA FEB 96)	2164-17-2
FLUOROTROCHLOROMETHANE (FREON 11)	75-69-4
FONOFOS	944-22-9
FORMALDEHYDE	50-00-0
FORMIC ACID	64-18-6
FOSETYL-AL	039148-24-8
FURAN	110-00-9
GLYPHOSATE	1071-83-6
HEXYTHIAZOX (SAVEY)	78587-05-0
HYDRAZINE/HYDRAZINE SULFATE	302-01-2
HYDROQUINONE	123-31-9
IPRODIONE	36734-19-7
MALEIC HYDRAZIDE	123-33-1
MANEB	12427-38-2
MERPHOS OXIDE	78-48-8
METHACRYLONITRILE	126-98-7
METHAMIDOPHOS	10265-92-6
METHOMYL	16752-77-5

Parameter	**CASRN**
METHOXYETHANOL, 2-	109-86-4
METHYLSTYRENE, ALPHA	98-83-9
NAPROPAMIDE	15299-99-7
NITROSO-N-ETHYLUREA, N-	759-73-9
OXAMYL (VYDATE)	23135-22-0
PEBULATE	1114-71-2
PHENYLENEDIAMINE, M-	108-45-2
PHENYLPHENOL, 2-	90-43-7
PHTHALIC ANHYDRIDE	85-44-9
PICLORAM	1918-02-1
PROPANIL	709-98-8
PROPHAM	122-42-9
PROPYLENE OXIDE	75-56-9
QUIZALOFOP (ASSURE)	76578-14-8
SIMAZINE	122-34-9
STRYCHNINE	57-24-9
TEBUTHIURON	34014-18-1
TERBACIL	5902-51-2
TERBUFOS	13071-79-9
TETRACHLORODIBENZO-P-DIOXIN, 2,3,7,8-(TCDD)	1746-01-6
TETRAETHYL LEAD	78-00-2
THIOFANOX	39196-18-4
THIRAM	137-26-8
TRIALLATE	2303-17-5
TRICHLORO- 1,2,2-TRIFLUOROETHANE, 1,1,2- (FREON 113)	76-13-1
TRICHLOROPROPANE, 1,1,2-	598-77-6
TRICHLOROPROPENE, 1,2,3-	96-19-5
TRIFLURALIN	1582-09-8
TRINITROTOLUENE, 2,4,6-	118-96-7
VINYL BROMIDE (BROMOMETHANE)	593-60-2
WARFARIN	81-81-2
ZINEB	12122-67-7

Attachment 4

Specialized Sample Collection Procedures

1. VOC Sample Collection

VOCs should be collected carefully to avoid chemical loss due to their volatility. Therefore, VOC samples will not be dewatered in the field, beyond the protocol for decanting all but a residual of about 1" of overlying water. These samples will be collected in triplicate (2 low level and 1 high level) directly from the core as discrete samples without homogenization or pooling.

Create a clean, safe and stable workspace on which to perform sample manipulations and set up equipment and materials in the workspace.

Place a portable field balance (accurate to 0.1 g) on the work surface and turn on the balance/allow it to warm up for several minutes.

Calibrate the portable field balance according to manufacturers' instructions.

Using the calibrated balance, calibrate a new, clean, graduated plastic cut-off syringe (or other transfer device, (e.g., Encore™ ,Terra Core Sampler™) by determining the length of the sediment column within the syringe/device that equates to 10 grams of sample material. Alternatively, a stainless steel spatula may be used if sediments cannot be properly obtained by syringe.

Document on the field record the graduation on the syringe that corresponds to the required sample weight, including a description of the sample material type (coarse, fine, peat, etc.). Discard the used sediment and syringe used for this calibration exercise. NOTE: This calibration should be repeated and documented each time the type of sample material changes appreciably.

Put on clean gloves immediately before sampling. Kevlar gloves are recommended for handling the 40-mL glass vials.

Inspect the 40-mL sample vials to ensure that the vials are in good condition, have not leaked, and contain the appropriate preservatives (DIW for low level/MeOH for high level) in the appropriate quantities.

2. Low Level

Collect the low-level samples by inserting the syringe into the recently exposed sediment surface and quickly taking a 10-gram sample using a new, clean cut-off plastic syringe (or other transfer device). Place the sample in a 40-mL vial containing the DIW preservative, wipe the vial threads with a chemical-free towelette to remove any adhering sediment, and seal the vial.

Check for effervescence. If the gas generated is small (several milliliters (ml)), submit the sample for analysis. If larger amounts of gas are generated, discard the sample and collect the sample in a vial without preservation.

Repeat the above steps to fill a second 40-mL vial using the same plastic syringe (note two low-level samples are required per sediment sample). Label each vial and immediately place them in a cooler containing ice and VOC trip blank(s).

3. High Level VOC Sampling

The ratio of sample material (in grams) to MeOH (in ml) should be 1 to 1. Always double check the amount of MeOH in the vials prior to collection (typically 10 ml) in order to confirm the required sample volume (in grams).

Collect the high-level sample using the same plastic syringe. Quickly collect a 10-gram sample and place it in a 40-mL vial containing 10-ml of the methanol (MeOH) preservative.

Wipe the vial threads to remove any adhering sediment and seal the vial. Only one high-level sample is required per sediment sample.

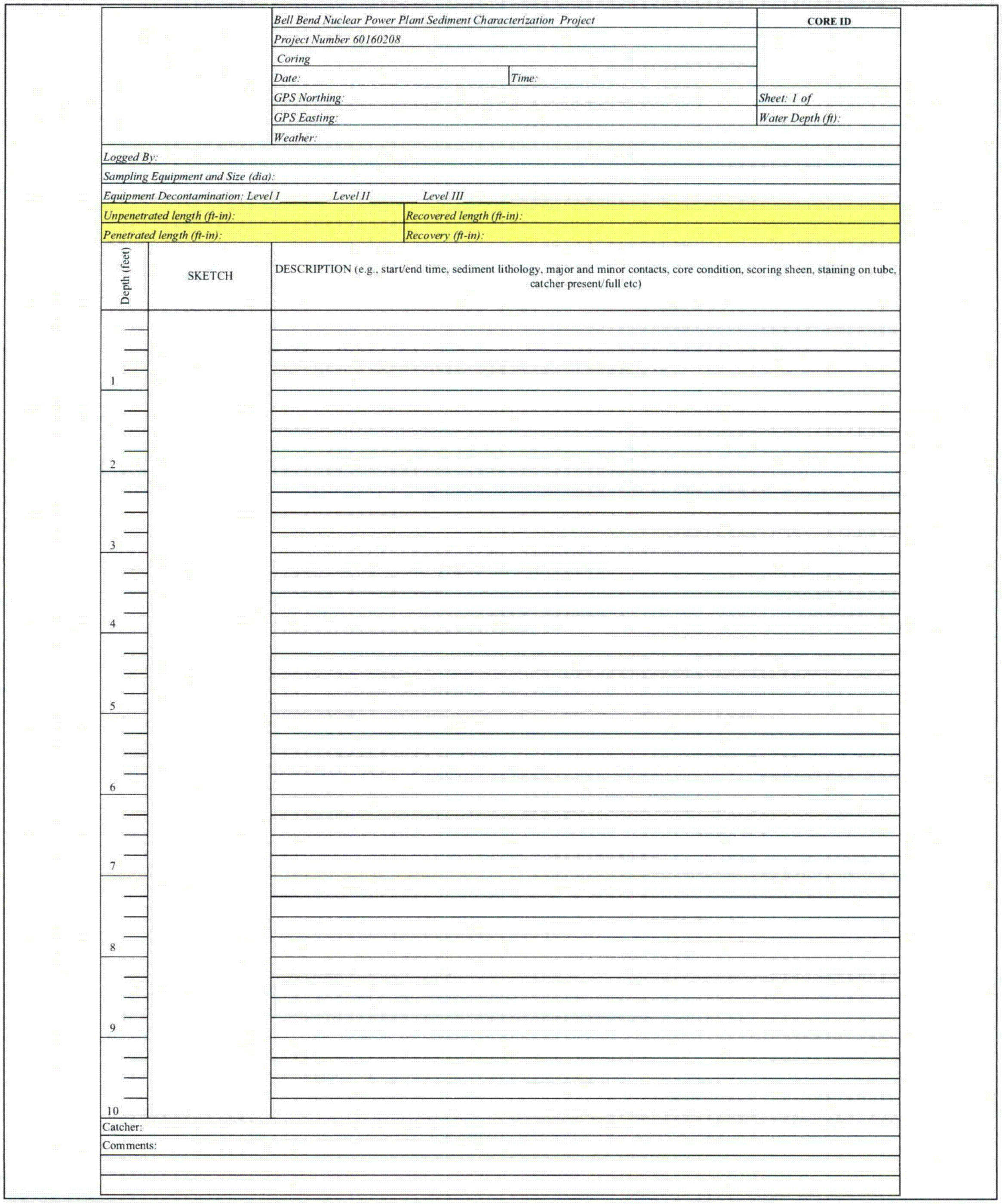
Label the vial and immediately place it in a cooler containing ice and VOC trip blank(s).

4. VOC Specific Solids Sample

Collect a separate subsample of at least 25 g for VOC % solids determination (to an unpreserved 40-mL vial or a 2-oz jar). Label and store it with the VOC sample set.

Attachment 5

Example of Core Log Form



Bell Bend Nuclear Power Plant Sediment Characterization Project

Project Number 60160208

Coring

Date: *Time:*

GPS Northing:

GPS Easting:

Weather:

CORE ID

Sheet: 1 of

Water Depth (ft):

Logged By:

Sampling Equipment and Size (dia):

Equipment Decontamination: Level I_______ Level II_______ Level III_______

Unpenetrated length (ft-in):	*Recovered length (ft-in):*
Penetrated length (ft-in):	*Recovery (ft-in):*

Depth (feet)	SKETCH	DESCRIPTION (e.g., start/end time, sediment lithology, major and minor contacts, core condition, scoring sheen, staining on tube, catcher present/full etc)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Catcher:

Comments:

Attachment 6

Example of Core Processing Form

Core Processing Form
Bell Bend NPP Characterization Project
Project No. 60160208

Task ____________
Date ____________
Core ID: ____________

Sample ID											
Equipment decon level[1]											
Time											
Interval Top (ft-in)											
Interval Bottom (ft-in)											
VOCs[2]											
VOC solids											
Metals											
Hg^{Total}											
SVOCs/PAHs											
PCBs											
Dioxin											
Pesticides											
8081											
Herbicides											
Cyanide											
Inorganic parameters											
TOC											
Physical Parameters[3]											

[1] Decontamination per Section 6.

[2] Indicate the parameters collected at each interval with a check or "X"

[3] A single subsample will provide material for grain size and moisture

Comments

Appendix A

Vibracore Standard Operating Procedures

AECOM

Project Operating Procedure

Sediment Coring Using a Vibracorer

Procedure Number: BBNPP-1

Revision No.: 0

Revision Date: September 2010

POP Author
Date: September 2010

Program Manager
Date: September 2010

Annual review of this SOP has been performed and the SOP still reflects current practice.

Initials: ________ Date: ________
Initials: ________ Date: ________

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Project Operating Procedure

Sediment Coring Using a Vibracorer

1.0 Scope and Applicability

1.1 The purpose of this document is to define the standard operating procedure (SOP) for collecting sediment cores using a vibracoring device as part of the Bell Bend Dredge Management Support Project (Bell Bend). This SOP describes the equipment, field procedures, materials, and documentation procedures necessary to collect cores using a vibracore. This SOP is based on EPA's guidance document Methods for *Collection, Storage, and Manipulation of Sediments for Chemical and Toxicological Analyses: Technical Manual* (U.S. EPA, 2001).

1.2 It is fully expected that the procedures outlined in this SOP will be followed. Procedural modifications may be warranted depending upon field conditions, equipment limitations, or limitations imposed by the procedure. Substantive modification to this SOP will be approved in advance by the Project Manager and communicated to the Unistar (UNE) Project Manager and the Pennsylvania Department of Environmental Protection (PADEP) Project Manager. Deviations to this SOP will be documented in the field records. The ultimate procedure employed will be documented in the report summarizing the results of the sampling event or field activity.

2.0 Health and Safety Considerations

2.1 The health and safety considerations for the work associated with this SOP, including physical, chemical, and biological hazards, are addressed in the site specific Health and Safety Plan (HASP) located in Appendix C of the Bell Bend Sampling and Analysis Plan (SAP).

2.2 The health and safety considerations for the work associated with vibracoring include:

- The physical hazards of handling heavy equipment,
- Overhead lifting hazards using boat-based winches and A-frames,
- Marine and deck safety aspects of the program,
- The potential for chemical hazards related to the sediments,
- The use of power tools and other support equipment, and
- Sharp edges of core catcher during decontamination.

2.3 Daily safety briefs will be conducted at the start of each working day before any work commences. These daily briefs will be facilitated by the Field Team Leader (FTL)/Site Safety Officer (SSO) or his/her designee to discuss the day's events and any potential health risk areas covering every aspect of the work to be completed. Weather conditions are often part of these discussions. As detailed in the HASP, everyone on the field team has the authority to stop work if an unsafe condition is perceived until the conditions are fully remedied to the satisfaction of the Field Team Leader.

3.0 Interferences

3.1 In all cases field personnel should continually monitor the core progression and ensure that the core sample is not vibrated excessively if the downward progression has ceased.

Common interferences encountered during core driving are listed below:

Interference	Possible Effect	Action Taken to Minimize Effect
Vibratory action	Consolidate/compact sediment during driving	Vibrate only as needed to advance the barrel; use of a piston to improve recovery; establish minimum acceptance criteria
Loss of material out bottom	Less drive length achieved; gaps in retained sediment	Use core catcher and retry another attempt
Blocking	Material doesn't enter core tube or lessens recovery	Move off station and re-drive; establish minimum acceptance criteria
Angled entry	Drive length less than expected and fore-shortened	Make sure that wire line is vertical during core driving
GPS satellite accuracy is low	Less confidence in station location	Wait until DGPS accuracy returns to acceptable limits and resume or use a buoy marker or land-survey techniques to confirm sample location

4.0 Equipment and Materials

The following equipment list contains materials which may be needed in carrying out the procedures outlined in this SOP. Not all equipment listed below may be necessary for a specific activity. Additional equipment may be required, pending field conditions.

- Personal protective equipment (PPE) and other safety equipment, as required by the HASP;
- Navigation charts and core locations figure(s);
- Sampling vessel adequate for task at hand and Susquehanna River conditions;
- Marine VHF radio;
- Positioning equipment (DGPS, HYPACK);

- Vibracoring device;
- Deployment equipment (e.g., A-frames, mast, winches, generator);
- Decontaminated soft core tube liners;
- Decontaminated stainless steel core cutter/catcher;
- Assorted nautical equipment (e.g., anchors, lines, personal flotation devices [PFDs]);
- Waterproof logbooks, pens, and labels;
- Permanent marker or grease pencil;
- Echo sounder;
- Depth measuring plate;
- Tape measure and ruler;
- Submersible pump and hose;
- Miscellaneous hand tools (i.e. wrenches, screw driver, hammer, etc.);
- Electrical or duct tape;
- Digital camera; and
- Decontamination equipment/supplies.

5.0 Procedures

Cores will be collected using a vibracoring device. Following collection, cores will be transported to the sample processing area.

5.1 Sampling Procedures

This section gives the step-by-step procedures for collecting cores using a vibracore. Observations made during sediment core collection should be recorded in a dedicated logbook.

5.1.1 Decontamination of Equipment

Decontamination of the core barrels, core catcher, core shoe, and assemblies will be performed prior to vessel departure in accordance with procedures outlined in the SAP. Since the core barrel is lined, the sample is not anticipated to come into contact with the interior of the core barrel. Therefore, the core barrel(s) interior and exterior will be rinsed with site water and hosed down after each collection. Core liners will be soft and replaced after each sample is collected and will not require decontamination as they are pre-cleaned and sealed prior to use. Decontamination of the core catcher will be performed onboard. The decontamination activities for other equipment will occur on shore and will be conducted with enough time before vessel departure to allow for the decontamination activities to be completed (including drying of decontaminated equipment). A sufficient amount of decontamination equipment and supplies will be brought on the coring vessel to accommodate the need for miscellaneous, unforeseen decontamination.

5.1.2 Locating Coring Position

1. The coring schedule for the day will be established prior to vessel departure, and sufficient equipment to complete the work will be on board the sampling vessel. The coring crew will be informed prior to departure of the coring locations and the number of cores required at each location. The number of cores to be recovered at each location will be determined by the sample volume requirements of the project analytical program.
2. If hard bottom (such as gravel, cobble, or rock) sediments are found at a river station, probing may be performed within the target area and in the direction of an alternate core location.
3. The vibracoring vessel will be positioned at each coring location using HYPACK software, DGPS, and an anchor array. Upon collection of a sample, the actual sampling site location will be documented electronically and position data will be downloaded to a thumb drive for later inclusion in the final report.

5.1.3 Collection of Core Samples (boat-based)

1. Record relevant data in logbook (location, station #, weather, start time, etc.)
2. Don PPE as required by the HASP.
3. Activate the submersible pump in preparation for cleaning the vibracore and coring tube, upon retrieval.
4. Place liner in vibracore barrel, complete barrel assembly, and slowly winch the vibracore into its deployment orientation.
5. Obtain water depth (to nearest 0.1 foot) from the echo sounder and record in logbook.
6. Slowly lower the vibracore into the water using the winch or other deployment equipment.
7. Slowly lower the vibracore through the water column to the sediment surface using the water depth reading.
8. Record the “zero” mark on the winch cable.
9. Turn motor of vibracorer on. Slowly lower vibracore into sediment to penetrate the sediment to desired depth or refusal. Record the start and end time in the logbook.
10. On completion of the required penetration, or upon vibracore refusal, de-energize the vibracore and slowly raise the vibracore.
11. Record the vibracore penetration depth in the logbook.

12. Record the final core location coordinates in the logbook.
13. Bring vibracore to sampling vessel deck and rinse the exterior of the barrel using site water as needed. Remove core shoe and core catcher, and secure core liner ends.
14. Remove the core liner from the vibracore barrel, rest horizontally on deck, and check to ensure ends are sealed tightly.
15. Return the vibracore device to its onboard, deck storage location and secure.
16. Draw an arrow on the core liner with permanent marker and label "top" to indicate the top of the core. Label the core with the location ID, date, and time, and record this information in the logbook.
17. Measure the recovered length of the sediment in the core liner (to the nearest 0.1 foot to the extent possible) and record. The distance between the top of the sediment in the core liner and the bottom of the core liner corresponds to the recovered length.
18. Prepare the core for vessel transfer to the processing area onshore. Add appropriate markings to indicate the location and unique identification of each segment. (Segments will be identified as AB, BC, CD, etc., with the first letter marked just below the upper designation, and the second letter marked just above the lower designation.

5.1.4 Management of Cores

1. Sediment residuals will be hosed from the deck and allowed to return back to the waterbody. Disposal of solid material (e.g., core liner and unused sediment) will be performed as outlined in the SAP.
2. Verify that the lengths of the cores, water depth, and positioning data have been recorded in the logbook.
3. Prior to transit to the next coring location or return to boat launch, decontaminate the coring equipment and sampling vessel as described in the SAP.
4. Complete Sample Custody forms (COCs) and transfer core to smaller support vessel for transfer to the processing area.
5. Proceed to next core location specified for that day and repeat above procedures.

6.0 Quality Assurance / Quality Control

6.1 Completing logbook will document that the process is being followed and that pertinent information is being collected and recorded in accordance with the procedures outlined in this SOP.

6.2 Entries the field logbook will be double-checked by the samplers to verify the information is correct. Completed entries will be reviewed periodically by the Field Task Leader (FTL) or his/her designee to verify that the requirements are being met.

7.0 Data and Records Management

7.1 Field notes will be kept during coring activities and will include information pertinent to coring activities includes chronology of events, sample locations (x,y,z), time/date, sampler name, methods (including type of core liner/barrel, if applicable), sampler penetration and acceptability, sample observations, and the times and type of equipment decontamination.

7.2 Field data will be distributed to the appropriate personnel in preparation of the final report.

7.3 Deviations to the procedures detailed in the SOP should be recorded in the field logbook.

7.4 All records associated with the activities described in this SOP will be ultimately maintained in accordance with AECOM standard policies.

8.0 Personnel Qualifications and Training

8.1 The individuals executing these procedures will have read, and be familiar with, the requirements of this SOP and the corresponding SAP. Actual vibracoring operations will be conducted only by personnel experienced with the equipment, but subsequent manipulations, measurements, cutting and labeling procedures are relatively simple and can be implemented by personnel without specialized training. It is recommended that initial core manipulations and handling activities be supervised by more experienced personnel.

8.2 Sampling personnel will also be health and safety trained and certified as specified in the HASP.

9.0 References

USEPA, 2001. Methods for Collection, Storage, and Manipulation of Sediments for Chemical and Toxicological Analysis: Technical Manual. EPA-823-B-01-002, October 2001.

10.0 Revision History

Revision	Date	Changes
0	September 2010	NA

Appendix B

Grab Sampling Standard Operating Procedures

AECOM

Project Operating Procedure

Sediment Grab Sampling

Procedure Number: BBNPP-2

Revision No.: 0

Revision Date: September 2010

POP Author — Date: September 2010

Program Manager — Date: September 2010

Annual review of this SOP has been performed and the SOP still reflects current practice.

Initials: ________ Date: ________
Initials: ________ Date: ________

Q:\mw2007\Projects\60160208\Task 1\Grab Sampling POP.docx

Project Operating Procedure
Sediment Grab Sampling

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Project Operating Procedure

Sediment Grab Sampling

1.0 Scope and Applicability

1.1 The purpose of this document is to define the standard operating procedure (SOP) for collecting sediment grab samples using a grab sampler deployed from a boat or other sampling platform as part of the Bell Bend Dredge Management Support Project (Bell Bend). Surface sediment samples will be collected for a variety of chemical and physical parameters. Grab samplers intended for use on the Bell Bend project include Ponar or similar grab samplers (including Van Veen, box corer, or Ted Young modified). This SOP describes the equipment, field procedures, materials, and documentation procedures necessary to collect grab samples. Specific information regarding grab sampling can be found in the associated Sampling and Analysis Plan (SAP). This SOP is based on EPA's guidance document Methods for Collection, Storage, and Manipulation of Sediments for Chemical and Toxicological Analyses: Technical Manual (U.S. EPA, 2001).

1.2 It is fully expected that the procedures outlined in this SOP will be followed. Procedural modifications may be warranted based on field conditions, equipment limitations, or limitations imposed by the procedure. Substantive modification to this SOP will be approved in advance by the Project Manager and communicated to the UniStar (UNE) Project Manager and the Pennsylvania Department of Protection (PADEP) Project Manager. Deviations from this SOP will be documented in the field records as well as the reason for the deviation(s). The ultimate procedure employed will be documented in the report summarizing the results of the sampling event or field activity.

2.0 Health and Safety Considerations

2.1 The health and safety considerations for the work associated with this SOP, including physical, chemical, and biological hazards are addressed in the site specific Health and Safety Plan (HASP).

2.2 The health and safety considerations for the work associated with grab sampling include:

- The physical hazards of handling heavy equipment,
- Overhead lifting hazards using boat-based winches and A-frames,
- Marine and deck safety aspects of the program,
- The potential for chemical hazards related to the sediments,
- The use of hand tools and other support equipment, and
- Pinch Points associated with the equipment.

Air monitoring may also be performed for each grab to verify that there isn't a risk of exposure to hydrogen sulfide and VOC emissions. Related instrumentation, action limits, and corrective actions are detailed in the project HASP.

2.3 Daily safety briefs will be conducted at the start of each working day before any work commences. These daily briefs will be facilitated by the Field Team Leader (FTL)/Site Safety Officer (SSO) or his/her designee to discuss the day's events and any potential health risk areas covering every aspect of the work to be completed. Weather conditions are often part of these discussions. As detailed in the HASP, everyone on the field team has the authority to stop work if an unsafe condition is perceived until the conditions are fully remedied to the satisfaction of the FTL/SSO.

3.0 Interferences

3.1 Grab sampler collection issues generally include mechanical failures, over penetration, or surface sediment loss. Each of these will affect the quality/representativeness of the resulting data. Any sampler that did not trigger properly, or did not completely close will be rejected. Samplers that are either over-filled or appear to have lost surface fines will also be rejected. These details are further discussed in Section 5 (Procedures).

4.0 Equipment and Materials

The following equipment list contains materials which may be needed in carrying out the procedures contained in this SOP. Not all equipment listed below may be necessary for a specific activity. Additional equipment may be required, pending field conditions.

- Coring/sampling vessel, including the necessary navigational, communication, and grab deployment equipment
- Marine VHF radio
- Ponar grab sampler or similar device
- Stand (cradle) on which to place the grab or box core while not in deployment
- Siphon tubing and bucket
- Source of running water (optional)
- Water filter and hoses (optional)
- First aid kit and PPE (refer to HASP)
- PID/toxic gas sensor (refer to HASP)
- Approved plans, including target sampling locations
- Sample containers or buckets
- Stainless steel bowls/trays and spoons/spatulas (or equivalent)
- Insulated coolers with wet ice
- Sample labels

- Waterproof paper and pen
- Field notebook
- Ruler and tape measure
- Decontamination supplies (refer to SAP)
- Digital camera (optional)
- Chain-of-custody forms and seals

5.0 Procedures

This section gives the step-by-step procedures for collecting samples using a grab sampler. Observations made during sediment grab sample collection will be recorded in a dedicated logbook

5.1 Equipment Decontamination

The grab sampler, stainless steel bowls/containers, and stainless steel spoons/spatulas will be cleaned prior to initial use and between each station following the decontamination procedures in the SAP. A sufficient supply of pre-decontaminated small equipment will be mobilized to the sampling locations to minimize the need for performing field decontamination. Larger equipment, such as grab sampling dredges, will however require field decontamination on the vessel between sampling stations. Note: grab sampling dredges will not require decontamination between deployments at the same station; only between sampling stations.

5.2 Equipment Rinseate Blanks

Equipment rinseate blanks will be collected at the frequency specified in the SAP after the sampling gear is decontaminated. The procedure for collecting equipment rinseate blanks and related sample containerization requirements are detailed in Attachment 2 of the SAP.

5.3 Positioning

5.3.1 The sediment sampling schedule for the day will be established prior to vessel departure, and sufficient equipment to complete the work will be on-board the sampling/coring vessel. Grab samples will be collected within he proposed blow down diffuser footprint and at a reference station located slightly upriver of the proposed cooling water intake structure (CWIS) location.

5.3.2 The sampling/coring vessel will move and position above a grab location using DGPS, HYPACK software, and anchors.

5.4 Sampling Preparation

The SAP summarizes the parameters that require collection at each station.

5.5 Sampler Deployment and Retrieval

The following describes the steps to be taken to collect and retrieve a grab sample.

1. Don PPE as required by the HASP.
2. Attach the sampler (Ponar or similar grab sampler) to the end of the winch cable with a shackle and tighten the pin.
3. Attach any needed weights to achieve the needed penetration or pads (boards) for stabilization. Cock the grab sampler.
4. Lower the sampler through the water column until the cable slackens and the jaw mechanism is triggered. Travel time will not exceed 1 m/sec to minimize bow wave disturbance. Record the station location (HYPACK system) and water depth (echo sounder or weighted line) in the dedicated logbook.
5. Retrieve the sampler and place it on the stand.
6. Open the sampler and examine it for acceptability:
   - The sediment surface should be basically level and intact over the surface area of the grab, with no sign of channeling or sample washout.
   - Penetration depth should be sufficient (as measured from the center of the grab) to meet the project requirements.
   - The jaws of the sampler should be tightly closed and water should not be substantially leaking from the sampler.
   - The surface appears intact (coarse material visible on the surface is acceptable as long as the first two criteria are met and the jaws of the grab are tightly closed and not leaking).

   Grabs that are only partially filled, or obviously slumped or pitched due to the sampler hitting at an angle are not considered acceptable. In addition, sediments should not be in contact with the underside of the sampler access doors. Drain overlying water from the sampler (by siphoning or decanting) until only a thin film remains
7. Describe the sample surface (color, texture, odor, etc.) in the dedicated logbook; continue to describe the sample during sample processing.
8. Collect the sample as described below. Future deployments will be adjusted for local sediment conditions by either adding/removing weight or pads to the grab frame to control the penetration depth.
9. Repeat steps 4 through 8 until sufficient grab samples are collected to meet the sample volume requirements as specified in the SAP.

5.6 Sample Handling

The following describes the steps to collect the appropriate samples from each grab sampler. Modifications to the following may occur dependent on whether samples are processed on board the vessel or transferred to shore in a clean bucket for land-based processing.

1. From each grab, remove the sediment as defined in the corresponding SAP using a decontaminated utensil or Encore™® or Equivalent Sampling Device. Sediment remaining after the full set of subsamples is collected will be handled as IDW and managed accordingly.

2. Sediment to be blended (for non-discrete sample parameters) will be placed in a decontaminated stainless steel bowl and mixed thoroughly until uniform in color and texture. Remove any objects and/or gravel greater than ½ inch diameter. Describe the pooled material.

3. Once each sample container is filled, wipe the rim and threads of the sample container, cap and label it with the sample ID, date, time, and analytical parameters, and record this information in a dedicated logbook. Cover the label with clear packing tape.

4. Fill out the chain-of-custody form.

5. Store the sample container in an insulated cooler containing wet ice to keep samples cold while on the vessel until it can be transported to the field facility for shipment to the corresponding analytical laboratory.

6. Clean the grab sampler in accordance with the decontamination procedures in SAP.

6.0 Quality Assurance /Quality Control

6.1 Completing the logbook will document that the process is being followed and that pertinent information is being collected and recorded in accordance with the procedures outlined in this SOP.

6.2 Entries the field logbook will be double-checked by the samplers to verify the information is correct. Completed entries will be reviewed periodically by the Field Task Leader (FTL) or his/her designee to verify that the requirements are being met.

7.0 Data and Records Management

7.1 Field notes will be kept during sampling activities and will include information pertinent to coring activities includes chronology of events, sample locations (x,y,z), time/date, sampler name, methods (including type of core liner/barrel, if applicable), sampler penetration and acceptability, sample observations, and the times and type of equipment decontamination.

7.2 Field data will be distributed to the appropriate personnel in preparation of the final report.

7.3 Deviations to the procedures detailed in the SOP should be recorded in the field logbook.

7.4 All records associated with the activities described in this SOP will be ultimately maintained in accordance with AECOM standard policies.

8.0 Personnel Qualifications and Training

8.1 The individuals executing these procedures will have read, and be familiar with, the requirements of this SOP and the corresponding SAP. Actual vibracoring operations will be conducted only by personnel experienced with the equipment, but subsequent manipulations, measurements, cutting and labeling procedures are relatively simple and can be implemented by personnel without specialized training. It is recommended that initial core manipulations and handling activities be supervised by more experienced personnel.

8.2 Sampling personnel will also be health and safety trained and certified as specified in the HASP.

9.0 References

EPA, 2001. Methods for Collection, Storage and Manipulation of Sediments for Chemical and Toxicological Analyses: Technical Manual. EPA 823-B-01-002. U.S. EPA, Office of Water, Washington, DC.

10.0 Revision History Standard Operating Procedure

10.0 Revision History

Revision	Date	Changes
0	September 2010	NA

Appendix C

AECOM SOP 1007 – Chain of Custody Procedures

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Standard Operating Procedure

Chain-of-Custody Procedures

Procedure Number: 1007

Revision No.: 2

Revision Date: February 2008

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President and Chief Executive Officer — Date: 18 February 2008

Annual review of this SOP has been performed
and the SOP still reflects current practice.

Initials: ________ Date: ________
Initials: ________ Date: ________

Standard Operating Procedure

Chain-of-Custody Procedures

SOP No.: 1007
Revision: 2
Date: February 2008

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Standard Operating Procedure

Chain-of-Custody Procedures

1.0 Scope and applicability

1.1 Chain of custody (COC) is defined as the unbroken trail of accountability that ensures the physical security of samples, data, and records (EPA Glossary of Quality-Related Terms). This standard operating procedure (SOP) describes COC procedures applicable to environmental samples collected by ENSR during field sampling and analysis programs. Custody procedures within the laboratories analyzing the samples are not addressed.

1.2 Samples are physical evidence. The objective of COC procedures is to provide sufficient evidence of sample integrity to satisfy data defensibility requirements in legal or regulatory situations.

1.3 The National Enforcement Investigations Center (NEIC) of the U.S. Environmental Protection Agency (EPA) defines custody of evidence in the following manner:

- It is in your actual possession;
- it is in your view, after being in your physical possession;
- it was in your possession and then you locked or sealed it up to prevent tampering; or
- it is in a secure area.

1.4 This SOP is to be utilized to conduct the work identified in the title of this SOP. In the event the Project Manager or Project Team determines that the protocols and procedures listed in this SOP are not applicable to the project, there is the option to either adapt this SOP or to develop a site-specific SOP to more closely match the requirements of the project. Refer to SOP 1011, Preparation and Control of Standard Operating Procedures, for SOP modification and Project Operating Procedure (POP) development procedures.

2.0 Health and safety considerations

2.1 The health and safety considerations for the work associated with this SOP, including both potential physical and chemical hazards, will be addressed in the site-specific Health and Safety Plan (HASP). In the absence of a site-specific HASP, work will be conducted according to the ENSR Health and Safety Policy and Procedures Manual and/or direction from the Regional Health and Safety Manager.

3.0 Interferences

The following may impact the legal or regulatory defensibility of the data:

- The samples are not accompanied by a COC form,
- The information recorded on the COC form is incomplete, inaccurate, or differs from the information recorded on the sample containers,

- The documentation of person-to-person transfer of sample custody is incomplete, or contains unexplained gaps in time,
- COC seals or tape were not applied, were not applied correctly, or were lost or removed, for sample coolers/packages being transported by a party other than the sample custodian.

4.0 Equipment and materials

4.1 The following materials are relevant to this procedure:

- COC Form (Figure 1)
- Sample labels
- COC tape or seal (Figure 2)
- Indelible pen or Sharpie™
- Clear plastic sealing tape

4.2 Materials identified in related SOPs may also be needed.

5.0 Procedures

5.1 Pre-sample collection activities

5.1.1 Some measurement methods require preparation of sample collection media or special treatment of sample containers prior to sample collection. In these cases, COC procedures should be initiated with the media preparation or container treatment. This requires that sample identification numbers or media/container identification numbers be assigned. These numbers should be entered on the COC form, leaving room for the subsequent recording of the associated sample numbers. In this variation, the custodian responsible for media preparation or container treatment has the responsibilities outlined in Section 5.2, and the sampler or field sample custodian has the responsibilities stated in Section 5.3 when he or she receives the prepared media or treated containers. There are a number of acceptable approaches to this variation, and the detailed procedures should be defined in the project-specific QAPP.

5.2 Sample collection phase

5.2.1 As few people as possible should handle the samples. For certain programs, it is helpful if a single person is designated as the sample custodian (the person responsible for the care and custody of the samples until they are transferred to the laboratory for analysis).

5.2.2 While in the field, sampling personnel should be able to testify that tampering of the samples could not occur without their knowledge. Examples of actions taken may include sealing the sample containers with COC tape or locking the samples in a secure area.

5.2.3 If samples are to be shipped by commercial overnight carrier, the field sampler or sample custodian completes a COC form (Figure 1) for each cooler/package of samples and places the original of completed form inside the associated cooler/package before the package is sealed (a copy is retained and kept in the field record files). Each completed COC form should accurately list the sample identification numbers of the samples with which it is packaged, and should contain the identification number of the COC tape on the cooler/package. Representatives of commercial carriers are not required to sign the COC form. Refer to ENSR SOP 7510 – Packaging and Shipment of Environmental Samples for specific packaging procedures.

5.2.4 If samples are hand carried to a laboratory, the person hand carrying the samples is the sample custodian. If the carrier is a different person than the one who filled out the COC form and packaged the samples, then that person transfers custody to the carrier by signing and dating each form in the "Relinquished By" section. The carrier then signs and dates each form in the adjacent "Received By" section. When the carrier transfers the samples to the laboratory, he or she signs and dates each form in the next "Relinquished By" section, and the laboratory sample custodian signs and dates each form in the adjacent "Received By" section.

5.2.5 If samples are transmitted to the laboratory by courier, the procedures described in either Section 5.2.3 or 5.2.4 are followed, depending on whether the courier is a commercial courier or laboratory representative, and whether the cooler has been secured by COC seals prior to pick up by a laboratory courier.

5.3 Sample labeling

5.3.1 Labeling of samples occurs at the time of sample collection.

5.3.2 Waterproof, adhesive labels are preferred. Labels should be applied to the container, not the lid whenever possible. Additional interior labels may be required for certain biological samples.

5.3.3 Sample tags may be required for certain projects requiring a strict level of legal or regulatory data defensibility. If tags are utilized, their use will be addressed in the project-specific work plan or QAPP.

5.3.4 Labels should be completed in waterproof, indelible ink. Covering the label with clear plastic tape is recommended to protect the legibility of the label and to prevent the label from detaching from the sample container.

5.3.5 The following information should be recorded on the sample label:

- Project identification (project name and number/client/site)
- Field sample identification code (exactly as it appears on the COC form)
- Sampler's initials
- Date and time of sample collection
- Analyses requested
- Preservation

5.4 Documentation of sample history

5.4.1 Sample history includes, but is not limited to, preparation of sample containers or collection media (for example, wipes), collection, handling (such as subsampling or compositing), storage, shipment, analytical preparation and analysis, reporting, and disposal.

5.4.2 Refer to SOP 7515, Recording of Field Data, for specific guidance on documentation of field activities, field measurements, and sample collection.

5.5 Documentation of custody

5.5.1 It is recommended that a COC form (Figure 1 or equivalent) be initiated upon sample collection. If this is not feasible for a particular project, the COC form may be initiated at the time of sample packaging. If this is the case, the sample collection records will serve as the initial custody document and will document the collection of the sample (sample location and identification, date and time of collection, sampler, and parameters to be analyzed, including containers and preservatives).

5.5.2 The following information is recorded on the COC form:

- Project identification (ENSR project number, client, site name and location).
- Page number (for example, 1 of 2, 2 of 2).
- Field sample identification code. This code should be unique to the sampling event and to the program. This code should agree exactly with the field sample identification code recorded on the bottle label.
- Sampling point location (optional if recorded elsewhere in field records).
- Date and time of sample collection.
- Sample matrix (soil, water, air, etc.).
- Preservative.
- Analysis requested.
- Number of containers.
- Type of sample (grab or composite). Identifying if aqueous samples have been filtered in the field is recommended.
- Signature(s) of sampling personnel and signatures of all personnel handling, receiving, and relinquishing the samples.
- Date(s) and time(s) of each sample transfer.
- Sampler remarks. These comments may serve to alert the laboratory to highly contaminated samples or identify quality control (QC) sample requirements.
- Airbill number (if shipped by overnight commercial carrier).
- Laboratory name and address.
- COC tape numbers.

5.5.3 The COC is filled out completely and legibly in indelible ink. There should be no unexplained blank spaces. Blank lines should be lined out and initialed and dated.

5.5.4 Data will not obliterated. Corrections are made, if necessary, by drawing a single line through and initialing and dating the error. The correct information is then recorded with indelible ink.

5.5.5 Information on the COC should agree exactly with that recorded on the sample containers. Discrepancies may result in the samples being incorrectly logged into the laboratory or delays in initiating sample analysis.

5.6 Sample receipt and inspection

5.6.1 Upon sample receipt, the coolers or packages are inspected for general condition and the condition of the COC tape. The coolers or boxes are then opened and each sample is inspected for damage.

5.6.2 Sample containers are removed from packing material and sample label information is verified against the COC form.

5.6.3 The condition upon receipt, including any discrepancies or problems, is documented and the COC form is completed by signing and recording the date and time of receipt.

5.6.4 Receipt and inspection of samples by subcontractor analytical laboratories will adhere to written procedures established by the laboratory.

6.0 Quality assurance / quality control

6.1 The records generated in this procedure are subject to review by the sampling team leader, project manager, or designee.

6.2 The records generated in this procedure will become a part of the evidence reviewed in the data validation process (see ENSR SOP 1009, Data Validation).

7.0 Data and records management

7.1 The records generated in this procedure are part of the permanent record supporting the associated measurements and may include, as applicable, the COC forms, sample tags, carrier waybills, and field and laboratory records of sample history (collection, handling, storage, analysis, etc.).

7.2 Unanticipated changes to the procedures or materials described in this SOP (deviations) should be appropriately documented in the project records.

7.3 Records associated with the activities described in this SOP should be maintained according to the document management policy for the project.

8.0 Personnel qualifications and training

8.1 Qualifications and training

8.1.1 The individual executing these procedures should have read, and be familiar with, the requirements of this SOP.

8.1.2 No specialized skills are necessary in order to implement these procedures; however, an understanding of the concept of custody is useful.

8.2 Responsibilities

8.2.1 The project manager is responsible for providing the project team with the materials, resources and guidance necessary to properly execute the procedures described in this SOP.

8.2.2 The individual performing the work is responsible for implementing the procedures as described in this SOP and any project-specific work plans.

8.2.3 For certain sampling programs, the project manager, sampling team leader, or designee may assign an individual to serve as sample custodian. This individual is responsible for supervising the implementation of COC procedures in accordance with this SOP and any project-specific work plans or QAPP.

9.0 References

American Society for Testing and Materials (ASTM). 2004. Standard Guide for Sample Chain-of-Custody Procedures. D 4840-99 (Reapproved 2004).

ENSR SOP 1009 – Data Validation.

ENSR SOP 1011 – Preparation and Control of Standard Operating Procedures.

ENSR SOP 7510 – Packaging and Shipment of Environmental Samples.

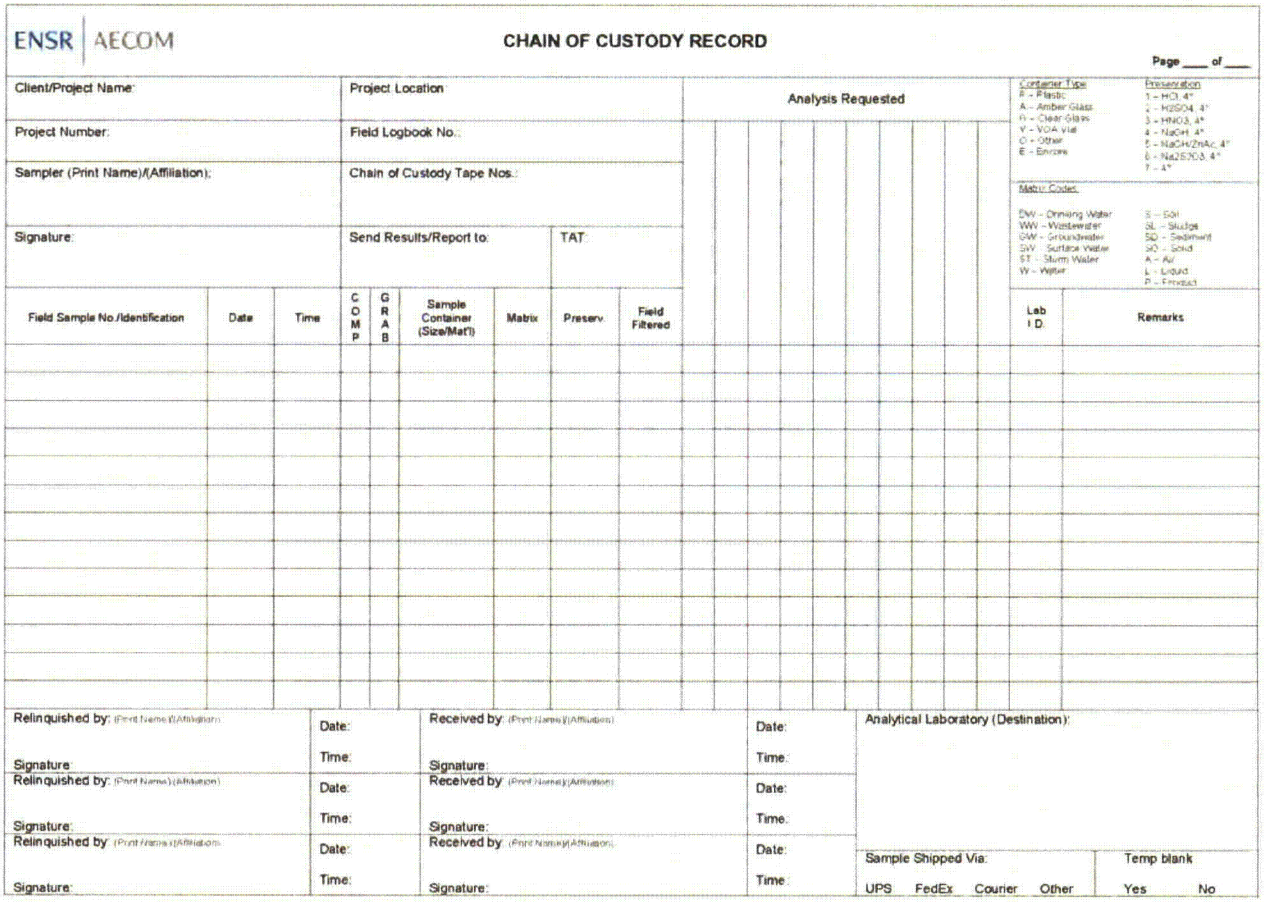
ENSR SOP 7515 – Recording of Field Data.

United States Environmental Protection Agency. 2001. Guidance for Preparing Standard Operating Procedures (SOPs). EPA QA/G-6. EPA/240/B-01/004. USEPA Office of Environmental Information, Washington, DC. March 2001.

10.0 Revision history

Revision	**Date**	**Changes**
0	NA	NA
1	4th Quarter, 1994	Reformatted and expanded from SOP 010-010-601
2	February 2008	Complete rewrite and format update

Figure 1 Example Chain-of-Custody Form



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CHAIN OF CUSTODY RECORD

Page ____ of ____

Client/Project Name:
Project Location
Project Number:
Field Logbook No.:
Sampler (Print Name)/(Affiliation):
Chain of Custody Tape Nos.:
Signature:
Send Results/Report to:
TAT:

Analysis Requested

Container Type
P – Plastic
A – Amber Glass
G – Clear Glass
V – VOA Vial
O – Other
E – Encore

Preservation
1 – HCl, 4°
2 – H2SO4, 4°
3 – HNO3, 4°
4 – NaOH, 4°
5 – NaOH/ZnAc, 4°
6 – Na2S2O3, 4°
7 – 4°

Matrix Codes
DW – Drinking Water
WW – Wastewater
GW – Groundwater
SW – Surface Water
ST – Storm Water
W – Water
S – Soil
SL – Sludge
SD – Sediment
SO – Solid
A – Air
L – Liquid
P – Product

Field Sample No./Identification	Date	Time	COMP	GRAB	Sample Container (Size/Mat'l)	Matrix	Preserv.	Field Filtered											Lab I.D.	Remarks

Relinquished by: (Print Name)/(Affiliation)
Signature:
Date:
Time:
Received by: (Print Name)/(Affiliation)
Signature:
Date:
Time:

Relinquished by: (Print Name)/(Affiliation)
Signature:
Date:
Time:
Received by: (Print Name)/(Affiliation)
Signature:
Date:
Time:

Relinquished by: (Print Name)/(Affiliation)
Signature:
Date:
Time:
Received by: (Print Name)/(Affiliation)
Signature:
Date:
Time:

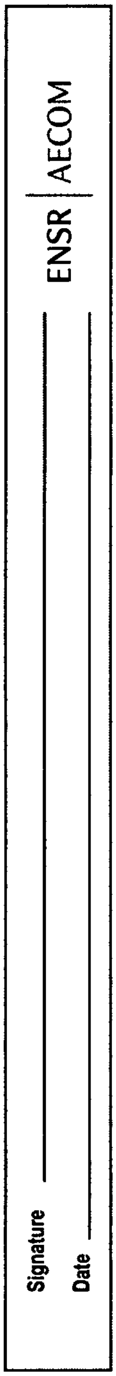
Analytical Laboratory (Destination):

Sample Shipped Via:
UPS FedEx Courier Other

Temp blank
Yes No

Serial No.______

Figure 2 Example Chain-of-Custody Tape



Appendix D

AECOM SOP 7510 – Packaging and Shipment of Environmental Samples

SOP NUMBER: 7510

Packaging and Shipment of Environmental Samples

Date:	4th Qtr. 1999
Revision Number:	4
Author:	Charles Martin
Discipline:	Geosciences

1.0 PURPOSE AND APPLICABILITY

1.1 Purpose and Applicability

This Standard Operating Procedure (SOP) describes the procedures associated with the packaging and shipment of environmental samples. Two general categories of samples exist: environmental samples consisting of water and soil submitted for routine environmental testing, and waste material samples which include non-hazardous solid wastes and/or hazardous wastes as defined by 40 CFR Part 261 submitted for environmental testing or bench/pilot-scale treatability testing. Packaging and shipping procedures will differ for the two sample categories.

This SOP is applicable to packaging and shipment of environmental samples submitted for routine environmental testing. Environmental samples are not considered a hazardous waste by definition; therefore, more stringent Department of Transportation (DOT) regulations regarding sample transportation do not apply. Environmental samples do, however, require fairly stringent packaging and shipping measures to ensure sample integrity as well as safety for those individuals handling and transporting the samples.

This SOP is designed to provide a high degree of certainty that environmental samples will arrive at their destination intact. This SOP assumes that samples will often require shipping overnight by a commercial carrier service, therefore, the procedures are more stringent than may be necessary if a laboratory courier is used or if samples are transported directly to their destination by a sampling team member. Should the latter occur, the procedures may be modified to reflect a lesser degree of packaging requirements.

Respective state or federal agency (regional offices) protocols may require or recommend specific types of equipment for use in sample packaging or a specific method of shipment that may vary from the indicated procedures. Deviations from this SOP to accommodate other regulatory requirements should be reviewed in advance of the field program, should be explained in the project work plan, and must be documented in the field project notebook when they occur.

1.2 General Principles

Sample packaging and shipment generally involves the placement of individual sample containers into a cooler or other similar shipping container and placement of packing materials and coolant in such a manner as to isolate the samples, maintain the required temperature, and to limit the potential for damage to sample containers when the cooler is transported.

1.3 Quality Assurance Planning Considerations

Sampling personnel should follow specific quality assurance guidelines as outlined in the site-specific work plan or Quality Assurance Project Plan (QAPP). Proper quality assurance requirements should be provided which will specify sample packaging and shipment requirements if variations to the indicated procedures are necessary on a particular project.

1.4 Health and Safety Considerations

Sampling personnel should be aware that packaging and shipment of samples involves potential physical hazards primarily associated with handling of occasional broken sample containers and lifting of heavy objects. Adequate health and safety measures must be taken to protect sampling personnel from these potential hazards. The project Health and Safety Plan (HASP) generally addresses physical and other potential hazards. This plan must be approved by the project Health and Safety Officer before work commences, must be distributed to all personnel performing sampling, and must be adhered to as field activities are performed. In the absence of a HASP, work will be conducted according to the ENSR Health and Safety Policy and Procedures Manual and/or direction from the Regional Health and Safety Manager.

2.0 RESPONSIBILITIES

2.1 Sampling Technician

It is the responsibility of the sampling technician to be familiar with the procedures outlined within this SOP and with specific sampling, quality assurance, and health and safety requirements outlined within the project-specific plans. The sampling technician is responsible for proper packaging and shipment of environmental samples and for proper documentation of sampling activities for the duration of the sampling program.

2.2 Sampling Coordinator

Large sampling programs may require additional support personnel such as a sampling coordinator. The sampling coordinator is responsible for providing management support such as maintaining an orderly sampling process, providing instructions to sampling technicians regarding sampling locations, and fulfilling sample documentation requirements, thereby allowing sampling technicians to collect samples in an efficient manner.

2.3 Project Manager

The project manager is responsible for ensuring that project-specific requirements are communicated to the project team and for providing the materials, resources, and guidance necessary to perform the activities in accordance with the project plan and this SOP. The project manager is also responsible for ensuring that proper arrangements have been made with the designated analytical laboratory. These arrangements include, but are not necessarily limited to, subcontractor agreements, analytical scheduling, and bottle/cooler orders. The project manager may delegate some of these responsibilities to other project staff.

3.0 REQUIRED MATERIALS

- Sample coolers
- Sample containers
- Shipping labels
- Chain-of-custody records, custody seals
- Bubble wrap
- Vermiculite (granular), or styrofoam pellets
- "Blue Ice" refreezable ice packs, or ice cubes
- Transparent tape, or rubber bands
- Fiber tape
- Duct tape
- Zipper-lock plastic bags

- Trash bags
- Health and Safety supplies
- Equipment decontamination materials
- Field project notebook/pen

4.0 METHOD

4.1 General Information

4.1.1 Regulatory Information

The extent and nature of sample containerization will be governed by the type of sample, and the most reasonable projection of the sample's hazardous nature and constituents. The EPA regulations (40 CFR Section 261.4(d)) specify that samples of solid waste, water, soil or air, collected for the sole purpose of testing, are exempt from regulation under the Resource Conservation and Recovery Act (RCRA) when any of the following conditions are applicable:

- Samples are being transported to a laboratory for analysis;
- Samples are being transported to the collector from the laboratory after analysis;
- Samples are being stored (1) by the collector prior to shipment for analyses, (2) by the analytical laboratory prior to analyses, (3) by the analytical laboratory after testing but prior to return of sample to the collector or pending the conclusion of a court case.

4.1.2 Sample Information:

The following information must accompany each shipment of samples on a chain-of-custody form (Figure 1) where each sample has an individual entry:

- Sample collector's name, mailing address and telephone number,
- Analytical laboratory's name, mailing address and telephone number,
- A unique identification of each sample,

- Sample description (matrix),
- Number and type of sample containers,
- Container size,
- Preservative,
- Type and method of analysis requested, and
- Date and time that the samples were collected and prepared for shipping,
- Special handling instructions, including notation of suspected high concentration samples.

4.1.3 Laboratory Notifications:

Prior to sample collection, the Project Manager, or designated alternative must notify the laboratory manager of the number, type and approximate collection and shipment dates for the samples. If the number, type or date of sample shipment changes due to program changes which may occur in the field, the Project Manager or alternate must notify the laboratory of the changes. Additional notification from the field is often necessary when shipments are scheduled for weekend delivery.

4.2 General Site Preparation

4.2.1 Small Projects

Small projects of one or two days duration may require packaging and shipment of samples using the field vehicle as the sample preparation area. If sample coolers will be sent via third party commercial carrier service, adequate sample packaging materials should be sent to the project location in advance of sampling or purchased from stores located near the site.

4.2.2 Large Projects

Multi-day or week sampling programs usually require rental of an office trailer or use of existing office/storage facilities for storage of equipment as well as for sample preparation. If possible, a designated area should be selected for storage of unused sample containers/coolers and another area for sample handling, packaging, and shipment. Handling of environmental samples should preferably be conducted in a clean area and away from unused sample containers to minimize the potential for cross contamination. Large quantities of packaging materials may require advance special ordering. Shipping forms/labels may be preprinted to facilitate shipping.

4.2.3 Cooler Inspection and Decontamination

Laboratories will often re-use coolers. Every cooler received at a project location should be inspected for condition and cleanliness. Any coolers that have cracked interior or exterior linings/panels or hinges should be discarded as their insulating properties are now compromised. Any coolers missing one or both handles should also be discarded if replacement handles (i.e., knotted rope handles) can not be fashioned in the field. Replacement coolers may be purchased in the field if necessary.

The interior and exterior of each cooler should be inspected for cleanliness before using it. Excess strapping tape and old shipping labels should be removed. If the cooler interior exhibits visible contamination or odors it should be decontaminated in accordance with ENSR SOP-7600 (Decontamination of Equipment) prior to use. Drain plugs should be sealed on the inside with duct tape.

4.2.4 Other Considerations

VOC Samples - Sample containers used for VOC analysis may be grouped into a single cooler, with separate chain-of-custody record, to limit the number of trip blanks required for transportation and analysis. Individual VOC samples may also be placed into Zipper-lock bags to further protect the samples.

Contaminated Samples - Sample containers with presumed high contaminant concentrations should be isolated within their own cooler with each sample container placed into a Zipper-lock bag.

4.3 Sample Packaging Method

Sample packaging should be conducted in the following manner:

4.3.1 Place plastic bubble wrap matting over the base of each cooler or shipping container as needed. A 2- to 3-inch thickness layer of vermiculite may be used as a substitute base material.

4.3.2 Insert a clean trash bag into the cooler to serve as a liner.

4.3.3 Check that each sample container is sealed, labelled legibly, and is externally clean. Re-label and/or wipe bottles clean if necessary. Clear tape should be placed over the labels to protect them. Wrap each sample bottle individually with bubble wrap secured with tape or rubber bands. Place bottles into the cooler in an upright single layer with approximately one inch of space between each bottle. Do not stack bottles or place them in the cooler lying on their side. If plastic and glass sample containers are used, alternate the placement of each type of container within the cooler so that glass bottles are not placed side by side.

4.3.4 Insert cooler temperature blanks if required.

4.3.5 Place additional vermiculite, bubble wrap, and/or styrofoam pellet packing material throughout the voids between sample containers within each cooler to a level which meets the approximate top of the sample containers. Packing material may require tamping by hand to reduce the potential for settling.

4.3.6 Place cubed ice or cold packs in heavy duty Zip-lock type plastic bags, close the bags, and distribute the packages in a layer over the top of the samples. Cubed ice should be double-bagged to prevent leakage. Loose ice should never be used. Cold packs should be used only if the samples are chilled before being placed in the cooler.

4.3.7 Add additional bubble wrap/styrofoam pellets or other packing materials to fill the balance of the cooler or container.

4.3.8 Obtain two pieces of chain of custody tape as shown in Figure 2 and enter the custody tape numbers in the appropriate place on the chain-of-custody form. Sign and date the chain-of-custody tape.

4.3.9 Complete the chain-of-custody form. If shipping the samples involves use of a third party commercial carrier service, sign the chain-of-custody record thereby relinquishing custody of the samples. Shippers should not be asked to sign chain of custody records. If a laboratory courier is used, or if samples are transported to the laboratory, the receiving party should accept custody and sign the chain-of-custody records. Remove the last copy from the form and retain it with other field notes. Place the original (with remaining copies) in a Zipper-lock type plastic bag and tape the bag to the inside lid of the cooler or shipping container.

4.3.10 Close the top or lid of the cooler or shipping container.

4.3.11 Place the chain of custody tape at two different locations (i.e., one tape on each side) on the cooler or container lid and overlap with transparent packaging tape.

4.3.12 Packaging tape should be placed entirely around the sample shipment containers. A minimum of two full wraps of packaging tape will be placed at least two places on the cooler.

4.3.13 Repeat the above steps for each cooler or shipping container.

4.4 Sample Shipping Method

Packaged sample coolers should be shipped using one of the following options:

4.4.1 Hand Delivery

When a project member is transporting samples by automobile to the laboratory, the cooler should only be sealed with tape. In these cases, chain-of-custody will be maintained by the person transporting the sample and chain-of-custody tape need not be used. Chain-of-custody records should be relinquished upon delivery and a copy of the record retained in the project file.

4.4.2 Laboratory Courier

Laboratory couriers are usually employees of the analytical laboratory receiving the samples. As such, they will accept custody of the samples and must be asked to sign the chain-of-custody records. Chain-of-custody records do not need to be sealed in the cooler although it is recommended that the coolers be sealed with tape. All other packaging requirements generally apply unless otherwise specified in the QAPP.

If the laboratory courier is not authorized to accept custody of the samples, or if the requirements of the project plan preclude transfer to the laboratory courier, samples will be handled as described below in Section 4.4.3.

4.4.3 Third Party Courier

If overnight shipment is required, a third party package delivery service should be used. Transport the cooler to the package delivery service office or arrange for package pick-up at the site. Fill out the appropriate shipping form or airbill and affix it to the cooler. Some courier services may use multi-package shipping forms where only one form needs to be filled out for all packages going to the same destination. If not, a separate shipping form should be used for each cooler. Keep the receipt for package tracking purposes should a package become lost. Please note that each cooler also requires a shipping label which indicates point of origin and destination. This will aid in recovery of a lost cooler if a shipping form gets misplaced. Never leave coolers unattended while waiting for package pick-up. Airbills or waybills will be maintained as part of the custody documentation.

4.5 Sample Receipt

Upon receipt of the samples, the analytical laboratory will open the cooler or shipping container and will sign "received by laboratory" on each chain-of-custody form. The laboratory will verify that the chain-of-custody tape has not been broken previously and that the tape number corresponds with the number on the chain-of-custody record. The laboratory will note the condition of the samples upon receipt and will identify any discrepancies between the contents of the cooler and chain-of-custody. The analytical laboratory will then forward the back copy of the chain-of-custody record to the project manager to indicate that sample transmittal is complete.

5.0 QUALITY CONTROL

The potential for samples to break during transport increases greatly if individual containers are not snugly packed into the cooler. Completed coolers may be lightly shake-tested to check for any loose bottles. The cooler should be repacked if loose bottles are detected.

Environmental samples are generally shipped so that the samples are maintained at a temperature of approximately 4°C. Temperature blanks may be required for some projects as a quality assurance check on shipping temperature conditions. These blanks usually are supplied by the laboratory and consist of a 40-ml vial or plastic bottle filled with tap water. Temperature blanks should be placed near the center of the cooler.

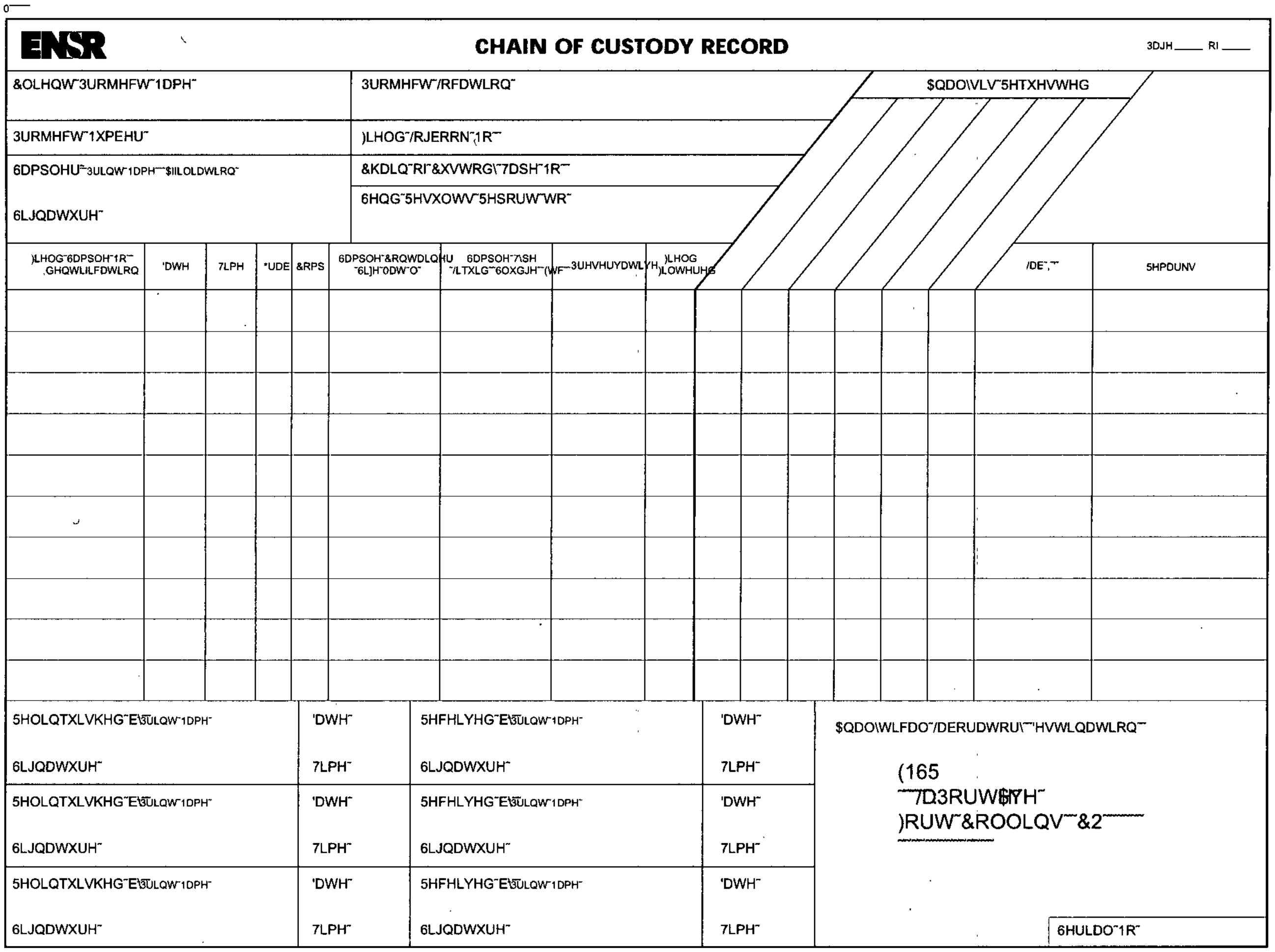
6.0 DOCUMENTATION

Documentation supporting sample packaging and shipment generally consists of chain-of-custody records and shipping records. In addition, a description of sample packaging procedures will be written in the field project notebook. All documentation will be retained in the project files following project completion.

7.0 TRAINING/QUALIFICATIONS

Sample packaging and shipment is a relatively simple procedure requiring minimal training and a minimal amount of equipment. It is, however, recommended that initial attempts be supervised by more experienced personnel. Sampling technicians should be health and safety certified as specified by OSHA (29 CFR 1910.120(e)(3)(i)) to work on sites where hazardous waste materials are considered to be present.

Figure 1. Chain of Custody Form



CHAIN OF COUSTODY RECORD

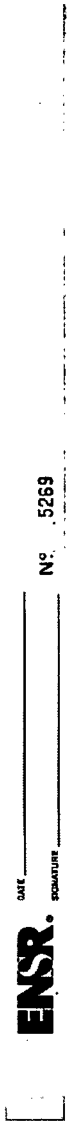
3DJH____ RI____

&OLHQW˜3URMHFW˜1DPH˜	3URMHFW˜/RFDWLRQ˜	$QDO\VLV˜5HTXHVWHG
3URMHFW˜1XPEHU˜	)LHOG˜/RJERRN˜1R˜	
6DPSOHU˜3ULQW˜1DPH˜˜$IILOLDWLRQ˜ 6LJQDWXUH˜	&KDLQ˜RI˜&XVWRG\˜7DSH˜1R˜ 6HQG˜5HVXOWV˜5HSRUW˜WR˜	

)LHOG˜6DPSOH˜1R˜ ,GHQWLILFDWLRQ	'DWH	7LPH	*UDE	&RPS	6DPSOH˜&RQWDLQHU ˜6L]H˜0DW˜O˜	6DPSOH˜7\SH ˜/LTXLG˜6OXGJH˜(WF˜	3UHVHUYDWLYH	)LHOG)LOWHUHG							/DE˜,˜	5HPDUNV

5HOLQTXLVKHG˜E\˜3ULQW˜1DPH˜ 6LJQDWXUH˜	'DWH˜ 7LPH˜	5HFHLYHG˜E\˜3ULQW˜1DPH˜ 6LJQDWXUH˜	'DWH˜ 7LPH˜	$QDO\WLFDO˜/DERUDWRU\˜'HVWLQDWLRQ˜ (165 ˜7D3RUW$YH˜)RUW˜&ROOLQV˜&2˜
5HOLQTXLVKHG˜E\˜3ULQW˜1DPH˜ 6LJQDWXUH˜	'DWH˜ 7LPH˜	5HFHLYHG˜E\˜3ULQW˜1DPH˜ 6LJQDWXUH˜	'DWH˜ 7LPH˜	
5HOLQTXLVKHG˜E\˜3ULQW˜1DPH˜ 6LJQDWXUH˜	'DWH˜ 7LPH˜	5HFHLYHG˜E\˜3ULQW˜1DPH˜ 6LJQDWXUH˜	'DWH˜ 7LPH˜	6HULDO˜1R˜

Figure 2. Chain of Custody Tape



Appendix E

Site Specific Health and Safety Plan

AECOM Environment

Prepared for:
UniStar Nuclear Energy
Baltimore, MD

Prepared by:
AECOM
Piscataway, NJ
60160208
November 2010

Bell Bend Susquehanna River Dredge Management Support Health and Safety Plan

Final

Alek

Prepared By Alek Modjeski, Project Manager

Alan Finio

Reviewed By Alan Finio, Program Manager

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1.0 Introduction

1.1 HASP Applicability

This Health and Safety Plan (HASP) has been developed by AECOM Inc. (AECOM) for work related to the Bell Bend Sediment Investigation Study to be performed along a portion of the Susquehanna River as described in the Sampling and Analysis Plan. It establishes the health and safety procedures necessary to minimize any potential risk to AECOM personnel, as well as any contractor personnel, that may be involved with implementing the Bell Bend Dredge Management Support Program.

The field survey includes:

- Sediment Vibracore Sampling
- Sediment Grab Sampling

This task-specific HASP will be distributed to all AECOM employees and any contractor employees involved with the proposed activities listed in Section 3.0 of this HASP. Each employee must sign a copy of the attached health and safety plan sign-off sheet (see Attachment A) affirming that they have read and understood the details of the HASP. Each employee must submit a signed copy of Attachment A to the AECOM Field Task Manager, or the acting AECOM Site Safety Officer (SSO), prior to the start of field activities.

1.2 Management of Change

This HASP attempts to identify the most common and unique hazards associated with performing these surveys. Unanticipated site-specific conditions or situations may occur during the implementation of the field surveys. Also, AECOM personnel and the selected contractors may elect to perform certain tasks in a manner that is different from what was originally intended due to a change in field conditions. As such, this HASP must be considered a working document that is subject to change to meet the needs of this particular field effort.

AECOM and the selected contractors will complete a Job Hazard Analysis (JHA) when new tasks or different investigative techniques are proposed which are not addressed in the HASP. The use of new techniques will be reviewed and if new hazards are associated with the proposed changes, they will be documented on the JHA form. An effective control measure must also be identified for each new hazard. JHA forms will be reviewed by the SSO prior to being implemented. Once approved, the completed forms will be reviewed with all field staff during the daily safety meeting. A blank JHA form is presented as Attachment B.

1.3 Organization/Responsibility

The implementation of health and safety for the Bell Bend Sediment Investigation Survey will be the shared responsibility of the AECOM Project Manager (PM), the AECOM Regional Health and Safety Manager (RHSM), the AECOM Field Team Leader, and other AECOM personnel implementing the proposed scope of work and managing their respective sub-contractors.

1.3.1 AECOM Project Manager

The AECOM PM (Capt. Alek Modjeski) is responsible for ensuring that the requirements of this HASP are implemented. Some of the PM's specific responsibilities include:

- Assuring that all personnel to whom this HASP applies, including all subcontractors to AECOM, have received a copy of it;
- Providing the RHSM with updated information regarding conditions at the site and the scope of site work as reported by the Field Team Leader/Site Safety Officer (SSO);
- Providing adequate authority and resources to the Field Team Leader/SSO to allow for the successful implementation of all necessary safety procedures;
- Supporting the decisions made by the Field Team Leader/SSO and RHSM;
- Maintaining regular communications with the Field Team Leader/SSO and, if necessary, the RHSM;
- Together with the Field Team Leader/SSO, coordinating the activities of all AECOM subcontractors and ensuring that they are aware of the pertinent health and safety requirements for this project; and
- Reporting to Unistar Nuclear Energy (UNE) of any issues, incidents or information the PM believes important to maintaining a safe and healthy environment for the sampling program.

1.3.2 AECOM Regional Health and Safety Manager

The AECOM RHSM (Michael Grasso) is the individual responsible for the preparation, interpretation and modification of this HASP. Modifications to this HASP which may result in less stringent precautions cannot be undertaken by the PM or the Field Team Leader without the approval of the RHSM. Specific duties of the RHSM include:

- Writing, approving and amending the HASP for this project;
- Advising the PM and Field Team Leader/SSO on matters relating to health and safety on this site;
- Recommending appropriate personal protective equipment (PPE) and safety equipment to protect personnel from potential site hazards;
- Conducting accident investigations; and,
- Maintaining regular contact with the PM and Field Team Leader/SSO to evaluate site conditions and new information which might require modifications to the HASP.

1.3.3 AECOM Field Team Leader/Site Safety Officer (SSO)

All AECOM field technicians are responsible for implementing the safety requirements specified in this HASP. However, one field technician will serve as the Field Team Leader/SSO. The Field Team

Leader /SSO will be appointed by the PM. The Field Team Leader/SSO will be on-site during all activities covered by this HASP. The Field Team Leader/SSO is responsible for enforcing the requirements of this HASP once work begins. The Field Team Leader/SSO has the authority to immediately correct all situations where noncompliance with this HASP is noted and to immediately stop work in cases where an immediate danger is perceived. Some of the Field Team Leader/SSO's specific responsibilities include:

- Assuring that all personnel to whom this HASP applies have submitted a completed copy of the HASP receipt and acceptance form;
- Assuring that all personnel to whom this HASP applies have attended a pre-entry briefing and any subsequent safety meetings that are conducted during the implementation of the program;
- Maintaining a high level of health and safety consciousness among employees implementing the proposed activities;
- Procuring and distributing the PPE and safety equipment needed for this project for employees;
- Verifying that all PPE and health and safety equipment is in good working order;
- Notifying the PM of all noncompliance situations and stopping work in the event that an immediate danger situation is perceived;
- Monitoring and controlling the safety performance of field teams to ensure that required safety and health procedures are being followed;
- Conducting accident/incident investigations and preparing accident/incident investigation reports;
- Conducting the project kick-off meeting in conjunction with the PM and conducting daily safety meetings with the field teams; and,
- Initiating emergency response procedures.

1.3.4 Field Personnel

All AECOM personnel and sub-contractors covered by this HASP are responsible for following the health and safety procedures specified in this HASP and for performing their work in a safe and responsible manner. Some of the specific responsibilities of the field personnel are as follows:

- Reading the HASP and this Addendum in entirety prior to the start of on-site work;
- Submitting a completed HASP Acceptance Form to the AECOM Field Team Leader/SSO prior to the start of work;
- Attending and participating in the required project kick-off meeting and any subsequent safety meetings that are conducted during the implementation of the program;

- Bringing forth any questions or concerns regarding the content of the HASP to the PM or the Field Team Leader/SSO prior to the start of work;
- Reporting new hazards and the proposed control for these hazards to the PM, Field Team Leader/SSO and/or RHSM so that this information can be disseminated to the entire project team during the daily safety briefings;
- Stopping work in the event that a specific and/or unique site hazard cannot be properly controlled;
- Reporting all accidents, injuries and illnesses, near-miss incidents and health and safety observations, regardless of their severity, to the AECOM Field Team Leader/SSO; and,
- Complying with the requirements of this HASP and the requests of the Field Team Leader/SSO.

1.3.5 Boat Captain

The sediment vibracore and grab sampling efforts are classified as on-water field activities. Boat captains assigned to the Project will be responsible for managing on-water operations conducted in support of these proposed efforts. These responsibilities include:

- Serve as primary point of contact for coordinating marine operations;
- Monitoring local boat traffic during on-water operations;
- Broadcasting a security call prior to the start of each day's specific on-water activity and at regular intervals during the day to alert boat traffic of on-going marine sampling activities (if applicable);
- Maintaining a project communications list on board that includes contact information for project staff as well as the USCG (if applicable), harbormasters (if applicable), local medical clinics and hospitals including maps and directions;
- Verifying that the vessels are properly licensed/registered and that the vessels are properly sized and equipped for existing river conditions;
- Conducting a mandatory all-hands marine safety briefing prior to the start of on-water activities and conducting a briefing to visitors and/or personnel coming aboard after the fact;
- Conducting daily safety briefings to remind staff of marine hazards and review any suggestions on how to improve vessel safety;
- Performing a thorough inspection of the boat and deck;
- Postponing or suspending marine operations due to weather conditions; and
- Coordinating all emergency response efforts; if necessary.

2.0 Site Description and History

The sample site area is located along the Susquehanna River adjacent to Susquehanna Steam Electric Station (SSES) in Salem Township, Luzerne County, Pennsylvania at the proposed CWIS and pipeline pathway for the proposed blowdown discharge diffuser. The sample area consists of two areas, 1) the proposed CWIS location and 2) the pipeline pathway at the proposed location for the blowdown discharge diffuser.

The CWIS sampling area is approximately 0.86 ac (0.003 km^2) and will consist of 23 sample stations. The blowdown discharge diffuser study area is approximately 0.46 ac (0.0019 km^2) and will consist of four grab stations and one core station. In addition a reference sample will be collected slightly upriver of the CWIS study area, directly downriver from the first set of power lines crossing the river. The sampling area is bordered by the river's open waters to the north and south; the SSES property which consists of an existing CWIS, open fields, and wooded, vegetated shoreline to the west; and large open farm fields and a vegetated riparian shoreline to the east.

The surrounding land use is predominantly agricultural and consists of open deciduous woodlands interspersed with grasslands, previously cultivated fields, and orchards. The largest community within 10 mi (16 km) of the site is the borough of Berwick, Pennsylvania, approximately 5 mi (8 km) to the southwest. The nearest metropolitan areas are Wilkes-Barre, Pennsylvania, approximately 20 mi (32 km) to the northeast; Allentown, Pennsylvania, approximately 50 mi (80 km) to the southeast; and Harrisburg, Pennsylvania, approximately 70 mi (113 km) southwest of the BBNPP site.

The SSES site, operated by PPL Susquehanna LLC, encompasses approximately 2,355 acres and is located adjacent to the study area. Since its first operation in 1983, the SSES has employed a boiling water reactor (BWR) nuclear steam supply system (NSSS) for each of its two units. The Unit 1 reactor is currently licensed for a power output of 3489 megawatts-thermal (MWt), and the Unit 2 reactor is currently licensed for a power output of 3489 MWt. The approximate gross electrical outputs of Unit 1 and Unit 2 are currently 1190 megawatts-electric (MWe) and 1190 MWe, respectively (PPL, 2006). Existing plant structures occupy a developed area of approximately 487 acres (ac) (197 ha), with most of the plant-related structures located west of U.S. Route 11. Additional property is located to the east of SSES on both sides of the Susquehanna River and includes the Riverlands Recreation Area located on 401 ac (162 ha) of land between U.S. Route 11 and the Susquehanna River. The existing SSES Intake and Discharge Structures are located on the west bank of the Susquehanna River. An Independent Spent Fuel Storage Installation is situated west of the SSES natural draft cooling towers.

3.0 Scope of Work

AECOM personnel will be performing field surveys in the fall of 2010 in support of the Bell Bend Nuclear Power Plant Project. These field surveys include:

- Sediment Vibracore Sampling
- Sediment Grab Sampling

3.1 Sediment Vibracore Sampling

Sediment vibracoring will be performed at a total of 24 stations within the proposed CWIS and blowdown discharge diffuser footprint. It is estimated that multiple cores may be needed at each station in order to obtain the sample volume needed for laboratory analysis. It is anticipated that core lengths will be approximately 12-15 feet in length and processing will be performed onshore.

One subcontractor operated sampling platform will be used for the effort. It is anticipated that a 32-foot aluminum pontoon vessel equipped with an A-frame and winch will be used and assisted by a small 16 foot Jon-boat. A crew of three (3) will be used to collect the core and prepare it for shore-side transfer. Each vessel will be operated by a licensed captain or an approved operator and assisted by a qualified crewman. An AECOM scientist will be on board to oversee and conduct sampling operations.

On-water sampling activities will be supported by a three-person, shore-side processing team that will be responsible for accepting, processing, homogenizing, sub-sampling, containerizing, and shipping the samples.

3.2 Sediment Grab Sampling

Surficial sediment will be collected from a total of five (5) stations distributed along the blow-down diffuser proposed pathway located perpendicular to the Susquehanna River and at a reference location upstream of the CWIS study site.

One subcontractor operated sampling platforms will be used for the effort. It is anticipated that a 32-foot aluminum pontoon vessel equipped with an A-frame and winch will be used assisted by a small Jon-boat. A crew of three (3) will be used to collect the grab and prepare it for shore-side transfer. Each vessel will be operated by a licensed captain or an approved operator and assisted by a qualified crewman. An AECOM scientist will be on board to oversee and conduct sampling operations.

On-water sampling activities will be supported by a two-person, shore-side support team who will be responsible for accepting and delivering field samples to the field facility for homogenization, sub-sampling and shipment.

3.3 Management of Investigative Derived Wastes (IDW)

The site is expected to meet clean fill standards and strict control of residuals is not warranted. Further, the project team does not anticipate generating any hazardous Investigative Derived Waste (IDW) unless if isopropanol (alcohol) is necessary. In that case the decontamination fluid will be containerized and transferred to state approved waste stream at Accutest Laboratories. The liquid and solid residuals that will be generated during the investigation include:

- Excess mud and sediments collected on the boat and the residual sediment materials from sample processing at the Ecology III Processing Area;
- Detergent washwater used on the boat and/or the sample processing area;
- Personnel protective equipment and disposable sampling supplies.

Excess mud and sediment collected on the vessel will be washed over the side of the vessel and returned to the waterbody. Excess sediment from the soft core liners will also be returned to the waterbody. Liners will be placed in plastic bags and disposed of off-site. The spoons used to homogenize the samples will be decontaminated with Alconox and site water.

4.0 Chemical and Biological Hazard Assessment and Controls

4.1 Chemical Contaminants of Concern

Since there are no known records or studies identifying contaminants of concern within the sediment at the project site and the portion of the river at Bell Bend is not on 303 (d) list for impaired waters, it is unlikely that contact with known contaminants will occur. However, in more urban environments, the possible presence for the following contaminants includes:

- Polychlorinated biphenyls (PCBs)
- Dioxins
- Metals
- Polycyclic aromatic hydrocarbons
- Pesticides
- Volatile organic compounds (VOCs)

4.2 Decontamination Solvents and other Chemicals used to Support Field Efforts and Sampling

4.2.1 Decontamination

Decontamination will be performed on the vessel and at the onshore, outdoor processing area. Solvents that will be used in the field to decontaminate the grab sampler, core catcher, sampling spoons or spatulas, and bowls include:

- Methanol

4.2.2 Sample Preservation

Samples will be containerized, labeled accordingly, placed in a cooler, and preserved with ice.

4.2.3 MSDSs and Container Labeling

A material safety data sheet (MSDS) must be available for each hazardous substance that is used in the field. This includes solutions/chemicals listed above that will be used to decontaminate sampling equipment and preserve samples. These MSDSs will be maintained in a binder at the processing station, as well as on the boat.

In addition, all containers of hazardous materials must be labeled in accordance with OSHA's Hazard Communication Standard. Either the original manufacturer's label or an NFPA 704M label specific for the material is considered to be an acceptable label. Such a label will need to be applied to any transfer bottles that are used for sampling tool decontamination activities.

4.3 Chemical Exposure Assessment/Control

4.3.1 Chemical Exposure Assessment

The site contaminants of concern are predominantly non-volatile in nature so exposure to the vapors of these compounds is not likely to occur. Similarly, the potential for exposure to the dusts of the contaminants of concern during sample collection and sample processing will also be minimal since the sediment samples will be wet.

The bigger concern is the potential for exposure to the vapors of the decontamination solvents and gaseous degradation by-products of naturally-occurring organisms in the sediment.

Another significant route of potential exposure to the contaminants of concern is direct dermal contact with sediments and direct contact with decontamination fluids.

4.3.2 Chemical Exposure Control

The potential chemical hazards associated with the proposed activities can be controlled in several ways, including:

- To avoid direct dermal contact with any contaminated media and with decontamination solvents, protective clothing, as described in Section 7.1, will be required when processing samples and decontaminating sampling equipment.
- Although highly unlikely, exposure to contaminants may occur via ingestion (hand-to-mouth transfer). The decontamination procedures described in Section 9.0 address personal hygiene issues that will limit the potential for contaminant ingestion.
- To avoid inhalation of volatilization of decontamination solvents and/or gaseous degradation by-products, all processing and decontamination will be performed in an open air environment. No processing will occur indoors.
- Additionally and as a precautionary measure, air monitoring will be performed along each core sample and with each grab sample using a photo-ionization detector (PID).

4.3.3 Chemical Storage and Transfer

All decontamination solvents will be stored accordingly. Chemicals should be handled in a manner that will reduce employee exposure as well as reduce the possibility of breakage and spillage. This can be accomplished by following these simple steps:

- Handle only the amount of chemical you need for the experiment being performed. Transfer the material to a smaller container that has been properly labeled for the task at hand.
- Always use the appropriate gloves when handling chemicals.
- Return chemicals to their proper storage locations immediately after use.
- Keep chemical containers covered/capped when not in use.
- Use a funnel to minimize splashing during chemical transfer and pouring.

- Use a bottle caddy to carry glass containers.

4.4 Biological Hazard Assessment/Control

4.4.1 Raw Sewage

Though unlikely at the project site, the potential upriver release of raw sewage related to combined sewer overflow "CSO" can occur. The nearest large city is located in Wilkes-Barre approximately 40 miles upstream. When heavy rains deliver an unusually large amount of stormwater to the system, the combined flow could exceed the treatment plant's capacity and the excess mixture of stormwater and raw sewage would be automatically diverted through "CSO points" into the river.

The most common pathogenic organisms found in raw sewage include bacteria, such as clostridium, viruses and parasitic protozoa. Common protozoan diseases include cryptosporidiosis and giardiasis.

Ingestion of and primary contact (i.e. bathing and recreating such as water skiing) with contaminated water are the primary methods of disease transmission in humans. Transmission can also occur via secondary contact (i.e. boating, fishing) with contaminated water. Infection generally results from bacterial penetration of the skin in scratched or abraded areas. Bacterial infection cause varying degrees of gastrointestinal disease and may be accompanied by fever, headache, and chills.

Waterborne microbes can also cause eye and ear infections as well as more serious diseases such as hepatitis A, which is a viral inflammation of the liver that causes flu-like symptoms, jaundice and gastrointestinal discomfort.

4.4.2 Tetanus

Tetanus is a serious bacterial disease that affects the nervous system. It is contracted through a cut or wound that becomes contaminated with tetanus bacteria. The bacteria can get in through even a tiny pinprick or scratch, but deep puncture wounds or cuts like those made by nails or knives are especially susceptible to infection with tetanus. In littered areas, employees may step on glass, nails or other types of sharp objects and are therefore at risk. This may be a concern for those employees who are working on the river banks where debris is prevalent and/or during certain river sampling activities where debris may be collected during sampling activities.

Tetanus bacteria attack the nervous system and cause an often-fatal disease characterized by respiratory paralysis and tonic spasms and rigidity of the voluntary muscles, especially those of the neck and lower jaw (lockjaw). Common first signs of tetanus are a headache and muscular stiffness in the jaw followed by stiffness of the neck, difficulty in swallowing, rigidity of abdominal muscles, spasms, sweating and fever. Symptoms usually begin 8 days after the infection, but may range in onset from 3 days to 3 weeks.

4.4.3 Needles and Syringes

Though unlikely, there is a possibility that one may come into contact with needles or syringes that have been used for medical and/or illicit drug use. Employees may step or kneel on these needles or syringes during the implementation of their field tasks. To avoid contact with needles that could possibly be infected with the HIV or other viruses, employees will not work in areas where drug paraphernalia and/or hypodermic needles are present. It may be necessary for staff to use a rake or similar device to look for needles that could be hidden under leaf litter or other debris. If these materials are discovered, the work area should be moved to an area where needles are not located. Under no circumstances should team members touch or remove any needles or syringes that they may happen upon.

4.4.4 Infection Control

It is very unlikely that the sampling teams may encounter raw sewage during the proposed field effort. However, as a precaution, the following will be followed when working on the Bell bend Susquehanna River site and when handling samples collected from the river:

- If an employee has skin lesions or abraded skin areas that are particularly susceptible to infection (i.e. deep cuts, burns, or existing dermatitis such as poison ivy), the employee should be reassigned to another task that does not pose a potential exposure to bacterial hazards.
- Gloves and safety glasses will be worn whenever employees are collecting or processing samples, or retrieving any equipment that has been placed in the river. If necessary due to the potential for splashing, rain suits will be worn to keep potentially impacted water off of employee's skin.
- Anti-bacterial wipes will be kept on the boat and in the other immediate work areas. Personnel must minimally wash their face and hands and any other part of their body that may have contacted contaminated water as soon as possible. Upon return to shore, employees will again wash their skin with anti-bacterial soap.
- Mobile eye wash bottles and first aid kits will be kept in the immediate work area. If an employee is cut, the affected area will be immediately disinfected and a bandage applied.
- All employees will be encouraged to participate in a Hepatitis A and tetanus booster vaccination program.

In the unlikely event that a team member is pricked or poked by a needle, the RHSM must be contacted immediately so the employee's corporate standard medical evaluation/treatment protocol for potential disease transmission can be implemented as soon as possible.

5.0 Physical Hazards and Controls

There are a variety of physical hazards that may be encountered during the implementation of the proposed field tasks including, but not limited to:

- boat hazards/ wading into the river
- driving safety
- cuts and lacerations
- contact with poisonous plants/ticks/mosquitoes
- slip, trip and fall hazards
- overhead hazards
- summer weather hazards/heat stress
- cold weather/hypothermia
- back safety
- personal safety

5.1 Boat Safety

The proposed work is taking place on several different boat types. As such, this project presents unique hazards to the field team when compared to land-based investigation programs. No effort has been made to incorporate all applicable United States Coast Guard (USCG) regulations; however; some selected excerpts from USCG regulations have been included to provide general guidance. The boat captains are ultimately responsible for having knowledge of, and complying with, all USCG and any other applicable marine regulations.

5.1.1 Working Around Equipment

Sampling will be conducted from vessels specially configured with either a hydraulic A-frame or mast-like tower and an associated hydraulic winch system for handling the grab sampler. Only qualified personnel are permitted to operate the handling system. The field-assembled tower must be assembled by those who are experienced with this system and in accordance with the manufacturer's instructions.

Support personnel must remain aware of overhead loads and will not walk directly beneath a suspended load. Additionally, all personnel handling the over boarding and recovery of the sampling gear must be alert at all times and maintain positive lateral control of the sampler to prevent swinging. All other personnel and visitors aboard the vessel must remain at a safe distance away from the swing radius of the gear. All employees working on deck must follow a clear communications plan (either a clear set of voice commands and/or hand signals) that will be used to direct gear handling and vessel operations.

5.1.2 Boat Inspection

Before a boat is placed in service, it will be inspected and determined to be in safe operating condition and that all required safety gear is aboard before use. A pre-use inspection of the watercraft must also be performed by the operator before each daily use. Watercraft found in an unsafe condition shall be taken out of service and its use prohibited until unsafe conditions have been corrected.

5.1.3 Boat Registration

All watercraft must meet USCG or state watercraft registration and numbering requirements. The USCG requires that all motorized watercraft be numbered in the state of principal use. A valid certificate showing the numbers issued to the watercraft is required to be on board the watercraft whenever the watercraft is in use. Watercraft registration numbers are required to be painted or permanently attached to each side of the forward half of the watercraft. Watercraft registration must be updated as the governing laws require.

5.1.4 Boat Capacity

Watercraft shall not be loaded (passengers and gear) beyond the weight capacity printed on the USCG information plate attached to the stern. If there is no capacity label, use the following formula to determine the safe loading capacity:

 # People = (length of boat x width) ÷15

Watercraft shall have sufficient room, freeboard, and stability to safely carry the cargo and number of passengers allowed with consideration given to the weather, and water conditions in which it will be operated. Once on board, distribute the load (people and equipment) evenly and secure all equipment to prevent it from shifting.

5.1.5 Personal Flotation Devices

Employees working over or near water, where the danger of drowning exists, shall wear a USCG-approved personal flotation device (PFD). When selecting the appropriate type and style of PFD, the type of activity being conducted and the required mobility of the user must be considered, because some activities may require a PFD which is less restrictive.

Project team employees will be required to wear a USCG-approved Type III or Type V personal flotation device (PFD) work vest when working on the boat. Prior to and after each use, each PFD shall be inspected for defects which would alter their strength or buoyancy. Defective units shall be discarded and suitably replaced.

In situations where the water temperature has fallen below 50°F, a USCG approved Mustang flotation suit shall be worn in place of the Type III PFD or Type V work vest.

5.1.6 Float Plan

Prior to leaving shore, a plan of the day's activities, including time and place of departure, anticipated return time, and list of employees working on the project should be filed with the AECOM designated shore-side personnel. In the event that the crew does not check in at the designated time stated on the float plan, then the assigned shore side staff will be responsible for implementing the emergency procedures outlined in the float plan.

5.1.7 Emergency Equipment

All personnel working on boat(s) that are owned/operated by others are to be informed of the locations of all safety equipment on the boat, including VHF radio and emergency contact list, first-aid kit, fire extinguishers and throw-ring, as applicable to the specific boat being used. Additionally, each crewmember shall be provided instructions in "Abandon ship/boat" and "person overboard" procedures prior to first departure.

5.2 Slip, Trip and Fall Hazards

There are many slip, trip and fall hazards associated with on-water sediment sampling. The boat decks will be slippery and the river banks will be uneven and perhaps littered with debris. Employees may need to wade into the river to retrieve sample coolers and/or to collect sediment samples. These river areas may also be littered with rocks and debris.

When accessing these types of locations, the field team should be aware of the potential for slipping, falling or tripping and the presence of various types of debris including rocks, glass, construction debris, and general refuse. Employees should walk around, not over or on top of, debris or trash piles. When carrying equipment, identify a path that is clear of any obstructions. It may be necessary to remove obstacles to create a smooth, unobstructed access point to the work areas on site.

Employees will therefore be required to wear sturdy, work footwear such as leather boots or hiking boots. If it is necessary to wade into the river, employees will be required to wear hip waders, or knee high boots, depending on the specific conditions at hand.

Because of the increased chance of a slip or fall while wading, it is necessary all employees exercise additional care and caution while performing such sampling activities. Personnel are cautioned not to wade into streams that are more than knee high in depth, or where the employee cannot visibly see the stream bottom. All river-related work must be conducted via the buddy system. No employee will be permitted to work on or near the water alone. In accordance with Section 5.1.5, an appropriate PFD must be worn at all times when working in or near the water's edge.

5.3 Personal Safety

Each field or processing team, at a minimum, will consist of at least two (2) personnel. Work will be performed at 804 Salem Boulevard, Berwick PA 18603 or from a pontoon vessel slightly downriver near the existing Cooling Water Intake Structure. In the event of an emergency, prompt communications with local emergency responders and the shore-side team is essential. Personnel needing emergency medical attention on the vessel will be transported via support vessel to the aforementioned field address. SSES will be notified after 911 is called. Marion Hidlay or Ted Jacobsen of Ecology III at 570-542-2191 or 570-683-5275 will act as the shore-side emergency response coordiantaion team and remain in contact with First Responders to provide instruction to the field address.

If field teams encounter hostile individuals within the project location or a confrontation does develop in the work area, staff should suspend activities, immediately leave the area of concern, and contact local 911 for assistance. Each two-person team must have at least one charged and otherwise functioning cell phone with them to facilitate emergency communications. Confirmation of cellular phone operation shall be confirmed at the start, mid-point and near end of each working day.

5.4 Overhead Hazards

Employees should be aware of potential overhead hazards while working on the boat. Overhead hazards include items being hoisted such as grab samplers, vibracore equipment, shackles, and block and tackle. Additionally, low tree limbs and low bridges may be in the way of the moving boat. Hard hats are required on the boat during overhead operations.

5.5 Driving Safety

5.5.1 Safe Driving Tips

The following safe driving tips must be implemented and primarily apply to driving to and from the processing area and boat launch. Procedures include:

- Assuring the vehicle has a current state registration, that a copy of the registration paperwork is in the vehicle, and that the registration's expiration date is marked on the license plate.
- Assuring the vehicle has a current inspection sticker on its windshield (if the state in which the vehicle is registered requires one).
- Assuring the vehicle is currently insured and that a copy of the vehicle insurance card is present in the vehicle.
- Employees must be in possession of a valid driver's license from their state of residence that is approved for the class of vehicle that they are operating.
- Inspect the vehicle for safety concerns before each use - checking tires, wipers, lights and other safety equipment for observable defects.
- Be properly rested and alert and must not operate any vehicle when tired or fatigued.
- Employees are expressly prohibited from working under the influence of alcohol or other controlled substance.
- Employees must wear a seat belt whenever the vehicle is in motion.
- Driver use of cell phones and other mobile communications devices (e.g., handheld computers, two way radios, etc.) is not allowed while operating a motor vehicle. The basic rule is: Car in gear – Cell phone OFF.
- Report accidents, thefts, damage, vandalism or other acts of criminal mischief to the appropriate local law enforcement agency and corporate representative.

5.5.2 Journey Management Plan

A Journey Management Plan (JMP) for safe travel to and from the site and from the sample retrieval locations to the field office will be developed. The plan can be a simple memo to all field staff but must address travel to the site from the established home base (i.e. hotel or office) and back again. The plan should also include a plan for travel from each land-based sample retrieval area to the facility office. This plan should include a determination of the best route, a check of traffic reports, notation of the best departure time, a check of expected weather conditions, information on road construction, and announced road closures. Considerations will be made for oversized or special vehicles and trailers going to the site. Prior to departure, a review will be made of the JMP, and an alternate route and a new JMP developed and approved, if necessary.

5.6 Back Safety

The coolers containing the samples will be heavy. Transfer of the coolers from the support vessel to the shore is further complicated by the uneven terrain or sloping nature of the river banks and selected transfer locations. In some instances, the on-shore team may have to wade into the water to retrieve the coolers and carry them to the land-based transport vehicle.

All coolers will be carried by a two-person team. No one is to attempt to lift and carry a sample cooler by themselves. The transport truck should be equipped with a small moving cart or hand cart that employees can use to move the coolers to the truck once the coolers are on land.

5.7 Cuts and Lacerations

In some areas, the river bottom may be littered with debris which could possibly become entangled, adhered to, or be part of the sample. All employees should be aware of this potential hazard and be prepared to don cut-resistant gloves, such as Kevlar, to avoid coming in direct contact with debris.

Further, some of the on-shore launch or processing locations may be littered with debris. Employees should be careful to avoid coming in direct contact with this debris. If the debris must be removed to access the work area, employees should use a small rake to clear the area, NOT THEIR HANDS.

Additionally, knives or blades may be used to cut string or rope or other items needed to conduct the sampling activities. When using knives or blades, the safety precautions listed below should be followed:

- Keep your free hand out of the way
- Secure your work if cutting through thick material
- Use only sharp blades; dull blades require more force that results in less knife control
- Pull the knife toward you; pulling motions are easier to manage
- Don't put your knife in your pocket
- Use a self-retracting blade
- Wear leather or Kevlar™ gloves when using knives or blades, or when removing sharp objects caught or dangling in sampling gear.

5.8 Poisonous Plants/Insects

5.8.1 Poisonous Plants

Persons working on the site should be aware of the possible presence of poisonous plants and insects. Poison ivy is a climbing plant with leaves that consist of three glossy, greenish leaflets. Poison ivy has conspicuous red foliage in the fall. Small yellowish-white flowers appear in May through July at the lower leaf axils of the plant. White berries appear from August through November. Poison ivy is typically found east of the Rockies. Poison oak is similar to poison ivy but its leaves are oak-like in form. Poison oak occurs mainly in the south and southwest. Poison sumac typically occurs as a small tree or shrub and may be 6-20 feet in height. The bark is smooth, dark and speckled with darker spots. Poison sumac is typically found in swampy areas and east of the Mississippi. The leaves have 7-13 smooth-edged leaflets and drooping clusters of ivory-white berries appear in August and last through spring.

The leaves, roots, stems and fruit of these poisonous plants contain urushiol. Contact with the irritating oil causes an intensely itching skin rash and characteristic, blister-like lesions. The oil can be transmitted on soot particles when burned and may be carried on the fur of animals, equipment and apparel.

Proper identification of these plants is the key to preventing contact and subsequent dermatitis. Wear long sleeves and pants when working in wooded areas. In areas of known infestation, wear Tyvek coveralls and gloves. Oils are easily transferred from one surface to another. If you come in contact with these poisonous plants, wash all exposed areas immediately with cool water to remove the oils. Some commercial products such as Tecnu's Poison Oak-n-Ivy Cleanser claim to further help with the removal of oils.

5.8.2 Ticks

5.8.2.1 Lyme Disease

Ticks are bloodsuckers, attaching themselves to warm-blooded vertebrates to feed. Deer ticks, are associated with the transmission the bacteria that causes Lyme Disease. Female deer ticks are about one-quarter inch in length and are black and brick red in color. Males are smaller and all black. If a tick is not removed, or if the tick is allowed to remain for days feeding on human blood, a condition known as tick paralysis can develop. This is due to a neurotoxin, which the tick apparently injects while engorging. This neurotoxin acts upon the spinal cord causing incoordination, weakness and paralysis.

The early stages of Lyme disease, which can develop within a week to a few weeks of the tick bite, are usually marked by one or more of these signs and symptoms:

- Tiredness
- Chills and fever
- Headache
- Muscle and/or join pain
- Swollen lymph glands
- Characteristic skin rash (i.e. bull's-eye rash)

5.8.2.2 Rocky Mountain Spotted Fever

Rocky Mountain spotted fever is spread by the American dog tick, the lone-star tick, and the wood tick, all of which like to live in wooded areas and tall, grassy fields. The disease is most common in the spring and summer when these ticks are active, but it can occur anytime during the year when the weather is warm.

Rocky Mountain spotted fever is found throughout the United States, except in Maine, Alaska, and Hawaii. Despite the name, few cases are reported from the Rocky Mountain region. Most cases occur in the southeastern United States

Initial signs and symptoms of the disease include sudden onset of fever, headache, and muscle pain, followed by development of rash. Initial symptoms may include fever, nausea, vomiting, severe headache, muscle pain, lack of appetite.

The rash first appears 2-5 days after the onset of fever and is often not present or may be very subtle. Most often it begins as small, flat, pink, non-itchy spots on the wrists, forearms, and ankles. These spots turn pale when pressure is applied and eventually become raised on the skin.

Later signs and symptoms include rash, abdominal pain, joint pain, and/or diarrhea.

The characteristic red, spotted rash of Rocky Mountain spotted fever is usually not seen until the sixth day or later after onset of symptoms, and this type of rash occurs in only 35% to 60% of patients with

Rocky Mountain spotted fever. The rash involves the palms or soles in as many as 50% to 80% of patients; however, this distribution may not occur until later in the course of the disease.

5.8.2.3 Prevention

Tick season lasts from April through October; peak season is May through July. You can reduce your risk by taking these precautions:

- During outside activities, wear long sleeves and long pants tucked into socks. Wear a hat, and tie hair back
- Use insecticides to repel or kill ticks. Repellents containing the compound DEET can be used on exposed skin except for the face, but they do not kill ticks and are not 100% effective in discouraging ticks from biting. Products containing permethrin kill ticks, but they cannot be used on the skin -- only on clothing. When using any of these chemicals, follow label directions carefully.
- After outdoor activities, perform a tick check. Check body areas where ticks are commonly found: behind the knees, between the fingers and toes, under the arms, in and behind the ears, and on the neck, hairline, and top of the head. Check places where clothing presses on the skin.
- Remove attached ticks promptly. Removing a tick before it has been attached for more than 24 hours greatly reduces the risk of infection. Use tweezers, grab as closely to the skin as possible and extract. Do not try to remove ticks by squeezing them, coating them with petroleum jelly, or burning them with a match.
- Report any of the above symptoms and all tick bites to the RHSM for evaluation.

5.8.3 Mosquito- borne Disease - West Nile Virus

West Nile encephalitis is an infection of the brain caused by the West Nile virus, which is transmitted by infected mosquitoes. Following transmission from an infected mosquito, West Nile virus multiplies in the person's blood system and crosses the blood-brain barrier to reach the brain. The virus interferes with normal central nervous system functioning and causes inflammation of the brain tissue. However, most infections are mild and symptoms include fever, headache and body aches. More severe infections may be marked by headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, paralysis and rarely, death. Persons over the age of 50 have the highest risk of severe disease.

Prevention centers on public health action to control mosquitoes and on individual action to avoid mosquito bites. To avoid being bitten by the mosquitoes that cause the disease, use the following control measures:

- If possible, stay inside between dusk and dark. This is when mosquitoes are most active.
- When outside between dusk and dark, wear long pants and long-sleeved shirts.
- Spray exposed skin with an insect repellent, preferably containing DEET.

5.8.4 Wasps and Bees

Wasps (hornets and yellow-jackets) and bees (honeybees and bumblebees) are common insects that may pose a potential hazard to the field team if work is performed during spring, summer or fall. Bees normally build their nests in the soil. However, they use other natural holes such as abandoned rodent nests or tree hollows. Wasps make a football-shaped, paper-like nest either below or above the ground. Yellow-jackets tend to build their nests in the ground but hornets tend to build their nests in trees and shrubbery. Bees are generally more mild-mannered than wasps and are less likely to sting. Bees can only sting once while wasps sting multiple times because their stinger is barbless. Wasps sting when they feel threatened. By remaining calm and not annoying wasps by swatting, you lessen the chance of being stung.

Wasps and bees inject a venomous fluid under the skin when they sting. The venom causes a painful swelling that may last for several days. If the stinger is still present, carefully remove it with tweezers. Some people may develop an allergic reaction (i.e. anaphylactic shock) to a wasp or bee sting. If such a reaction develops, seek medical attention at once. In addition, if an individual knows s/he has an allergic reaction to wasp and bee stings, they are encouraged to consult their doctor prior to working in the area that may pose such a risk and carry the proper medication.

5.9 Sun Exposure

Employees are encouraged to liberally apply sunscreen, with a minimum sun protection factor (SPF) of 15, when working outdoors to avoid sunburn and potential skin cancer, which is associated with excessive sun exposure to unprotected skin. Additionally, employees should wear safety glasses that offer protection from UVA/UVB rays.

5.10 Heat stress

This field effort is taking place in early fall. Though temperatures may be comfortable, the hazards of heat stress are still valid.

Types of heat stress

Heat related problems include heat rash, fainting, heat cramps, heat exhaustion and heat stroke. Heat rash can occur when sweat isn't allowed to evaporate; leaving the skin wet most of the time and making it subject to irritation. Fainting may occur when blood pools to lower parts of the body and as a result, does not return to the heart to be pumped to the brain. Heat related fainting often occurs during activities that require standing erect and immobile in the heat for long periods of time. Heat cramps are painful spasms of the muscles due to excessive salt loss associated with profuse sweating. Heat exhaustion results from the loss of large amounts of fluid and excessive loss of salt associated with profuse sweating. The skin will be clammy and moist and the affected individual may exhibit giddiness, nausea and headache.

Heat stroke occurs when the body's temperature regulatory system has failed. The skin is hot, dry, red and spotted. The affected person may be mentally confused and delirious. Convulsions could occur. EARLY RECOGNITION AND TREATMENT OF HEAT STROKE ARE THE ONLY MEANS OF PREVENTING BRAIN DAMAGE OR DEATH. A person exhibiting signs of heat stroke should be removed from the work area to a shaded area. The person should be soaked with water to promote evaporation. Fan the person's body to increase cooling.

Early symptoms of heat-related health problems:

- decline in task performance
- excessive fatigue
- incoordination

- reduced vigilance
- decline in alertness
- muscle cramps
- unsteady walk
- dizziness

Susceptibility to heat stress increases due to:

- lack of physical fitness
- obesity
- lack of acclimation
- drug or alcohol use
- increased age
- sunburn
- dehydration
- infection

People unaccustomed to heat are particularly susceptible to heat fatigue. First timers in PPE need to gradually adjust to the heat. Sweating normally cools the body as moisture is removed from the skin by evaporation. However, the wearing of certain personal protective equipment (PPE), particularly chemical protective coveralls (e.g., Tyvek), reduces the body's ability to evaporate sweat and thereby regulate heat buildup. The body's efforts to maintain an acceptable temperature can therefore become significantly impaired by the wearing of PPE.

5.11 Inclement Weather

As work continues through early/mid fall, it is important to have a response plan in place that dictates what actions employees will take in the event of severe weather, specifically severe thunderstorms.

When a severe thunderstorm is coming, employees will only have a short amount of time to make important decisions. Employees do not have access to consistent and current news information via the television or radio when working in the field. To ensure that on-site staff are alerted to the onset of severe weather, the project team will be issued a battery-operated National Oceanic and Atmospheric Administration (NOAA) weather radio. The radio will be equipped with an alarm that will automatically broadcast any pertinent information from NOAA's National Weather Service.

Via the radio, the field technician will be aware of any severe thunderstorm watches or warnings that have been issued for their work area by the National Weather Service. It is important for field team members to understand the difference between a "watch" and a "warning".

If a severe thunderstorm watch is issued for your work or travel area, it means that a severe thunderstorm is possible. If a severe thunderstorm warning is issued, it means that a severe thunderstorm has actually been spotted or is strongly indicated on radar and it is time to seek safe shelter immediately.

Weather broadcasts are typically issued for specific counties, not individual towns. It is important for all field team members to know what county they are performing survey work. Additionally, employees should become familiar with the names of the counties through which they must travel when mobilizing/demobilizing from their assigned work location, in the event that a broadcast is issued for those counties.

If a severe thunderstorm watch is issued, employees must remain alert for approaching storms and review the procedures for seeking refuge in the event that a warning is issued. If a severe thunderstorm warning is issued, employees will take the following measures:

- If you hear thunder, you are close enough to a storm to be struck by lightning.
- Cease all work, and contact shore support teams to coordinate a meeting at the nearest pre-defined access point on the river. Personnel should get off the water and immediately seek shelter in a vehicle or indoors.
- Do not take shelter in small sheds, under isolated trees or in convertible automobiles.
- Avoid trees as they are targets for lightning.
- If in a car, keep the windows up.

If you are caught outside during a thunderstorm and no shelter is available, find a low spot away from trees, fences and poles. Squat low to the ground on the balls of your feet and place your hands on your knees with your head positioned between them. Make yourself the smallest target possible and minimize your contact with the ground.

Any lightning safety plan should incorporate the 30/30 Rule. The 30/30 Rule states that people should seek shelter if the "Flash-To-Bang" delay (length of time in seconds between a lightning flash and its subsequent thunder), is 30 seconds or less, and that they remain under cover until 30 minutes after the final clap of thunder.

A 30 second lead time is necessary prior to a storm's arrival because of the possibility of distant strikes. A 30 minute wait after the last thunder is heard is necessary because the trailing storm clouds still carry a lingering charge. This charge can and does occasionally produce lightning on the back edge of a storm, several minutes after the rain has ended.

Studies have shown most people struck by lightning are struck not at the height of a thunderstorm, but before and after the peak of the storm. This shows many people are unaware of how far lightning can strike from its parent thunderstorm. DO NOT wait for the rain to start before seeking shelter, and do not leave shelter just because the rain has ended.

6.0 Personal Protective Equipment

6.1 Protective Clothing and Safety Gear

Personal protective equipment (PPE) will be worn in accordance with the following table to prevent on-site personnel from being injured by the safety hazards posed by the Site and/or the activities being performed. In addition, chemical protective clothing or rain gear can be worn to prevent contact with the sediment.

PPE Item	Sediment Vibracoring	Sediment Grab Sampling	Sample Processing and Preparation
Hard hat	X	X	
Hip waders		When wading into river	When accepting coolers from boat
Work boots	X	X	X
Safety glasses	X	X	X
Long sleeved shirt /pants	X	X	X
Type III or V PFD	X	X	When accepting coolers from boat
Nitrile gloves	X	X	X
Work gloves	X	X	
Kevlar gloves		If debris is found	If debris is found
Polycoated coveralls or rain suits	suggested	suggested	suggested

6.2 Safety Equipment

The following additional safety items must be brought onto each boat handling the sample and to the sample processing location by each team member:

- Portable, hand-held eyewash bottles
- First aid kit
- Sunscreen and bug repellant
- Tecnu Ivy n' Oak Cleanser
- Liquid anti-bacterial soap/potable water
- NOAA weather radio
- Portable telephones

7.0 General Safety Requirements

7.1 Safety Practices

The following measures are designed to augment the specific health and safety guidelines provided in this plan.

- The Buddy System will be used at all times by field personnel at the Site. The Buddy System includes maintaining visual, voice, and/or radio communication at all times.
- Eating, drinking, chewing gum or tobacco, smoking or any practice that increases the probability of hand-to-mouth transfer and ingestion of materials is prohibited in the immediate work area and the decontamination zone.
- Smoking is prohibited in all work areas. Matches and lighters are not allowed in these areas.
- Hands and face must be thoroughly washed upon leaving the work area and before eating, drinking or any other activities.
- The use of alcohol or illicit drugs is prohibited during the conduct of field operations.
- All equipment must be decontaminated or properly discarded before leaving the Site in accordance with the Sampling and Analysis Plan (SAP) and the HASP core document.

7.2 Weapons-Free Site

Possessing firearms or unauthorized weapons on the boats, at the processing area, and any other controlled work areas is expressly prohibited. Therefore, all AECOM, Ecology III, and Aqua Surveys employees, sub-contractors and their employees must ensure that they do not bring weapons into these project locations. This requirement applies to all site visitors with the exception of local emergency responders who have been summoned to the site to address a security-related issue. Weapons include but are not limited to guns, knives and explosives, but exclude knives that are used as tools and that are required for project work.

8.0 Dec ontamination

8.1 Personal Decontamination

Proper decontamination is required of all personnel before leaving each work area (i.e. boat, facility etc). Disposable PPE, such as gloves, will be removed and placed in garbage bags for final disposition.

Regardless of the type of decontamination system required, a container of Anti-bacterial soap should be made available so employees can wash their hands and face before leaving each work area. After leaving the work zone and before eating, smoking or drinking, employees should wash their face and hands.

8.2 Decontamination of Equipment and IDW Management

As states earlier, the site is expected to meet clean fill standards and strict control of residuals is not warranted. Further, the project team does not anticipate generating any hazardous Investigative Derived Waste (IDW). If isopropanol (alcohol) is necessary, then this decontamination fluid will be containerized and transferred to state approved waste stream at Accutest Laboratories. The liquid and solid residuals that will be generated during the investigation include:

- Excess mud and sediments collected on the boat and the sample process area onshore, including the core liners;
- Personnel protective equipment and disposable sampling supplies.
- Detergent washwater used on the boat and/or the sample processing area;

Excess mud and sediment collected on the vessel will washed over the side of the vessel and returned to the waterbody. Excess sediment from the soft core liners will also be returned to the waterbody. Liners will be placed in plastic bags and disposed of off-site. The spoons used to homogenize the samples will be decontaminated with Alconox and site water.

9.0 Training and Medical Requirements

9.1 Off-site Training

9.1.1 HAZWOPER Training

All personnel performing activities covered by this HASP must have completed the appropriate training requirements specified in OSHA 29 CFR 1910.120(e). Each individual must have completed an annual 8-hour refresher training course and/or initial 24-hour training course within the last year prior to performing any work covered by this HASP.

9.1.2 First Aid/CPR

At least one person on each boat, including the captain, must be certified in CPR/ First Aid. At least one employee on the processing team must be currently trained and certified to provide First Aid and CPR.

9.2 On-site Training

9.2.1 Pre-entry Briefing

A pre-entry briefing will be conducted by the FTL/SSO to review the specific requirements of this HASP prior to the commencement of on-site activities. HASP sign-off sheets will be collected at this meeting.

9.2.2 Hazard Communication

All employees working on site will be advised of the hazards associated with working on site and the methodology to be utilized to mitigate those hazards and prevent exposures. This information will be presented to personnel prior to initiation of any field activities. The following information regarding hazardous materials will be presented to site personnel per OSHA's Hazard Communication Program:

- Chemical/physical hazards of site contaminants and decontamination solvents and other hazardous materials brought on site
- Appropriate PPE for protection from exposure to sediment and decontamination solvents
- Review of Material Safety Data Sheets (MSDS) and discussion about where MSDSs will be maintained on site
- Container Labeling requirements

9.2.3 Marine Safety Briefing

A marine safety briefing will be conducted by the boat captain prior to launching to review safe boat operations with the sampling teams, the location of all access/egress points on the river for any given day of sampling, the location of emergency equipment on each vessel and the emergency procedures that will be implemented, if necessary. Marine safety briefings will be conducted by the respective captain of each vessel.

9.2.4 Daily safety meetings

Daily morning safety meetings will also be conducted throughout the duration of the project and will be attended by all AECOM, Ecology III, and Aqua Surveys staff and contractor personnel that will be on site that day. Attendance at the pre-entry briefing, marine safety briefing and subsequent daily safety meetings is mandatory for all personnel and will be documented by the FTL/SSO. An attendance form is provided in Attachment B.

9.3 Medical

9.3.1 Medical Surveillance Examinations

All personnel performing activities covered by this HASP must be active participants in a medical monitoring program which complies with 29 CFR 1910.120 (f) unless otherwise excluded under HAZWOPER. Each individual must have completed an annual surveillance examination and/or an initial baseline examination within the last year prior to performing any work covered by this HASP.

9.3.2 Hepatitis A and Tetanus Vaccine

In addition to the medical surveillance requirements under OSHA's HAZWOPER standard, all employees will be encouraged to participate in a Hepatitis A and tetanus booster vaccination program.

9.4 Visitors to the Site

AECOM suggests that all people interested in visiting the site contact the Project Management team in advance of their visit. This is an important requirement as the boats have capacity limitations that need to be observed. Depending on boat capacity, visitors may or may not be granted access to the sampling boats. Similarly, visitors to the processing area will need to verify that someone will be present to greet them. All visitors will be required to participate in a visitor safety orientation program that will be presented by the FTL/SSO. No visitors will be permitted into active work areas without having attended this orientation. No visitors will be permitted in any active work areas without an escort. It is expected that all site visitors will have the requisite PPE for entering the work areas they wish to observe.

10.0 Emergency Response

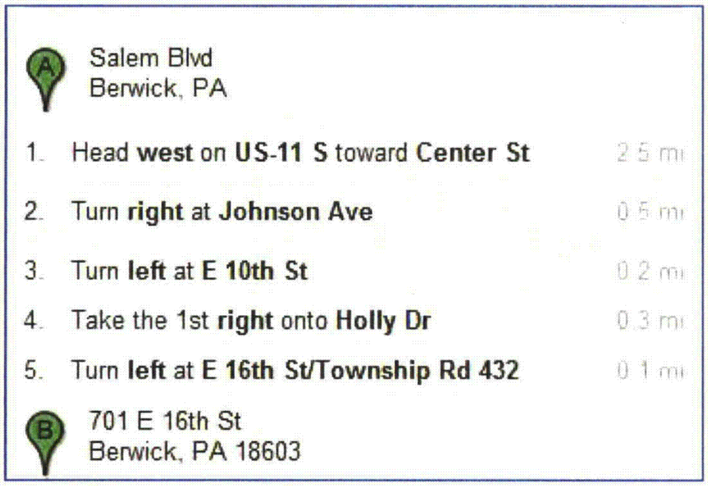
10.1 Access to Information in Core Document

In the event of a non-critical injury, and once preliminary reporting been completed, if the injury employee desires/needs to speak with a medical professional to consult on the nature of their injury and treatment options, employees should contact the RSH&E Manager who will contact WorkCare. Once contacted, WorkCare will make direct contact with the employee.

Once the injury has been reported, seek treatment at the identified Health Care facility indicated below:

The Berwick Hospital Center
701 East 16th St.
Berwick, PA 18603
(570) 759-5000

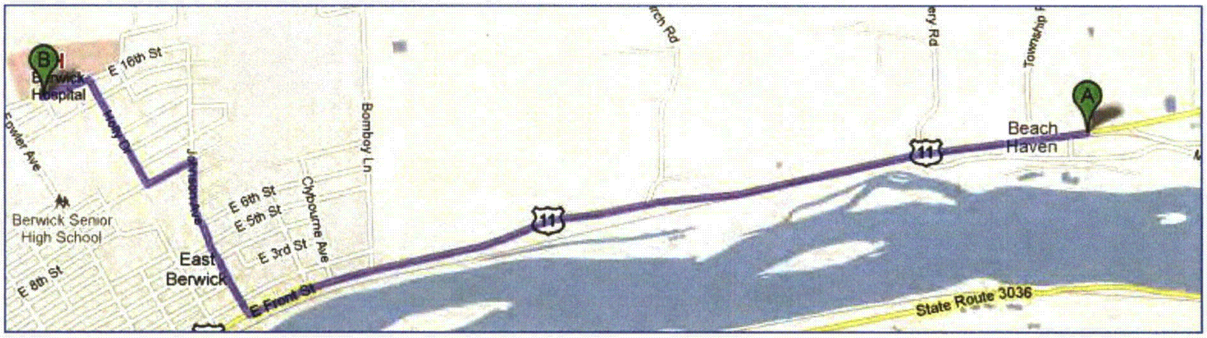
Driving direction and a map to the Hospital is provided below. Driving distance is approximately 3.6 miles; driving time is approximately 7 minutes. The route to the hospital shall be driven by the FTL/SSO to verify that the directions are correct and that detours are not in place. Once verified or update the route to the hospital must be posted and/or available on site.



A
Salem Blvd
Berwick, PA

1. Head **west** on **US-11 S** toward **Center St** 2.5 mi
2. Turn **right** at **Johnson Ave** 0.5 mi
3. Turn **left** at **E 10th St** 0.2 mi
4. Take the 1st **right** onto **Holly Dr** 0.3 mi
5. Turn **left** at **E 16th St/Township Rd 432** 0.1 mi

B
701 E 16th St
Berwick, PA 18603



10.2 Employee Training

Employees will be instructed in the site-specific aspects of emergency evacuation. Emergency contact information will be provided. In the event emergency contact information changes occur, information will be updated and relayed to the team accordingly.

10.3 Alarm Systems/Emergency Signals

The most simple and effective emergency communication system in many situations will be direct verbal communications. Verbal communications must be supplemented anytime voices cannot be clearly perceived above ambient noise levels (i.e., noise from heavy equipment; drilling rigs, etc.) and anytime a clear line-of-sight cannot be easily maintained amongst AECOM personnel because of distance, terrain, or other obstructions.

Verbal communications may not be adequate to warn employees of hazards associated with the immediate work area. Telephone facilities will likely not be available in the immediate work areas or anywhere on the subject properties. Therefore, mobile phones must be brought to the site to facilitate communications between on-shore and off-shore field teams and local emergency responders, if necessary.

10.4 Rescue and Medical Duty Assignments

In the event an injury or illness requires more than first aid treatment, the FTL/SSO will accompany the injured person to the medical facility and will remain with the person until release or admittance is determined. The escort will relay all appropriate medical information to the on-site project manager and the RHSM.

Work will be performed at 804 Salem Boulevard, Berwick PA 18603 or from a pontoon vessel slightly downriver near the existing Cooling Water Intake Structure. In the event of an emergency, prompt communications with local emergency responders and the shore-side team is essential. Personnel needing emergency medical attention on the vessel will be transported via support vessel to the aforementioned field address. SSES will be notified after 911 is called. Marion Hidlay or Ted Jacobsen of Ecology III at 570-542-2191 or 570-683-5275 will act as the shore-side emergency response coordiantaion team and remain in contact with First Responders to provide instruction to the field address."

10.5 Designation of Responsible Parties

The FTL/SSO and/or Boat Captain are responsible for initiating emergency response. In the event the FTL/SSO or Boat Captain cannot fulfill this duty, the alternate FTL/SSO will take charge. All personnel on site are responsible for knowing the escape route from the site and where to assemble after evacuation.

The onshore Field Processing Manager will remain in contact with the boats via radio and/or cell phones and will act as the primary contact between ship and shore.

10.5.1 Employee Accounting Method

The FTL/SSO, or a designee, is responsible for identifying all field personnel on-site at all times. On small, short duration jobs such as this, this can be done informally as long as accurate accounting (i.e. via headcount) is possible.

10.6 Accident Reporting and Investigation

Any incident (other than minor first aid treatment) resulting in injury, illness or property damage requires an accident investigation and report. The injured AECOM employee's supervisor, the AECOM PM and the RHSM should be notified immediately of the injury.

The investigation should be conducted as soon as emergency conditions are under control. The purpose of the investigation is not to attribute blame, but to determine the pertinent facts so that repeat or similar occurrences can be avoided. An AECOM Accident Investigation Form is presented in Attachment D of this HASP.

Appendix B

Logbook Entries