Workplan to Perform Sediment Treatability Study

Yosemite Slough Sediment Area

March 23, 2012

Prepared for:

The City and County of San Francisco

Prepared by:

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NOTE:

The City and County of San Francisco have contracted NewFields, LLC to capture sediments from the Yosemite Slough site and perform treatability testing on the sediments, the intrinsic pore water and surface water to support the US EPA in preparing an Engineering Evaluation/ Cost Assessment document.

March 23, 2012

Approved by:_____

David Puchalski, Project Manager

NewFields, LLC

Reviewed by:_____

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NewFields, LLC

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- SOP for Sediment Sampling utilizing a Hand Push Piston Core Sampler
- SOP for Decontamination of Sampling Equipment in the Field
- SOP for Documentation of Field Sampling

List of Abbreviations and Acronyms

bgs	below ground surface
CAM	California Assessment Manual
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COPC	contaminant of potential concern
CRZ	Contamination Reduction Zone
DDT	dichloro-diphenyl-trichloroethane
DQI	Data Quality Indicator
DQO	Data Quality Objective
DTSC	California Department of Toxic Substances Control
E & E	Ecology and Environment, Inc.
EE/CA	Engineering Evaluation and Cost Analysis
ERM	Effects Range Median
FOSC	Federal On-Scene Coordinator
GPS	Global Positioning System
HEPA	High Efficiency Particulate Air
IDW	investigation-derived waste
LCS	laboratory control sample
MDL	method detection limit
MS/MSD	matrix spike/matrix spike duplicate
mg/kg	milligrams per kilogram
NOAA	National Oceanic and Atmospheric Administration
PCBs	polychlorinated biphenyls
PE	Performance Evaluation

PM	Project Manager
ppb	parts per billion
ppm	parts per million
PPE	personal protective equipment
PQL	practical quantifiable limit
QA	Quality Assurance
QC	Quality Control
RPD	relative percent difference
SAP	Sampling and Analysis Plan
SFPUC	San Francisco Public Utilities Commission
SOP	standard operating procedure
SPF	Sample Preparation Facility
STLC	Soluble Threshold Limit Concentration
SZ	Support Zone
TCLP	Toxicity Characteristic Leaching Procedure
TTLC	Total Threshold Limit Concentration, Title 26, California Code of Regulations
TPH	total petroleum hydrocarbons
U.S. EPA	United States Environmental Protection Agency
WCS	Waste Characterization Study
WZ	Work Zone

1.0 Introduction

The United States Environmental Protection Agency (US EPA) Region IX Superfund Remedial Program Section has been conducting remedial investigations of contaminated sediments in the Yosemite Slough area in San Francisco, California. The US EPA is preparing an Engineering Evaluation and Cost Analysis (EE/CA) for the remediation of contaminated sediments. The EE/CA process evaluates remedial alternatives and potential project costs to complete each alternative. Sediment handlings including dewatering of recovered sediment are cost blocks which will be included within the EE/CA.

The City and County of San Francisco (the City) have contracted NewFields to perform a sediment treatability study in the Yosemite Slough area to support the US EPA. The results of the treatability study will be provided to the US EPA to assist in the preparation of the EE/CA. The US EPA is simultaneously completing a waste characterization study in the area. As such the City will work closely with the US EPA to coordinate these complimentary site investigations. The US EPA has shared the locations of the 8 waste characterization samples, as presented in Table 3. The US EPA approved the collection of treatability samples near YC-038, YC-040 and YC-041 in the slough and a 4th sediment sample near YC-043 in the South Basin as identified on Table 3 and Figure 4.

The US EPA describes the Yosemite Slough Sediment Site (the Site) as an approximately 1,600-foot long channel that receives stormwater runoff and leads to the South Basin of the San Francisco Bay. There are three outfalls from the City's Combined Sewer Overflow System in the area. In addition, the US EPA defines the Site to include a portion of the South Basin at the mouth of Yosemite Slough, within the area designated as Parcel F of the U.S. Navy’s Hunters Point Shipyard (Figures 1 and 2), where impacted sediments from multiple sources may have been, or are, commingled. Analytical data from previous and on-going investigations of multiple sites in the vicinity of the study area indicate Site sediments are contaminated with polychlorinated biphenyls (PCBs); metals including chromium, lead, mercury, and zinc; total petroleum hydrocarbons (TPH); and the pesticides chlordane, dieldrin, and dichlorodiphenyl-trichloroethane (DDT), at concentrations exceeding appropriate screening levels.

This workplan describes the sample collection procedures, sample management and treatability tests that will be completed. Data collection and data documentation will follow US EPA protocol including laboratory analytical reports. NewFields will strive to

comply with all aspects of this workplan, however site conditions, weather conditions and project details may require modifications to the plan. The treatability report will document specific variations in work tasks between the workplan and the project tasks.

1.1 Project Organization

The following is a list of project personnel and their responsibilities for this treatability study.

City Client Liaison – Amy Brownell, PE. The City has contracted NewFields to complete the treatability study for the Yosemite Slough site. Ms. Brownell will act as the client liaison managing NewFields' activities as well as coordinating NewFields work with the US EPA and other interested parties.

U.S. EPA Remedial Project Manager (RPM) – Craig Cooper. The U.S. EPA RPM for the Yosemite Slough site is Craig Cooper. Mr. Cooper will provide comments and technical guidance for the project. Mr. Cooper will maintain close communication with the City project team including Ms. Brownell.

NewFields Project Manager (PM) – David Puchalski, NewFields. Mr. Puchalski will act as the PM for this project. The PM will review and approve the workplan document, will coordinate and manage all field and laboratory activities and approve the final Treatability Study report.

NewFields Field Services Manager (FSM) – Tim Hammermeister, NewFields. Mr. Hammermeister will act as the FSM for this project. The FSM will schedule, coordinate and oversee sample and data collection activities.

NewFields Quality Assurance Coordinator (QA) – Wendy Wong, NewFields. Ms. Wong will act as the QA coordinator for this project. The QA coordinator will inspect and manage both field and laboratory data including confirmation that quality assurance inspections and procedures are completed.

Sample Analysis and Laboratory Support – Laboratory analytical services will be provided by Accutest Laboratories, Inc. (Accutest), a California certified testing laboratory. Accutest may choose to subcontract portions of the analysis to other laboratories based on the analysis requested. Whenever a subcontracted laboratory is

used, they will be required to meet or exceed the minimum laboratory certifications defined in the US EPA Quality Assurance Project Plan (QAPP) for the site.

1.2 Distribution List

Copies of the final Treatability Study will be distributed to the following persons and organizations:

- Amy Brownell, PE
  San Francisco Department of Public Health
  1390 Market St., Suite 410
  San Francisco, CA 94102

- Craig Cooper
  Superfund Project Manager
  U.S. EPA Region 9
  75 Hawthorne Street
  San Francisco, CA 94105

1.3 Project Goals

Remedial investigations and environmental sampling activities have been conducted in the San Francisco bay area including the Yosemite Slough for many years. The investigations have identified elevated concentrations of several chemicals including PCBs, hydrocarbons, metals, and chlorinated pesticides are present in sediment at the Site[1]. The US EPA is preparing an Engineering Evaluation/ Cost Assessment (EE/CA) which evaluates the costs to complete various remedial actions including removal and disposal of sediments in the Site.

Representatives of the US EPA will be completing a Sediment Waste Characterization Study "to more accurately estimate the costs for disposal of sediments for remedial alternatives considered in the EE/CA, waste characterization data will be collected and used in the EE/CA evaluation to assess potential disposal options."[2] This workplan proposes the collection of additional sediment samples which will be obtained in close proximity to waste characterization sediment samples and evaluated for ex-situ sediment treatability efficacy. The goal of this treatability study is to characterize and

[1] *Sampling and Analysis Plan – Yosemite Slough Sediment Waste Characterization Study*, Ecology and Environment, Inc., February 1, 2012, Job No. 002693.7008.01SO.
[2] Ibid.

quantify variations in sediment materials across the site as well as characterize dewatered sediment effluent quality.

2.0 Site Location

The Yosemite Slough Site is an inlet channel tidally connected to central San Francisco Bay in southeastern San Francisco, California. The Site is located in San Francisco's Bayview-Hunters Point neighborhood between the Hunters Point Naval Shipyard to the north and the Candlestick Point State Recreational Area to the south. The boundary of the Yosemite Slough site as defined by the US EPA includes contaminated sediments in the 1,600-foot long slough channel and portions of contaminated sediments under deeper bay waters (South Basin) at the mouth of the slough. At low tide, the majority of the sediments in the inlet channel are exposed creating a mudflat.[3]

The approximate location of the Site is 37° 43' 25" North Latitude, 122° 23' 07" West Longitude. The Yosemite Slough Site is bordered by the United States Navy's Hunter Point Shipyard Superfund Site. The exact boundary between the Yosemite Slough Site and impacted portions of Parcel F at the Hunters Point Shipyard Superfund Site and has not been determined.

Figure 1 is a Site Location Plan that identifies the location, orientation and neighboring properties near the Yosemite Slough site. Figure 2 is a Roadway and Area Location Plan that identifies the Yosemite Slough location along with current topography, drainage patterns and generalized surrounding property usage based on a USGS quadrangle map.

2.1 Site Description[4]

The site is approximately 1,600 feet long and 200 feet wide, with an area of 320,000 square feet, and it is located within the Yosemite Creek drainage basin, which encompasses approximately 1,500 acres in southeastern San Francisco, California (Battelle 2004).

At low tide, the sediments over a majority of the site are exposed. The investigation area for this assessment is presented on the attached Figures 1 through 4.

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[3] US EPA Region 9 Superfund: Yosemite Creek Sediment website. February 17, 2012. http://yosemite.epa.gov/r9/sfund/r9sfdocw.nsf/3dec8ba3252368428825742600743733/fb6e5165bed5dcbd88257983007e7b9e!OpenDocument

[4] *Yosemite Creek Sediment Removal Assessment Report*, Ecology and Environment, Inc., May 2011, Contract No.: EP-S5-08-01

2.2 Site History

Several reports are posted to the EPA's website that contain historical information about the area. The reader is encouraged to review those reports to understand the history of the area. The following hyperlink will open the EPA's Yosemite Creek Sediment web page.

http://yosemite.epa.gov/r9/sfund/r9sfdocw.nsf/3dec8ba3252368428825742600743733/fb6e5165bed5dcbd88257983007e7b9e!OpenDocument

2.3 Environmental Investigations

Previous investigations have shown Site sediments to be impacted with PCBs; metals including chromium, lead, mercury, and zinc; TPH; and the pesticides chlordane, dieldrin, and DDT (Battelle 2004, E&E 2011).

The South Basin area of the San Francisco Bay, in which the Site is located, has been the subject of numerous environmental investigations (Battelle 2004). Remedial investigations, feasibility studies, and remedial actions are ongoing at the Hunters Point Shipyard Superfund site, which includes the South Basin, under the U.S. Navy's Base Realignment and Closure Program. Additionally, the California State Parks Foundation conducted soil, groundwater, and sediment sampling for proposed wetlands creation areas in a 35-acre area that includes the Site.

Sediments at the site were investigated in December 1995 under the Bay Protection and Toxic Cleanup Program. Samples contained concentrations of mercury and PCBs exceeding the NOAA ERM guidelines (Battelle 2004).

As a part of ongoing Comprehensive Environmental Response, Compensation, and Liability Act remedial activities at Hunters Point Shipyard (see Figure 1), a remedial investigation and feasibility study was performed in 1996 by PRC Environmental Management, Inc. under the direction of the Navy at Parcel F, the portion of Hunters Point Shipyard that includes the South Basin shoreline and adjacent sediments. Sediment sample results from the South Basin and from the Site indicated elevated levels of mercury, PCBs, total DDT, and total chlordane. This investigation was conducted to evaluate contamination of the South Basin by the Navy but also addressed the potential for additional sources of contamination to the South Basin, including discharges to the Site (Battelle 2004).

Based on the evidence of contaminated sediments at the Site, the SFRWQCB required further investigation to delineate the nature and extent of the contamination. Additional investigation and sampling of the site was performed under the direction of the SFPUC

in October 1998, October 1999, and April 2000. The SFPUC investigation included the collection of surface and subsurface sediment samples up to four feet below ground surface (bgs), as well as bioassays and determination of bioaccumulation in clam tissue. The investigation and its results are discussed in the 2004 Battelle Sediment Investigation at Yosemite Creek report (Battelle 2004).

2.4 Geology, Hydrology and Hydrogeology[5]

Based on information presented in the Battelle report (Battelle 2004) and documents from the nearby Bay Area Drum site, the geology beneath the site likely consists of artificial fill, younger bay mud, bay side sand, and/or Franciscan formation rock (sandstone, graywacke, shale, and chert) (Harding Lawson Associates [HLA] 1999). The closest area to the site for which geologic information is available is the Hunters Point Shipyard site. Geology beneath the adjacent Hunters Point Shipyard reportedly includes artificial fill, which can contain serpentinite bedrock, excavated bay mud, sands, gravels, and construction and industrial debris. The fill generally overlies bay mud deposits and occasionally undifferentiated sedimentary deposits (Barajas & Associates, Inc. 2008).

Groundwater flow in the region likely flows towards the site and discharges into the South Basin in a general southeasterly direction (HLA 1999). The Yosemite Basin is located between two hills: to the north lies Hunters Point and to the south lies Bayview Hill. The original Yosemite Creek originated from a spring in what is now McLaren Park and flowed into San Francisco Bay. Yosemite Basin is approximately three square miles and is bounded by McLaren Park to the west and the Hunters Point neighborhood and San Francisco Bay to the east. Natural wetlands restoration along Yosemite Creek has been completed by the California State Parks Foundation.

[5] Ibid, Yosemite Creek Sediment website

3.0 Project Objectives

The City has contracted NewFields to perform a sediment treatability study in the Yosemite Slough area to support the US EPA. This workplan proposes the collection of additional sediment samples which will be obtained in close proximity to waste characterization sediment samples obtained by the US EPA. The sediment, pore water and surface water samples will be evaluated for ex-situ sediment treatability characteristics. The goal of this treatability study is to characterize and quantify variations in sediment materials across the site as well as characterize dewatered sediment effluent quality.

3.1 Data Use Objectives

The US EPA is preparing an EE/CA for the site. The data generated by implementing this workplan will be used to describe treatment alternatives and options for treatment and disposal of sediment, surface water and intrinsic pore water which may be removed from the Yosemite Slough area.

3.2 Project Task/Sampling Objectives

The City has contracted NewFields to perform a sediment treatability study in the Yosemite Slough area to support the US EPA. Bulk samples of various media in the Slough including sediment samples, surface water samples and inherent pore water samples will be tested, along with chemical and physical manipulations to accomplish the following sampling objectives:

- Quantify variations in chemical concentration in sediments across the Slough area.
- Quantify physical variations in sediments across the Slough area.
- Quantify chemical concentrations in sediment-water effluent following mixing and gravity dewatering
- Quantity chemical concentrations in sediment-water effluent following chemical addition and physical manipulation
- Evaluate the efficiency of physical and chemical dewatering techniques

3.3 Action Levels

The results of the treatability study will be used in combination with waste characterization analysis to evaluate the costs and alternatives for future remedial actions. The treatability study provides an evaluation of physical and chemical

alternatives and cannot be compared to one set of specific regulatory action levels or one media-specific criterion. Several regulatory criteria must be integrated into the evaluation of a remedial action including surface water quality criteria, waste disposal criteria, sediment quality criteria and elutriate water quality criteria as established by the US Code of Federal Regulations, the California Code of Regulations, and regulations of the waste receiving facilities.

NewFields will work with the City and the US EPA to determine the appropriate action-level criteria for each media of concern when preparing the Treatability Study.

3.4 Quality Assurance Project Plan

NewFields has developed a Quality Assurance Project Plan (QAPP) for the treatability study. Task specific DQOs shall be integrated with the US EPA DQO for the Site during the development of the EE/CA document.

3.5 Schedule of Sampling Activities

The field sampling activities will be scheduled upon approval of the workplan by the City and the US EPA. Field sampling must be scheduled with high tide events to allow daytime sampling in the intertidal zone. All field work will occur in calm wind conditions and during high tide when the Site is submerged under water. Field sampling of the four sediment locations and may take up to four days depending on tide conditions, sample recovery, weather, and Site access. Table 3 identifies the proposed sample locations; the samples are also presented on Figure 4.

3.6 Special Training Requirements/Certifications

All field team members will have OSHA hazardous waste operations worker training as defined in 29 CFR 1910.120. Also, sediment samplers will be trained for safe work over water. All samplers will be trained to wear air purifying respirators and comfortable with OSHA personal protective equipment strengths and limitations.

The field team will also receive hands-on training for operation of the vibratory sampling and modified piston core sampler. At least two field members will be trained in the operation and documentation of a hand-held Global Positioning System (GPS) unit. At least two field team members will be trained in data documentation procedures, photo-documentation procedures and chain-of-custody procedures.

4.0 Sampling Rationale and Design

Representatives of the US EPA are completing a Sediment Waste Characterization Study "to more accurately estimate the costs for disposal of sediments for remedial alternatives considered in the EE/CA, waste characterization data will be collected and used in the EE/CA evaluation to assess potential disposal options."[6] This Treatability Study will evaluate the physical and chemical characteristics of representative sediment samples.

This workplan proposes the collection of additional sediment samples which will be obtained in close proximity to waste characterization sediment samples. The goal of this treatability study is to characterize and quantify variations in sediment materials across the site as well as characterize dewatered sediment effluent quality.

4.1 Sampling Locations

The US EPA has obtained waste characterization sediment sampled from eight locations in and around the site. Figure 4 defines the investigation area of the Site as well as the US EPA's waste characterization sample locations. Four of the proposed locations are within the boundary of the site, designated as YC-038 through YC-041. The four additional locations, designated as YC-042 through YC-045 are within the San Francisco Bay area. The additional borings in the Bay are within a different hydraulic regime and beyond the area of the slough.

The results of the treatability study will be used to support the US EPA's EE/CA, therefore the sample locations were selected to characterize the variations in sediment across the investigation area. The City and NewFields collaborated with the US EPA to select the four treatability sample locations. NewFields will obtain sediment and surface water samples from four locations for the treatability study as approved by the US EPA. Three of the sediment sample locations will be from within the slough, including YC-038, YC-040 and YC-041. One of the sample locations, YC-043 will be from the Bay area. Table 3 identifies the US EPA sample coordinates in latitude and longitude format and Figure 4 presents the location of the 4 sample points.

NewFields will utilize hand-held GPS units to navigate to the planned coordinates and strive to obtain sediment samples in the immediate vicinity of the waste characterization samples. For similar projects, the variance for a hand-held GPS unit is approximately 3-meters. NewFields will strive to minimize the spatial variance when obtaining the field

[6] *Sampling and Analysis Plan – Yosemite Slough Sediment Waste Characterization Study*, Ecology and Environment, Inc., February 1, 2012, Job No. 002693.7008.01SO.

samples and will document the satellite reception and relative accuracy during sampling.

4.2 Sample Depths and Collection

The treatability sample plan requires a relatively large volume of sediments recovered across a depth range similar to a proposed sediment removal action. The large volume of sediments is required to allow multiple, complimentary treatability tests from each sample location. Multiple sediment cores will be collected using either a vibra-core sampler or a modified hand driven piston core sampler. Sediment samples will be collected from the sediment surface to a maximum depth of 3-feet and homogenized.

Individual samples will be collected within the core barrel of the sampler. The samples will be extracted from the core barrel directly into large volume containers such as 5-gallon pails. The samples will be homogenized within each container, labeled and secured for shipping.

4.3 Analytes of Concern

The primary contaminants of concern across the Site are metals and PCBs. Secondary contaminants of concern include total petroleum hydrocarbons (TPH) and pesticides.

Additionally, physical analysis and supplemental chemical analysis of the sediment samples will be completed to characterize the sediments and supernatant from dewatered sediments. The primary analysis for these parameters include grain size of the sediments, suspended and dissolved solids in the dewatered effluent, dissolved chemicals of concern in the dewatered effluent and water content of the dewatered sediments.

5.0 Analytical Testing

Sediment and surface water samples will be collected from four distinct locations as approved by the US EPA. Samples from each location will be segregated and undergo physical and chemical manipulation to evaluate sediment treatability. Analytical samples will be collected through the testing process and submitted to Accutest Laboratories, Inc. for analysis. The analytical list has been selected to assist in evaluating the onsite treatment and disposal options for sediment and effluent from sediment dewatering.

The following sections provide additional information regarding the specific analytical methods and procedures.

5.1 Laboratory Analysis of Sediment Samples

Sediment samples will be submitted to Accutest Laboratories, Inc. for the following laboratory analysis.

- Grain size distribution via ASTM D422
- Grain size distribution of sediment fines via ASTM D854
- Paint filter liquid content test via Method 9095A
- Specific gravity of solids via ASTM D854
- Water content via US EPA 160.3
- Atterberg limits via ASTM D4318
- Total recoverable metals via Method 6010B
- PCBs and PCB congeners via EPA 8082A
- Pesticides via EPA 8081A
- Total petroleum hydrocarbons – fuel oil range (C28+) via EPA 8015
- Volatile solids via EPA 160.4

The treatability study will perform multiple variations and physical manipulations of the samples. Not all samples will undergo the entire analytical list.

Table 1 defines the required minimum sample volumes, the sample containers, the chemical preservatives, handling procedures and the analytical methods for each analysis.

5.2 Laboratory Analysis of Aqueous Samples

Surface water samples will be collected from the deck of the sample boat using a 12 volt submersible pump or a peristaltic suction pump. The samples will be collected at least 6-inches below water surface and 6-inches above the sediment surface near

sample location YC-040. New, disposable, low-density polyethylene (LDPE) tubing will be fitted to the pump with surface water pumped directly into the new, pre-rinsed carboys.

An aliquot of surface water will be collected to measure field parameters (i.e., pH, conductivity, temperature, dissolved oxygen, and redox potential) during sample collection. Surface water quality parameters will also be obtained before sampling and at the completion of sampling. Laboratory-supplied sample containers for chemical analysis will be filled directly from the discharge of the tubing. Additional QA guidelines, including sample handling, decontamination and documentation procedures, are presented in the QAPP.

Aqueous samples including homogenized untreated surface water as well as dewatered effluent will be submitted to Accutest Laboratories, Inc. for the following laboratory analysis.

- Total suspended solids (TSS) via EPA 160.2
- Total dissolved solids (TDS) via EPA 160.1
- Biochemical oxygen demand via EPA 405.1
- Chemical oxygen demand via EPA 410.1
- Total ammonia and TKN via EPA 350.3 and EPA 651.3
- Total phosphorous and total phosphates via EPA 365.2
- Total organic carbon via EPA 9060
- Total recoverable metals via Method 6010B
- PCBs and PCB congeners via EPA 8082A
- Pesticides via EPA 8081A
- Total petroleum hydrocarbons – fuel oil range (C28+) via EPA 8015

Additionally direct-read field instruments will be utilized to determine physical and chemical parameters the US EPA classify as “instant analysis” parameters. At a minimum, these parameters include pH, specific conductivity, dissolved oxygen and Oxidation-Reduction Potential (ORP).

The treatability study will perform multiple variations and physical manipulations of the samples. Not all samples will undergo the entire analytical list.

Table 2 defines the required minimum sample volumes, the sample containers, the chemical preservatives, handling procedures and the analytical methods for each analysis.

5.3 Quality Assurance Samples

Duplicate quality assurance samples commonly referred to as sample duplicates will be collected and analyzed at a general frequency of 1 sample for every 20 sample analysis. The proposed treatability tests include sample preparation, sample manipulation and sample handling, thus duplicate sample selection will be determined based on sufficient sample volume and sample management techniques.

Quality assurance and quality control standards will be closely monitored, documented and maintained throughout the study.

6.0 Field Methods and Procedures

All field activities will follow industry accepted standard operating procedures (SOPs) including documentation of field activities. In addition, NewFields will utilize the following SOPs for the collection of samples as well as observational data.

- SOP for Sediment Sampling utilizing a VibraCore Sampler
- SOP for Sediment Sampling utilizing a Hand Push Piston Core Sampler
- SOP for Decontamination of Sampling Equipment in the Field
- SOP for Documentation of Field Sampling

Copies of the individual SOPs are included within Appendix C. The following sections briefly describe the specific work tasks required to complete the field sample collection.

6.1 Sediment Sampling Process

Sediment samples will be obtained from four (4) predetermined locations across the Site and the Bay area, as identified in Table 3. The western portion of the Slough is intertidal and drains during low tide conditions. The workplan proposes collection of all sediment samples from a boat, however based on previous sample events, portions of the Slough may be accessed via foot during low tide events.

Sediment sampling will begin with a vibracore sediment sampler deployed from a shallow draft boat. The sample equipment will also include hand core sampling tools, as a contingency measure. Field sampling procedures shall follow the individual SOPs including documentation of field sampling activities. The following tasks briefly outline the proposed sediment sampling activities.

1. Prior to field mobilization, all field personnel will review the site specific Health and Safety Plan and become familiar with the project work scope and potential project risks.
2. The field samplers and the boat crew will meet at a pre-determined location. Prior to the start of any field work, the sample team will review the HASP and proposed work activities.
3. All equipment will be loaded and secured on the sampling boat. Prior to leaving the shore, the sample team will complete all pre-mobilization paperwork and field documentation.
4. The sample boat will travel to the first of four predetermined sample locations using a hand held GPS unit. Once at the sample location, a marker buoy will be deployed to visually identify the sample location.
5. The sample boat will be secured using a minimum of a two-anchor system at the proposed sample location.
6. The vibracore system will be prepared utilizing an A-frame or tripod winch mounted on the boat. The aluminum or poly-carbonate vibracore collection barrel shall be pre-cleaned, inspected and then secured to the vibrating head. The field team will strive to utilize polycarbonate core barrels whenever possible and practical.
7. All consumable materials that contact the captured samples will be new, unused material such as the core catcher, the core barrel, the core liner, surface water sampling pipe, etc. These materials will be inspected, washed with an environmental detergent such as Alconox, rinsed with deionized water and inspected. The detergent solution and deionized water rinse will be captured, containerized, sampled and ultimate disposed following lab analysis.
8. Sediment cores will be collected from the sediment surface to a maximum depth of 3.0 feet. Individual core samples will be extruded and composited into 5-gallon pails. A minimum of 24-gallons of sediment will be collected at each sample location; therefore multiple sediment cores must be collected. As an example, if a 4-inch nominal core barrel is utilized, a minimum of 14 cores must be collected.
9. The recovery from each core will be documented including the precise core location, the core depth, the volume of material recovered and the sample container.
10. Surface water samples will be collected at the completion of sediment sample collection. The surface water will be utilized as a dilution fluid for treatability testing.
11. All field equipment that comes in contact with the sediments will be field decontaminated between the sample sites.
12. Upon completion of sediment and surface water sampling, the sample team will relocate to the next sample location. Due to the variations in the tide, the sample

team must coordinate sample locations and tide levels to complete the field sampling activities.

6.2 Sample Equipment

The following list provides the minimum sample equipment and materials that will be utilized for the project:

- Aluminum and/or polycarbonate core barrels, 4-inch nominal diameter x 5-feet long
- Core barrel cutter heads without core catchers
- 4-inch nominal push-in core caps
- Core barrel cutter heads with integral core catchers
- Vibratory hammer system with control box
- Gasoline powered generator
- Stainless steel sample handling tools such as scoops or trowels
- Hand-held GPS unit
- Waterproof digital camera
- Multi-component water quality meter, such as YSI Quattro or equivalent
- Fiberglass measurement tape with depth weight
- Floating surface buoy, line and integral weight
- Stainless steel sample homogenization bowls
- Deionized water
- Alconox detergent
- Decontamination buckets and brushes
- Waste storage containers or plastic trash bags
- Sample handling materials including sample gloves, sample containers, coolers, labels, markers and chain-of-custody
- Field documentation including waterproof field book, sample location map, Health and Safety Plan, Treatability Study Workplan, emergency contacts list

6.3 Field Documentation

All aspects of the field sampling activities will be documented within permanent, write-in-the-rain field books or waterproof field data sheets. The following data milestones will be recorded at each day and at each sample location. Individual and unique field sheets as well as individual field book pages will be used for each sample day.

o The day of week and date of each work day

- The names, company affiliations and general work activities conducted for all sample team members
- An inventory of major sampling equipment including a description of the vibratory hammer, the GPS unit, the digital camera and the piston core sampler.
- A log of sample locations and sample collection activities including the location and time each sediment core is recovered and containerized.
- A log of all photographs including daily time synchronization of the GPS unit with the digital camera, all samples, labeled sample containers, photographs of the sample equipment and photographs of the GPS locations.
- A chronologic summary of daily activities including at a minimum the meeting time for the team, the time of the health and safety meeting, the start time on the water, the time individual sample activities begin at a sample location, the time individual sample activities end at a location, the transit time between sample locations, the time off the water and the time all team members exit the site.
- A tabular list of the samples that were collected including the sample location, the sample times, the sample containers, the preservation techniques and/or chemicals used, the sampler's name, the sample identification name, the proposed laboratory and the proposed shipping method.
- A tabular list of field readings including water quality measurements, water depths, and the time of each reading.
- A description of the individual samples including color, texture, odor, sediment content, water content, sample depth, supplemental materials within the sample and any other characteristic of interest.
- A site sketch to supplement the GPS sample location grid.
- The shipping method and shipping documentation for the samples, including way bill or transport identification numbers if immediately available.
- A name and signature line for each team member that entered data into the field log or onto the field data sheets.

6.4 Digital Photographs

The field team will strive to utilize only one digital camera during each sample day. Digital photographs will supplement the field notes and data collection sheets, while also providing a digital record of complex field conditions or complex data sets. A log of all photographs will be captured within the field book and no photographs will be deleted during the work day.

The digital camera shall record the date and time of each photograph and consecutively number each photograph. The field team shall also utilize the same set-up options for the camera during each sample day, such a megapixel quality, automatic light adjustments, automatic focus settings, etc.

6.5 Global Positioning System and Ground Mapping

The field team shall utilize at least one and preferably two hand held global positioning system (GPS) units. Each GPS unit shall include a digital display of the location of the unit, the date and time of the reading, the estimated accuracy of the reading and an automatic point designation and naming system. At least one member of the field team will be fully trained in all functions of the GPS unit including plotting navigation courses, recording and recovering geographic coordinates and reviewing a log of the daily location track for the unit.

If at all possible, two independent GPS units will be used with one unit used by the sample team and a separate unit used by the boat captain. When two GPS units are used, both units shall be set to the same geographic coordinate system and the same units of measure; i.e. degrees-minutes-second, or degrees in decimal format, etc.

If the field team must convert the location coordinates, the field conversion will be completed through the GPS unit and will not be completed via field calculation. If required, the field team will enter the point of interest into the GPS unit via the base unit of measure (e.g. dd-mm.mmm); the team will save the location in the GPS unit and then change the units of measure through the setup of the GPS unit (e.g. dd.dddd). Through this method, the GPS unit will perform the conversion of the location units. If this conversion is required, the location point shall be recorded in both the base unit of measure and the converted unit of measure within the field book.

6.6 Field Decontamination Procedure

The field team shall strive to provide single use, disposable equipment or multiple pre-cleaned pieces of equipment in order to minimize field decontamination procedures. All sampling equipment will be pre-cleaned or field decontaminated prior to each sampling event. Field decontamination procedures for this workplan are described in the SOP for Decontamination of Sampling Equipment in the Field attached to this workplan.

Field decontamination will include a bay water rinse of all parts, initial brushing and physical agitation to remove any loose materials, a deionized water (DI) rinse, a detergent wash with a bristled brush and Alconox-DI water mixture, a DI water rinse and

a field inspection of the equipment. All dilute detergents and DI water rinsate will be captured at each sample location. Decontamination fluids will be returned to the shore for subsequent storage in a 55-gallon waste drums, followed by waste characterization sampling of the material. The ultimate disposal of decontamination fluids will be determined once the results of the waste characterization analysis are received.

Bulk sediment samples will be obtained for the treatability testing. In order to minimize the introduction of introduced contaminants, the field team will not utilize chemical solvents such as acetone, methanol, hexane, nitric acid or methylene chloride for field decontamination activities.

7.0 Investigation Derived Waste

The proposed field sampling activities will include the generation of waste materials known as investigation derived waste (IDW). The US EPA mandates the management of IDW must ensure protection of human health and the environment. The following IDW may be generated as part of this workplan:

- Used personal protective equipment (PPE); e.g. sample gloves, tyvek suits, disposable hearing protection, disposable face shields, etc.

- Disposable sampling equipment which has been used and contacted potentially impacted media; e.g. polycarbonate sample tubes, aluminum cutter heads, plastic spoons, plastic core catchers, etc.

- Packaging and storage waste materials; e.g. aluminum foil, plastic baggies, DI water containers, manufacturer's packaging material, etc.

- Liquids and solids from field decontamination procedures; e.g. decontamination fluids, rinsate liquids, etc.

- Sediments and source water samples that are not destroyed during the treatability testing.

The field team will strive to minimize the generation of IDW to reduce the need for special storage or disposal requirements that may result in substantial additional costs yet provide little or no reduction in site risks relative to the final remedial action. Generation of IDW will be minimized through proper planning of the field activities that may generate IDW, as well as through use of screening information from the site inspection. This workplan will utilize the guidance provided in the Office of Emergency

and Remedial Response Directive 9345.3-02 (May 1991), which provides guidance for management of IDW during Site investigations. The field team will manage the individual waste streams in similar manners, with the goal to minimize the volume of IDW. The following procedures shall be used for the individual waste streams:

- Used PPE, disposable sampling equipment and package materials will be managed together and minimized whenever possible. These wastes are not considered hazardous and can be sent to a municipal landfill. These wastes will be stored within heavy duty, rip-stop trash bags until filled to 80% capacity. The bags will be compacted using manual pressure, standing air will be removed to the extent practical and the bags taped shut. If a bag contains sharp objects or there is a potential for the bag to rip, the bag will be isolated with an outer over-pack bag.

- Decontamination fluids from this workplan will include deionized water, a dilute solution (2% to 5%) of Alconox non-phosphate detergent, source water, inherent sediment pore water and sediment solids. The three latter materials are generated from the site and the DI water and Alconox are approved for direct disposal to the environment. The decontamination fluid will be captured at each sample location. Decontamination fluids will be returned to the shore for subsequent storage in a 55-gallon waste drums, followed by waste characterization sampling of the material. The ultimate disposal of decontamination fluids will be determined once the results of the waste characterization analysis are received.

- Supplemental sediment and site water that is not destroyed during treatability testing will be returned to the site. These materials will be placed within labeled and secured 55-gallon waste drums. The material will be sampled for waste characterization and secured while the waste characterization sampling is completed. The ultimate disposal of sediments and site water will be determined once the results of the waste characterization analysis are received.

8.0 Sample Management and Documentation

This treatability study workplan proposes the collection of two unique types of samples; 1) bulk sediment and water samples from the investigation area which are obtained for the completion of treatability tests and 2) modified, amended or chemically manipulated treated samples for laboratory analysis. The sample naming convention as well as documentation such as chain-of-custody procedures will be identical for both types of samples throughout the treatability study. However sample handling, sample shipping and holding times will be different for each sample type.

8.1 Sample Naming

All treatability samples will be assigned a unique sample name. Since the treatability samples will be collected in the immediate vicinity of the US EPA waste characterization samples, the treatability study sample names will include a similar numbering format. The following provides an example naming format for the treatability study samples.

Example sample name: TS-038-SC01-W

Sample naming key:

TS- A 2 letter designation indicating a treatability study sample

###- The 3-digit unique sample number assigned by the US EPA waste characterization sample team. The Waste Characterization workplan proposes sample numbers including 038, 040, 041 or 043.

SC A 2 letter designation indicating the treatability test that was used to generate the sample. The following minimum sample names shall be used for this treatability study.

RS – Raw sample which has not been manipulated

SC – Settling column sample

PA – Polymer addition sample

GT – Geotextile filtered sample

FP – Filter press sample

##- The 2-digit sample number assigned by the treatability study test technician. The numbers will be assigned consecutively for each treatability test and are expected to range from 01 to 10.

W A single letter designation of the type of sample media. For this workplan the media designation will be either W for an aqueous sample and S for a sediment sample.

The sample name as identified above is treatability sample 038, obtained from the vicinity of waste characterization sample YC-038. This is the first sample (01) which was taken from a settling column test (SC) and the sample is a water sample (W).

8.2 Sample Containers, Preservatives and Holding Times

All bulk treatability samples will initially be secured in new, clean, bulk sample containers; either 5-gallon US DOT rated pails with removable lids or 1-gallon lined metal paint containers.

Samples that will be submitted for laboratory analysis will be secured within pre-cleaned laboratory grade sample containers that are provided by the laboratory. Sample containers, along with sample coolers will be shipped to the treatability laboratory for testing and manipulation. Analytical the samples will be collected, labeled, preserved and shipped directly the analytical laboratory.

Section 5 of this workplan provides further information regarding the sample volumes, analytical testing procedures and sample containers necessary for each analysis.

Laboratory holding times for “raw” untreated or un-manipulated samples will be begin on the sample collection date. Holding times for treated or manipulated samples from the treatability study will be based upon the date the treatability studies begin or chemical manipulation of the samples begins.

8.3 Sample Packaging and Shipment

All samples will be packaged and shipped using industry standard procedure to minimize the potential for sample damage while maximizing the physical stability of the sample containers including temperature stability. Each sample container will be uniquely labeled with the following information:

- Sample name, as identified in the previous section of this report
- Sample date; e.g. March 10, 2012 or 3/12/12
- Sample time in 24-hour clock format: e.g. 13:15
- Sampler’s initial; e.g. 2 or 3 letter initials as selected by the sampler
- Project Name: Yosemite Slough Treatability
- Sample media; e.g. Surface Water, Sediment, etc.

- Container number; e.g. 1 of 3 jars
- Sample preservative, if applicable
- Special handling requirements, if applicable or if space allows.

All samples will be containerized as quickly as possible following collection, documentation and inspection of the sample media. All sample containers will be new, clean, dedicated containers which are ordered and delivered for this project. Individual sample containers will be packed and secured within US Department of Transportation shipment containers or in the case of bulk containers, each container will have an acceptable US DOT rating. A group of samples that are packed and shipped together will be termed a sample shuttle. As an example, 10 aqueous samples, each containerized within individual 100-ml sample containers may be combined within a 40-quart sealed cooler to create one sample shuttle.

All sample containers shall be inspected and itemized on a chain-of-custody document. At least 2 copies of the chain-of-custody shall travel with the samples including at least one dedicated copy secured within or attached on the exterior of each sample container. The field teams will directly transfer samples to a laboratory representative or transfer samples via an experienced transportation and delivery firm, such as United Parcel Service. The transportation provider will include the ability to track the location of each sample shuttle via a unique shipping identification number which shall be assigned to each sample shuttle.

8.4 Chain-of-Custody Documentation and QA/QC Forms

All members of the project team will follow the procedures for managing samples through the chain-of-custody (COC) format. All information required for the COC will initially be captured within the field notes, site data sheets and/or field book by the sampling scientist. The sampling scientist will maintain physical possession of all samples while conducting field activities. Prior to completion of each work day, the sampler shall prepare a COC describing each sample container within each sample shuttle. The following minimum information will be included on each COC:

- Project name or unique designation
- Sampler’s name
- Sampler’s contact information including phone number and e-mail address
- Sampler’s company affiliation
- Unique sample name for each sample
- Sample date
- Sample time

- Sample matrix
- Quantity of sample containers
- Preservatives
- Volume of sample or sample container
- Optionally, the COC may include the type of sample that was collected, such as a “normal” sample, a duplicate sample, a spiked sample, a field blank, a rinsate blank, a trip blank, etc.
- Analysis requested or handling procedures for each sample
- Receiving destination for the samples
- A contact name at the receiving destination
- A phone number and e-mail for receiving destination
- Note for special handling or special instructions
- A table of sample control documenting each person to receive and then relinquish the sample shuttle including a minimum of four lines
- A notation of whether the COC includes sample containers in multiple sample shuttles or only one sample shuttle.

At least one copy of the chain-of-custody form shall be included within each sample shuttle. The sample team may elect to capture all site information within an electronic chain-of-custody format. If selected, all information within the electronic COC will be duplicated within the field book or field notes. Also, at least 2 copies of the COC will be printed at the time the sample shuttles are packaged; one for record purposes and one for transportation with each sample shuttle.

A Quality Assurance/ Quality Control sample summary form will be initiated with the preparation of the COC for each sample shuttle. The QA/QC form will include a summary of all sample containers and the physical handling of all samples, including the quality of the sample preservative. The QA/QC form will also identify the analytical goals for each sample including normal analysis, a reference blank, a field procedure confirmation blank or a laboratory confirmation blank. A copy of the QA/QC form for each appropriate sample container will be published with all laboratory reports.

9.0 Quality Assurance and Quality Control Procedures

The sample collection team and treatability testing team will strive to maintain the highest level of quality control for sample collection and sample handling. Whenever a deviation from industry accepted quality assurance and quality control measures occurs, each deviation will be documented including the deviant action, the rationale for the deviation, the potential effect on sample results and the people who were notified regarding the deviation. The purpose of the QA/QC program is to help ensure that legally defensible data which meets US EPA criteria will be generated in cases where the full EPA Laboratory program protocols are not followed.

9.1 Field Blanks

No quality assurance samples including field blanks are proposed as part of the treatability study. The unique and often repetitive and duplicative treatability testing negates the usefulness of quality assurance samples.

Quality assurance and quality control standards will be closely monitored, documented and maintained throughout the study.

9.2 Laboratory Quality Control Samples

The volume of sample collected and submitted for laboratory analysis will be sufficient to allow the testing laboratory to perform quality control testing on random samples. At a minimum, for analytical chemistry samples, one laboratory quality control sample will be randomly analyzed for each 20 samples analyzed. These QC samples will be randomly selected based on the batch of samples that are being analyzed for each analytical method. These QC standard samples will be reported with the laboratory analysis for each analytical parameter.

Each analytical laboratory shall perform matrix spike (MS) and matrix spike duplicate (MSD) samples to evaluate the quality control standards for each analysis. MS/MSD samples are analyzed to assess potential matrix effects upon the data and their potential effects regarding the accuracy and precision of the analysis. MS/MSD (organic analyses) and MS/LD (inorganic analyses) samples will be analyzed at a minimum frequency 5 percent of total samples to evaluate analytical accuracy and precision. All MS/MSD sample descriptions and analysis shall be reported with the laboratory analysis package for each parameter. The laboratory shall report all quality assurance results that are beyond acceptable analytical limits. The laboratory shall specifically identify QA results in a distinct non-conformance section of each lab report.

Method blanks evaluate the existence and magnitude of cross-contamination resulting from laboratory procedures. Laboratory method blanks will be analyzed at the frequencies prescribed by each analytical method and in coordination with the laboratory's internal procedures.

9.3 Field Data Validation

All field information shall be recorded in sequentially numbered, bound logbooks, using non-erasable, waterproof ink. The logbook pages must themselves be sequentially numbered from one through the end. The use of standardized forms (e.g., Field Trip Approval form, Field-Sampling Request form, Field Data Sheet, Well-Sampling Data Log, Equipment, Calibration forms, etc.), is permitted, but these forms should be assembled prior to field use. The COC Custody Record must also be kept in the project files along with the other logbooks and field documents. The field data validation process should evaluate the following items:

1. That properly-calibrated instruments have been used;

2. That appropriate Standard Operating Procedures (SOPs) have been followed; and

3. That accurate and complete records of field activities have been maintained.

9.4 Analytical Data Deliverable Requirements

The analytical documentation should include an organized summary of the final results, a copy of signed chain-of-custody for each sample, and all quality control documentation, including a case narrative that explains any QA/QC or analysis problems encountered and the corrective actions taken. Specifically, analytical documentation should include the following data within the final deliverable package:

A. Documentation of analysis dates and methods showing:

1. Sampling date,
2. Facility sample number and lab sample number,
3. Preservative used (when applicable),
4. Extraction date (when applicable),
5. Digestion date,
6. Analysis date and time of day,
7. Extraction, digestion, and analytical method numbers,
8. Report date, and

9. Chain-of-custody report.

B Results of method and lab blanks, including detection limits.

C. Results of lab replicates (when applicable).

D. Results of instrument calibration documented by:

1. Calibration curve for each metal,
2. Correlation coefficient for each metal, and
3. Standard deviation and relative standard deviation of the organic analytes.

E. Initial calibration verification and continuing calibration verification documented by:

1. Results of verification standard analysis (concentration of standard) and
2. Percent recoveries.

Aroclor Calibration Notation:

For method 8082A aroclor analysis, the laboratory shall conduct calibration using the 1660 multipoint calibration standard as well as individual calibration standards for Ar 1254 and Ar 1260.

F Results of matrix spike/matrix spike duplicate (MS/MSD) analysis documented by:

1. Concentration of analyte in original sample (before spiking),
2. Amount of spike for each component,
3. Spiked sample result for each component,
4. Percent recovery of each component,
5. Relative percent difference of each component, and
6. Analysis date and time.

G. Results of Method of Standard Additions (when applicable).

H. Results of Laboratory Control Sample.

I. Detection limits summary report.

J. Holding times summary report.

The laboratory shall provide all chromatograms for EPA 8015 and EPA 8082A analysis plotted at approximately 50% vertical scale. All chromatograms shall be provided in hard copy as well as digital form.

9.5 Laboratory Data Validation

The laboratory data validation process begins with the analyst at the bench-level and concludes with the Lab QA Officer. The list of laboratory reportables is included previously. "Non-reportable" items are those parameters that are not required in routine reports however, the data would be necessary for a full validation when requested. Non-reportable data/records must be maintained by the laboratory (along with reportable data) organized by project/batch. Active files must be maintained for a period of at least one (1) year from data generation. Archived files must be maintained for the prescribed life of records specified by the US EPA or for five (5) years, whichever is greater. Laboratory QA Officers are often responsible for the completeness of these file; however, a laboratory may have this assigned to other responsible staff.

9.6 Third Party Validation

When required by the project, full data validation shall be performed in general accordance with EPA National Functional Guidelines for Superfund Organic Methods Data Review (USEPA-540-R-08-01, June 2008, http://www.epa.gov/superfund/programs/clp/download/somnfg.pdf) and National Functional Guidelines for Inorganic Data Review (EPA 540-R-04-004, October 2004, http://www.epa.gov/superfund/programs/clp/download/inorgfg10-08-04.pdf). The Functional Guideline documents are written specifically for use with CLP methods. If SW846 methods are used rather than CLP methods, the guidelines need to be adapted for SW846 methods and project specific QA/QC criteria but following the basic concepts that are established in the Functional Guideline documents.

9.7 Data Variances

Data variances, either field data, electronic data, laboratory data or other data, will be recorded and documented during the project. A tabular listing of data variances will be prepared and submitted with the Treatability Study report. The table shall document the data type, the data purpose, a narrative of the variance or data excursion and the amended, a description of whether the data will be utilized or expunged, and (if utilized) the corrected or selected data value that will be utilized in the data evaluation.

9.8 Data Management

All field and laboratory data will be compiled into a geospatial database. The database will connect the chronologic data, spatial data, observational data and analytical data to combine "geo" (spatial data) with "database" (data repository) to create a central data repository for spatial data storage and management.

An electronic copy of the geodatabase will be submitted with the Treatability Study, however the file will be marked “Draft” as the database will not be fully investigated for data validity. The geodatabase will be provided as a screening and data mining tool.

10.0 Treatability Testing

The US EPA plans to prepare an Engineering Evaluation/ Cost Assessment (EE/CA) which evaluates the costs to complete various remedial actions including removal and disposal of sediments in the Site. The goal of this treatability study is to characterize and quantify variations in sediment materials across the site as well as characterize dewatered sediment effluent quality. The details of the removal action have not been finalized including depth and location of the removal, removal methods and restoration methods. As these processes are uncertain the treatability test plan has been developed to provide a broad range of information to support further design plans and the EE/CA document.

The treatability testing will work to address the following project questions:

1. What is the variability in physical characteristics of the sediments across the Slough area? This data will be combined with previous grain size analysis to evaluate this condition.

2. What are the gravity dewatering performance details for untreated sediments from the Slough?

3. Can chemical additives aid in dewatering performance?

4. Can mechanical methods improve dewatering performance including an evaluation of dewatering bags and a mechanical dewatering system?

5. What is a chemical characteristic of supernatant from a land based dewatered operation using gravity dewatering, chemical dewatering additives and a combination of chemical additives with a mechanical system?

6. What is the expected water quality variation that may be expected if mechanical dredging is selected verses hydraulically dredging operations?

7. What is the predicted water quality from a land based sediment dewatering system?

10.1 Treatability Test Plan

The project questions identified above requires multiple analyses of physically and chemically manipulated sediment and surface water samples. The following items describe the proposed test stages that will be completed in a conceptual order of

testing. However, results of one manipulation technique may vary the test procedures slightly. The City and NewFields will provide preliminary results and verbal reports of the project testing to the US EPA as requested. Table 4 describes the analytical testing that is proposed for sediments and an estimated number of test samples for each of the test stages described below.

The treatability study will focus on the sediment horizon from 0 to 3 feet below the sediment surface. The study has been developed assuming homogenized sediments from this horizon are representative of any sediments removed in this zone and that vertical variations in sediment material handling and dewatering across this zone may be neglected. In other words, the sediment testing results may be extrapolated down to a removal depth of less than 3 feet or up to a removal depth greater than 3 feet.

Stage 1 Physical and Chemical Characteristics of Raw Sediments

A homogenized sample of a 0 to 3 feet deep vertical profile of sediments and inherent pore water will be submitted for physical and chemical analysis from each of the four (4) sample locations. Individual 3-feet long sediment cores will be captured, containerized in 5-gallon containers and field homogenized. One bulk, homogenized sediment sample will be collected from each of the four sediment sample locations. Bulk samples will be prepared by homogenizing equal volumes of sediment from each of the 5-gallons sediment containers. Bulk sediment sample will analyzed for chemicals of concern and physical characteristics.

The bulk sediment samples and surface water will be used to generate elutriate samples following dredge elutriate test (DRET) procedures. DRET analysis will be used to evaluate the potential water quality impacts during dredging actions. The DRET simulates the release of sediment-bound and porewater constituents into the receiving water column at the point of dredging. The DRETs will performed in accordance with US ACE guidance and the procedure published in DiGiano et al., 1995.

Stage 2 Evaluation of Chemical Additives

Jar testing using the Standard Practice for Coagulation-Flocculation Jar Test (ASTM D2035) procedures will be completed using laboratory prepared sediment slurries. Each of the four slurry samples will be prepared using 20% by volume bulk sediment material and 80% by volume bay surface water and mechanical mixing techniques. Each of the four samples will undergo multiple chemical manipulations, including variations in chemicals as well as chemical concentrations.

All four sediment samples will undergo jar testing, however it is assumed the four samples will behave similarly. Therefore not all samples may undergo testing with all chemical additives or all chemical concentrations. All samples will be evaluated using the three most favorable chemical additives.

Suspended solid (TSS) and dissolved solid (TDS) samples will be captured from the elutriate following manipulation with the three most favorable chemical additives.

Stage 3 Textile Dewatering System Performance

Homogenized sediment samples and surface water samples will be tested using a representative sediment slurry and geotextile dewatering fabrics such as TenCate. Individual sediment slurries will be prepared by combining 20% by volume bulk sediment material and 80% by volume bay surface water and mechanical mixing techniques. If large solids are identified in the slurry preparation, the slurry will be passed through a #4 sieve to remove materials larger than 4.75 mm.

The lab will initially perform jar testing using the 2 optimum chemical additives identified in Stage 2 above. The optimum performance of geotextiles includes capturing fine grained sediments effectively without “blinding” the textile weave. Also, the potential effects of adhesion of sediments to the textile will be evaluated. Upon completion of 2 dewatering tests, alternate chemical additives will be evaluated to optimize geotextile performance.

Select geotextile effluent will be submitted for total suspended solids concentrations.

Dewatered sediment samples will be submitted for laboratory analysis including physical and chemical parameters as described in Table 4.

Stage 4 Mechanical Dewatering System Performance

Homogenized sediment samples and surface water samples will be evaluated for mechanical dewatering actions. As currently proposed, a bench scale plate and frame dewatering system will be evaluated. Individual sediment slurries will be prepared by combining 15% by volume bulk sediment material and 85% by volume bay surface water and mechanical mixing techniques. If large solids are identified in the slurry preparation, the slurry will be passed through a #8 sieve to remove materials larger than 2.38 mm.

The testing will utilize at least 2 different chemical additives as identified in Stage 2 testing above. Alternate chemical additives may also be evaluated based on the preliminary test runs. Similar to sediment "blinding" across the textile bag, chemically treated sediments may blind across the filter press plates and decreased the effectiveness of the dewatering operation. The optimum chemical additive for gravity settling may not be the optimum additive for a mechanical filtration system.

Select filter press effluent will be submitted for total suspended solids concentrations.

Dewatered sediment samples will be submitted for laboratory analysis including physical and chemical parameters as described in Table 4.

Stage 5 Gravity Settling and Elutriate Testing

Test stages 1 through 4 provide preliminary screening results including solids removal testing. Upon selection of the apparently optimum chemical additive, large volume Modified Elutriate Test (MET) preparation techniques will be utilized to generate sufficient sample volumes for expanded chemical analysis. The MET simulates dissolved and particulate associated concentrations of contaminants in the effluent from a gravity separation system and was completed to evaluate short-term water quality impacts from an onsite treatment system including a CDF, geotextile bags or temporary sediment retention cells. The MET will be conducted following guidelines in Palermo (1985).

During Stage 5 testing, homogenized sediment samples and surface water samples will be evaluated for mechanical dewatering actions. The laboratory technicians will evaluate physical variations in sediment samples and create a representative sediment slurry combining 15% by volume bulk sediment material and 85% by volume bay surface water using mechanical mixing techniques to simulate a hydraulic dredge material (15/85 material). The laboratory will also prepare a 30% by volume bulk sediment material and 70% by volume bay surface water to simulate mechanical dredge operations (30/70 material). If large solids are identified in the slurry preparation, the slurry will be passed through a #8 sieve to remove materials larger than 2.38 mm.

Untreated sediment samples will undergo mixing and aeration during the MET manipulations to evaluate dredge system operation. The following points describe the variations in sample manipulation and analytical testing.

- ✓ Baseline untreated 15/85 samples will undergo mixing, physical screening (if needed), 1-hour aeration, and MET elutriate generation. The solids will be allowed to gravity settle for a period of 24-hours, while elutriate samples will be

collected at 1-hour to simulate a hydraulic dredge removal and gravity dewatering action similar to disposal in a CDF.

- ✓ Baseline untreated 30/70 samples will undergo mixing, physical screening (if needed), 1-hour aeration, and MET elutriate generation. The solids will be allowed to gravity settle for a period of 24-hours, while elutriate samples will be collected at 1-hour to simulate a mechanical dredge removal and gravity dewatering action similar to disposal in a CDF.

- ✓ Untreated 15/85 samples will undergo mixing, physical screening (if needed), 1-hour aeration, chemical addition based on the optimum Stage 2 testing and MET elutriate generation. The solids will be allowed to gravity settle for a period of 24-hours, while elutriate samples will be collected at 1-hour to simulate a hydraulic dredge removal and gravity dewatering action similar to disposal in a CDF.

- ✓ Untreated 15/85 samples will undergo mixing, physical screening (if needed), 1-hour aeration, chemical addition based on the optimum Stage 3 testing and geotextile filtration following a MET elutriate generation. The solids will be allowed to gravity settle for a period of 24-hours, while elutriate samples will be collected at 1-hour to simulate a hydraulic dredge removal and geotube textile filtration system.

- ✓ Untreated 15/85 samples will undergo mixing, physical screening (if needed), 1-hour aeration, chemical addition based on the optimum Stage 4 mechanical dewatering testing following a MET elutriate generation. The solids will be allowed to gravity settle for a period of 24-hours, while elutriate samples will be collected at 1-hour to simulate a hydraulic dredge removal and mechanical dewatering sediment.

If sufficient sediment volume is available, duplicate tests using different sediment slurry concentrations will be conducted.

Following 24-hour gravity settling, sediment samples will be submitted for laboratory analysis including physical and chemical parameters as described in Table 4. After one-hour of settling, elutriate samples from each test will be collected and submitted for chemical analysis.

10.2 Treatability Study Report

A Treatability Study Report will be prepared and submitted to the City / County of San Francisco. The following major categories present the conceptual table of contents for the Treatability Study Report.

<u>Proposed Table of Contents</u>

1.0 Introduction

2.0 Treatability Workplan

3.0 Field Data Collection

4.0 Sample Management

5.0 Bench Testing Activities

- 4.1 Untreated Water Testing
- 4.2 Chemical Addition / Flocculent Testing
- 4.3 Physical Filtration Water Testing
- 4.4 Chemical Addition/ Solids Settling Testing
- 4.5 Mechanical Dewatering Testing

6.0 Treatability Data Results and Interpretations

7.0 Quality Assurance and Quality Control Review

8.0 Residuals Management

9.0 Health and Safety

10.0 Summary and Data Recommendations

11.0 Proposed Project Schedule

The City, US EPA representatives, representatives from NewFields and other parties have discussed the treatability study work scope, as well as the waste characterization sampling work scope and other investigation tasks. The US EPA plans to integrate the results of these studies to prepare an Engineering Evaluation and Cost Analysis in the very near future. The City is committed to assist the US EPA in a timely and effective manner. The following conceptual project schedule presents the project milestones to complete the treatability study:

Work task	Completion date
Stakeholder review of the workplan	March 19, 2012
Obtain treatability samples during high tide event	March 28 to April 6, 2012
Preliminary treatability testing	April 10, 2012
Receive laboratory reports	April 30, 2012
Prepare Treatability Study Report	May 25, 2012

12.0 References

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FIGURES

1 inch = 2,000 feet

Legend

- Preliminary US EPA Yosemite Creek Site Boundary
- Road
- Buildings

Note:

1. Preliminary Site Boundary identified by US EPA contractor; Ecology and Environment, Inc. in Waste Characterization Study, Sampling and Analysis Plan.
2. Waste characterization sample locations were were provided by ENE following March 2012 sampling.
3. Treatability samples will be capture from 4 WCS sample locations; YC-038, YC-040, YC-041 and YC-043.

NEWFIELDS

Figure 1
Site Location Plan

Sediment Treatability Study Workplan
Yosemite Slough Sediment Site
San Francisco Bay, San Francisco, CA

1 inch = 2,000 feet

Note:

1. Preliminary Site Boundary identified by US EPA contractor; Ecology and Environment, Inc. in Waste Characterization Study, Sampling and Analysis Plan.

2. Waste characterization sample locations were were provided by ENE following March 2012 sampling.

3. Treatability samples will be capture from 4 WCS sample locations; YC-038, YC-040, YC-041 and YC-043.

Legend

- Preliminary US EPA Yosemite Creek Site Boundary
- Road
- Buildings

NEWFIELDS

Figure 2

Roadway and Area Location Plan

Sediment Treatability Study Workplan
Yosemite Slough Sediment Site
San Francisco Bay, San Francisco, CA

1 inch = 450 feet

Legend

- Preliminary US EPA Yosemite Creek Site Boundary
- Road
- Buildings

Note:

1. Preliminary Site Boundary identified by US EPA contractor; Ecology and Environment, Inc. in Waste Characterization Study, Sampling and Analysis Plan.
2. Waste characterization sample locations were were provided by ENE following March 2012 sampling.
3. Treatability samples will be capture from 4 WCS sample locations; YC-038, YC-040, YC-041 and YC-043.

NEWFIELDS

Figure 3
Investigation Area Plan

Sediment Treatability Study Workplan
Yosemite Slough Sediment Site
San Francisco Bay, San Francisco, CA

1 inch = 450 feet

Legend

- Proposed Treatability Sample Locations
- EPA Waste Characterization Samples 03-2012
- Preliminary US EPA Yosemite Creek Site Boundary
- Road
- Buildings

Note:

1. Preliminary Site Boundary identified by US EPA contractor; Ecology and Environment, Inc. in Waste Characterization Study, Sampling and Analysis Plan.
2. Waste characterization sample locations were were provided by ENE following March 2012 sampling.
3. Treatability samples will be capture from 4 WCS sample locations; YC-038, YC-040, YC-041 and YC-043.

NEWFIELDS

Figure 4
EPA WCS Sample Locations

Sediment Treatability Study Workplan
Yosemite Slough Sediment Site
San Francisco Bay, San Francisco, CA

TABLES

Table 1

Sediment Sample Analysis List

Workplan to Perform Sediment Treatability Study

Sediment Analysis	**pH**	**Grain Size Distribution**	**Grain-size distribution for finer fraction**	**Paint Filter Liquids Test**	**Specific gravity**	**Water Content**	**Atterberg limits**	**Total Recoverable Metals**	**Total Organic Carbon**	**PCBs and PCB congeners**	**Pesticides**	**Total petroleum hydrocarbons – fuel oil range (C28+)**	**Total Volatile Solids**
Laboratory Method	Super natant	ASTM D422	ASTM D854	Method 9095A	ASTM D854	USEPA 160.3	ASTM D4318	SW-846 Method 6010B/7 471A	USEPA 9060	USEPA 8082A	USEPA 8081A	USEPA 8015	USEPA 160.4
Sample Volume	10 grams	100 grams	100 grams	100 grams	100 grams	100 grams	100 grams	10 grams	10 grams	30 grams	10 grams	10 grams	40 grams
Sample Container	100 ml glass	250 ml glass	250 ml glass	250 ml glass	250 ml	250 ml glass	250 ml glass	100 ml glass	100 ml glass	100 ml glass	100 ml glass	100 ml glass	250 ml glass
Sample Preservative	Cool 4°C	None	None	None	None	None	None	Cool 4°C	Cool 4°C	Cool 4°C	Cool 4°C	Cool 4°C	Cool 4°C
Laboratory Holding Time	15 minutes	No limit by method - <6 months	No limit by method - <6 months	No limit by method - <6 months	No limit by method - <6 months	No limit by method - <6 months	No limit by method - <6 months	6 months	7 days	7 days to Extract - 40 days after extraction	7 days to Extract - 40 days after extraction	14 days to Extract - 40 days after extraction	7 days
Estimated Quantity of Samples	16	4 to 8	4 to 8	12 to 16	4	12 to 16	4 to 8	8 to 12	8 to 16	8 to 12	8 to 12	8 to 16	4 to 8

Notes:

1. The defined sample volume may be decreased through simultaneous laboratory sample processing.
2. Whenever possible, the sample volume will be decreased without allowing the laboratory to increase detection limits or analytical accuracy.

Table 2

Aqueous Sample Analysis List

Workplan to Perform Sediment Treatability Study

Aqueous Analysis	**pH**	**ORP**	**Specific Conductivity**	**Total Suspended Solids (TSS)**	**Total Dissolved Solids (TDS)**	**Biochemical Oxygen Demand**	**Chemical Oxygen Demand**	**Total NH3/TKN**	**Total P/PO4**	**Chlorides**	**Total Organic Carbon**	**Total Recoverable Metals**	**Dissolved Metals**	**PCBs and PCB congeners**	**Total petroleum hydrocarbons – Diesel and fuel oil range (C20 through C44)**
Laboratory Method	Direct read	Direct read	Direct read	EPA 160.2	EPA 160.1	EPA 405.1	EPA 410.4	USEPA 350.3 /351.3	USEPA 365.2	SW-846 9056	USEPA 9060	SW-846 Method 6010B/ 7471A	SW-846 Method 6010B/ 7471A	USEPA 8082A	USEPA 8015
Sample Volume	Meter specific	Meter specific	Meter specific	100 ml	100 ml	1000 ml	50 ml	400 ml	50 ml	50 ml	25 ml	100 ml	100 ml	1000 ml	1000 ml
Sample Container	N-A	N-A	N-A	250 ml glass or HDPE	250 ml glass or HDPE	1 liter glass or HDPE	250 ml glass or HDPE	500 ml glass or HDPE	100 ml glass or HDPE	100 ml glass or HDPE	100 ml plastic	500 ml glass or HDPE	500 ml glass or HDPE	1 liter glass or HDPE	1 liter glass or HDPE
Sample Preservative	None	None	None	Cool 4°C	Cool 4°C	Cool 4°C	Cool 4°C & HCl pH<2	Cool 4°C & H2SO4 pH<2	Cool 4°C & H2SO4 pH<2	Cool 4°C & H2SO4 pH<2	Cool 4°C & H2SO4 pH<2	HNO3 <pH2	HNO3 <pH2	Cool 4°C & 0.008% Na2S2O3 /L	Cool 4°C & HCl pH<2
Laboratory Holding Time	N-A	N-A	N-A	7 days	7 days	48 hours	48 hours	28 days	28 days	28 days	28 days	6 months	6 months	7 days to Extract - 40 days after extraction	14 days to Extract - 40 days after extraction
Estimated Quantity of Samples	32	32	32	24 to 32	24 to 32	4 to 12	4 to 12	8 to 12	8 to 12	4 to 6	4 to 12	8 to 12	8 to 12	8 to 12	8 to 12

Notes:

1. The defined sample volume may be decreased through simultaneous laboratory sample processing.
2. Whenever possible, the sample volume will be decreased without allowing the laboratory to increase detection limits or analytical accuracy.

Table 3

Treatability Sample Location List

Workplan to Perform Sediment Treatability Study

EPA Waste Characterization Sample Name	Co-located Treatability sample location (Yes or No)?	Treatability Sample Name	Latitidue of EPA WCS Sample	Longitude of EPA WCS Sample	Estimated volume of sediment sample collected.	Estimated sediment sample depth (top to bottom-feet).
YC-038	**Yes**	**T-038**	-122.3857353	37.7237229	24 gallons	0 to 3 feet
YC-039	No	n-a	-122.3844758	37.7234369	n-a	n-a
YC-040	**Yes**	**TS-040**	-122.3840724	37.7229826	24 gallons	0 to 3 feet
YC-041	**Yes**	**TS-041**	-122.3832290	37.7222162	24 gallons	0 to 3 feet
YC-042	No	n-a	-122.3817295	37.7219570	n-a	n-a
YC-043	**Yes**	**TS-043**	-122.3801440	37.7214050	24 gallons	0 to 3 feet
YC-044	No	n-a	-122.3823678	37.7203454	n-a	n-a
YC-045	No	n-a	-122.3808925	37.7200778	n-a	n-a

Notes:

1. Treatability samples will be collected at the four defined locations, as close as practical to the lat and long coordinates provided.
2. The defined sample volume may be decreased through simultaneous laboratory sample processing.

Table 4
Treatability Sediment Sampling Tests
Workplan to Perform Sediment Treatability Study

Test Stage	Test Goal	Treatability Test Operation	Sediment Sample Source	Quantity of Tests	pH	Grain Size Distribution	Grain-size distribution for finer fraction	Paint Filter Liquids Test	Specific gravity	Water Content	Atterberg limits	Total Recoverable Metals	Total Organic Carbon	PCBs and PCB congeners	Pesticides	Total petroleum hydrocarbons – diesel range	Total Volatile Solids
					Supernatant	ASTM D422	ASTM D854	Method 9095A	ASTM D854	USEPA 160.3	ASTM D4318	SW-846 Method 6010B/7471	USEPA 9060	USEPA 8082A	USEPA 8081A	USEPA 8015	USEPA 160.4
Stage 1	Identify chemical variations in Raw sediments	No sample manipulation.	RAW Sediment samples.	4	TS-038	TS-038	TS-038	TS-038	TS-038	TS-038	TS-038	TS-038	TS-038	TS-038	TS-038	TS-038	TS-038
					TS-040	TS-040	TS-040	TS-040	TS-040	TS-040	TS-040	TS-040	TS-040	TS-040	TS-040	TS-040	TS-040
					TS-041	TS-041	TS-041	TS-041	TS-041	TS-041	TS-041	TS-041	TS-041	TS-041	TS-041	TS-041	TS-041
					TS-043	TS-043	TS-043	TS-043	TS-043	TS-043	TS-043	TS-043	TS-043	TS-043	TS-043	TS-043	TS-043
Stage 2	Identify and quantify the performance of flocculant chemicals.	Sediment jar testing using at least 1 sediment slurry.	Jar testing using 20% sediment / 80% water slurry.	4 to 8 chemicals for each sediment sample.	TS-038	n-a	n-a	TS-038	n-a	TS-038	n-a	TS-038	TS-038	n-a	n-a	n-a	n-a
					TS-040	n-a	n-a	TS-040	n-a	TS-040	n-a	TS-040	TS-040	n-a	n-a	n-a	n-a
					TS-041	n-a	n-a	TS-041	n-a	TS-041	n-a	TS-041	TS-041	n-a	n-a	n-a	n-a
					TS-043	n-a	n-a	TS-043	n-a	TS-043	n-a	TS-043	TS-043	n-a	n-a	n-a	n-a
Stage 3	Identify and quantify the performance of textile filtration system.	Geotextile/ Geotube filtration fabric testing	Bench testing using 20% sediment / 80% water slurry.	At least 1 chemically conditioned test for each of the 4 sample locations.	TS-038	n-a	n-a	TS-038	n-a	TS-038	n-a	TS-038	TS-038	n-a	n-a	n-a	n-a
					TS-040	n-a	n-a	TS-040	n-a	TS-040	n-a	TS-040	TS-040	n-a	n-a	n-a	n-a
					TS-041	n-a	n-a	TS-041	n-a	TS-041	n-a	TS-041	TS-041	n-a	n-a	n-a	n-a
					TS-043	n-a	n-a	TS-043	n-a	TS-043	n-a	TS-043	TS-043	n-a	n-a	n-a	n-a
Stage 4	Determine dewatering time, elutriate quality and dewatering efficiency of a filter press.	Plate and frame **OR** Continuous Belt press dewatering.	Bench testing using 15% sediment / 85% water slurry.	2 chemically conditioned test for each sample location.	TS-038	TS-038	n-a	TS-038	n-a	TS-038	n-a	n-a	TS-038	n-a	n-a	n-a	n-a
					TS-040	TS-040	n-a	TS-040	n-a	TS-040	n-a	n-a	TS-040	n-a	n-a	n-a	n-a
					TS-041	TS-041	n-a	TS-041	n-a	TS-041	n-a	n-a	TS-041	n-a	n-a	n-a	n-a
					TS-043	TS-043	n-a	TS-043	n-a	TS-043	n-a	n-a	TS-043	n-a	n-a	n-a	n-a
Stage 5	Evaluate the supernatant of various dredge and dewatering techniques.	MET preparation, chemical manipulation, solids and elutriate generation.	Bench homogenized sediment samples- 15/85 Slurry and 30/70 slurry.	1 untreated settling tests and 4 chemically conditioned settling tests.	TS-038	n-a	n-a	TS-038	n-a	TS-038	n-a	TS-038	TS-038	TS-038	n-a	n-a	n-a
					TS-040	n-a	n-a	TS-040	n-a	TS-040	n-a	TS-040	TS-040	TS-040	n-a	n-a	n-a
					TS-041	n-a	n-a	TS-041	n-a	TS-041	n-a	TS-041	TS-041	TS-041	n-a	n-a	n-a
					TS-043	n-a	n-a	TS-043	n-a	TS-043	n-a	TS-043	TS-043	TS-043	n-a	n-a	n-a

Table 5
Targeted Metals
Workplan to Perform Sediment Treatability Study

Aqueous Metals Analysis List

Metal	Symbol	Effluent/ Water Analysis
Aluminum	Al	Total and Dissolved Analysis
Arsenic	As	Total and Dissolved Analysis
Cadmium	Cd	Total and Dissolved Analysis
Total Chromium	Cr	Total and Dissolved Analysis
Copper	Cu	Total and Dissolved Analysis
Iron	Fe	Total and Dissolved Analysis
Lead	Pb	Total and Dissolved Analysis
Manganese	Mn	Total and Dissolved Analysis
Mercury	Hg	Total and Dissolved Analysis
Nickel	Ni	Total and Dissolved Analysis
Selenium	Se	Total and Dissolved Analysis
Silver	Ag	Total and Dissolved Analysis
Zinc	Zn	Total and Dissolved Analysis

Note:

1. Samples will be analyzed for total Chromium. Hexavalent chrome analysis is not proposed at this time.

APPENDIX A

QAPP

QUALITY ASSURANCE PROJECT PLAN

For

Workplan to Perform Sediment Treatability Study

Yosemite Slough Sediment Area

March 23, 2012

Prepared for:

The City and County of San Francisco

Prepared by:

NewFields LLC

22 West Street
Red Bank, New Jersey 07701
(732) 224-7066

NOTE:

The City and County of San Francisco have contracted NewFields, LLC to capture sediments from the Yosemite Slough site and perform treatability testing on the sediments, the inherent pore water and surface water to support the US EPA in preparing an Engineering Evaluation/ Cost Assessment document.

March 23, 2012

Approved by:_____

David Puchalski, Project Manager

NewFields, LLC

Reviewed by:_____

Tim Hammermeister, Field Services Manager

NewFields, LLC

Quality Assurance Project Plan for Sediment Treatability Study

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Quality Assurance Project Plan for Sediment Treatability Study

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Figure 2 Roadway and Area Location Plan

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Quality Assurance Glossary

Accuracy. A data quality indicator, accuracy is the extent of agreement between an observed value (sampling result) and the accepted, or true, value of the parameter being measured. High accuracy can be defined as a combination of high precision and low bias.

Analyte. Within a medium, such as water, an analyte is a property or substance to be measured. Examples of analytes would include pH, dissolved oxygen, bacteria, and heavy metals.

Analytical Services Protocol or ASP means the compendium of approved EPA and California laboratory methods for sample preparation and analysis and data handling procedures.

Bias. Often used as a data quality indicator, bias is the degree of systematic error present in the assessment or analysis process. When bias is present, the sampling result value will differ from the accepted, or true, value of the parameter being assessed.

Blind sample (aka Blind Duplicate). A type of sample used for quality control purposes, a blind sample is a sample submitted to an analyst without their knowledge of its identity or composition. Blind samples are used to test the analyst's or laboratory's expertise in performing the sample analysis.

Comparability. A data quality indicator, comparability is the degree to which different methods, data sets, and/or decisions agree or are similar.

Completeness. A data quality indicator that is generally expressed as a percentage, completeness is the amount of valid data obtained compared to the amount of data planned.

Confirmatory Sample means a sample taken after remedial action is expected to be complete to verify that the cleanup requirements have been met. This term has the same meaning as "post remediation sample".

Contract laboratory program or CLP means a program of chemical analytical services developed by the EPA to support CERCLA.

Data Usability Summary Report, (DUSR) is a document that provides a thorough evaluation of the analytical data to determine whether or not the data, as presented, meets the site/project specific criteria for data quality and use.

Data users. The group(s) that will be applying the data results for some purpose. Data users can include the monitors themselves as well as government agencies, schools, universities, businesses, watershed organizations, and community groups.

Data quality objectives (DQOs). Data quality objectives are quantitative and qualitative statements describing the degree of the data's acceptability or utility to the data user(s). They include indicators such as accuracy, precision, representativeness, comparability, and completeness. DQOs specify the quality of the data needed in order to meet the monitoring project's goals. The planning process for ensuring environmental data are of the type, quality, and quantity needed for decision making is called the **DQO process.**

Detection limit. Applied to both methods and equipment, detection limits are the lowest concentration of a target analyte that a given method or piece of equipment can reliably ascertain and report as greater than zero.

Duplicate sample. Used for quality control purposes, duplicate samples are two samples taken at the same time from, and representative of, the same site that are carried through all assessment and analytical procedures in an identical manner. Duplicate samples are used to measure natural variability as well as the precision of a method, monitor, and/or analyst. More than two duplicate samples are referred to as replicate samples.

Effective solubility means the theoretical aqueous solubility of an organic constituent in groundwater that is in chemical equilibrium with a separate phase mixed product (product containing several organic chemicals). The effective solubility of a particular organic chemical can be estimated by multiplying its mole fraction in the product mixture by its pure phase solubility.

Environmental sample. An environmental sample is a specimen of any material collected from an environmental source, such as water or macro invertebrates collected from a stream, lake, or estuary.

Equipment or rinsate blank. Used for quality control purposes, equipment or rinsate blanks are types of field blanks used to check specifically for carryover contamination from reuse of the same sampling equipment (see field blank).

Field blank. Used for quality control purposes, a field blank is a “clean” sample (e.g., distilled water) that is otherwise treated the same as other samples taken from the field. Field blanks are submitted to the analyst along with all other samples and are used to detect any contaminants that may be introduced during sample collection, storage, analysis, and transport.

Instrument detection limit. The instrument detection limit is the lowest concentration of a given substance or analyte that can be reliably detected by analytical equipment or instruments (see detection limit).

Intermediate Sample means a sample taken during the investigation process that will be followed by another sampling event to confirm that remediation was successful or to confirm that the extent of contamination has been defined to below a level of concern.

Laboratory Duplicate sample. Used for quality control purposes, laboratory duplicate samples are derived from the same sample material and submitted to the laboratory in 2 separate and unique sample containers. Each sample is taken at the same time from, and representative of, the same site that are carried through all assessment and analytical procedures in an identical manner. Laboratory duplicate samples are used to measure natural variability as well as the precision of a method, monitor, and/or analyst. More than two duplicate samples are referred to as replicate samples.

Matrix. A matrix is a specific type of medium, such as surface water or sediment, in which the analyte of interest may be contained.

Measurement Range. The measurement range is the extent of reliable readings of an instrument or measuring device, as specified by the manufacturer.

Method detection limit or MDL means the minimum concentration of a substance that can be measured and reported with a 99 percent confidence that the analyte concentration is greater than zero and is determined from the analysis of a sample in a given matrix containing the analyte.

Non-targeted compound means a compound detected in a sample using a specific analytical method that is not a targeted compound, a surrogate compound, a system monitoring compound or an internal standard compound.

PAH means polycyclic aromatic hydrocarbon as defined by USEPA Method 8270.

Performance evaluation (PE) samples. Used for quality control purposes, a PE sample is a type of blind sample. The composition of PE samples is unknown to the analyst. PE samples are provided to evaluate the ability of the analyst or laboratory to produce analytical results within specified limits.

Practical quantitation level or PQL means the lowest quantitation level of a given analyte that can be reliably achieved among laboratories within the specified limits of precision and accuracy of a given analytical method during routine laboratory operating conditions.

Precision. A data quality indicator, precision measures the level of agreement or variability among a set of repeated measurements, obtained under similar conditions. Precision is usually expressed as a standard deviation in absolute or relative terms.

Protocols. Protocols are detailed, written, standardized procedures for field and/or laboratory operations.

Quality assurance (QA). QA is an integrated management system designed to ensure that a product or service meets defined standards of quality with a stated level of confidence. QA activities involve planning quality control, quality assessment, reporting, and quality improvement.

Quality assurance project plan (QAPP). A QAPP is a formal written document describing the detailed quality control procedures that will be used to achieve a specific project's data quality requirements.

Quality control (QC). QC is the overall system of technical activities designed to measure quality and limit error in a product or service. A QC program manages quality so that data meets the needs of the user as expressed in a quality assurance project plan.

Relative standard deviation (RSD). RSD is the standard deviation of a parameter expressed as a percentage and is used in the evaluation of precision.

Relative percent difference (RPD). RPD is an alternative to standard deviation, expressed as a percentage and used to determine precision when only two measurement values are available.

Replicate samples. See duplicate samples.

Representativeness. A data quality indicator, representativeness is the degree to which data accurately and precisely portray the actual or true environmental condition measured.

Semivolatile organic compound means compounds amenable to analysis by extraction of the sample with an organic solvent. For the purposes of this section, semi-volatiles are those target compound list compounds identified in the statement of work in the current version of the EPA Contract Laboratory Program.

Sensitivity. Related to detection limits, sensitivity refers to the capability of a method or instrument to discriminate between measurement responses representing different levels of a variable of interest. The more sensitive a method is, the better able it is to detect lower concentrations of a variable.

Spiked samples. Used for quality control purposes, a spiked sample is a sample to which a known concentration of the target analyte has been added. When analyzed, the difference between an environmental sample and the analyte's concentration in a spiked sample should be equivalent to the amount added to the spiked sample.

Split sample. Used for quality control purposes, a split sample is one that has been equally divided into two or more subsamples. Splits are submitted to different analysts or laboratories and are used to measure the precision of the analytical methods.

Standard reference materials (SRM). An SRM is a certified material or substance with an established, known and accepted value for the analyte or property of interest. Employed in the determination of bias, SRMs are used as a gauge to correctly calibrate instruments or assess measurement methods. SRMs are produced by the U. S. National Institute of Standards and Technology (NIST) and characterized for absolute content independent of any analytical method.

Standard deviation(s). Used in the determination of precision, standard deviation is the most common calculation used to measure the range of variation among repeated measurements. The standard deviation of a set of measurements is expressed by the positive square root of the variance of the measurements.

Standard operating procedures (SOPs). An SOP is a written document detailing the prescribed and established methods used for performing project operations, analyses, or actions.

Target analyte list or TAL means the list of inorganic compounds/elements designated for analysis as contained in the version of the EPA Contract Laboratory Program Statement of Work for Inorganics Analysis, Multi-Media, Multi-Concentration in effect as of the date on which the laboratory is performing the analysis. For the purpose of this chapter, a Target Analyte List scan means the analysis of a sample for Target Analyte List compounds/elements.

Targeted compound means a hazardous substance, hazardous waste, or pollutant for which a specific analytical method is designed to detect that potential contaminant both qualitatively and quantitatively.

Tentatively identified compound or TIC means a non-targeted compound detected in a sample using a GC/MS analytical method which has been tentatively identified using a mass spectral library search. An estimated concentration of the TIC is also determined.

True value. In the determination of accuracy, observed measurement values are often compared to true, or standard, values. A true value is one that has been sufficiently well established to be used for the calibration of instruments, evaluation of assessment methods or the assignment of values to materials.

Unknown compound means a non-targeted compound which cannot be tentatively identified. Based on the analytical method used, the estimated concentration of the unknown compound may or may not be determined.

Variance. A statistical term used in the calculation of standard deviation, variance is the sum of the squares of the difference between the individual values of a set and the arithmetic mean of the set, divided by one less than the numbers in the set.

Volatile organics means organic compounds amenable to analysis by the purge and trap technique. For the purposes of this workplan, analysis of volatile organics means the analysis of a sample for either those priority pollutants listed as amenable for analysis using EPA method 624 or those target compounds identified as volatiles in the version of the EPA "Contract Laboratory Program Statement of Work for Organics Analysis, Multi-Media, Multi-Concentration" in effect as of the date on which the laboratory is performing the analysis.

1.0 Distribution List

Copies of the Treatability Study QAPP will be distributed to the following persons and organizations:

- Amy Brownell, PE
  City of San Francisco Health Department
  1390 Market St., Suite 410
  San Francisco, CA 94102

- Craig Cooper
  Superfund Project Manager
  U.S. EPA Region 9
  75 Hawthorne Street
  San Francisco, CA 94105

2.0 Project Organization

The following is a list of project personnel and their responsibilities for the treatability study.

City Client Liaison – Amy Brownell, PE. The City has contracted NewFields to complete the treatability study for the Yosemite Slough site. Ms. Brownell will act as the client liaison managing NewFields' activities as well as coordinating NewFields work with the US EPA and other interested parties.

U.S. EPA Remedial Project Manager (RPM) – Craig Cooper. The U.S. EPA RPM for the Yosemite Slough site is Craig Cooper. Mr. Cooper will provide comments and technical guidance for the project. Mr. Cooper will maintain close communication with the City project team including Ms. Brownell.

NewFields Project Manager (PM) – David Puchalski, NewFields. Mr. Puchalski will act as the PM for this project. The PM will review and approve the workplan document, will coordinate and manage all field and laboratory activities and approve the final Treatability Study report.

NewFields Field Services Manager (FSM) – Tim Hammermeister, NewFields. Mr. Hammermeister will act as the FSM for this project. The FSM will schedule, coordinate and oversee sample and data collection activities.

NewFields Quality Assurance Coordinator (QA) – Wendy Wong, NewFields. Ms. Wong will act as the QA coordinator for this project. The QA coordinator will inspect and manage both field and laboratory data including confirmation that quality assurance inspections and procedures are completed.

Sample Analysis and Laboratory Support – Laboratory analytical services will be provided by Accutest Laboratories, Inc. (Accutest), a California certified testing laboratory. Accutest may choose to subcontract portions of the analysis to other laboratories based on the analysis requested. Whenever a subcontracted laboratory is used, they will be required to meet or exceed the minimum laboratory certifications defined in the US EPA Quality Assurance Project Plan (QAPP) for the site.

3.0 Problem Background and Identification

The US EPA plans to prepare an EE/CA for the Yosemite Slough site. The EE/CA will include a cost analysis component for the treatment and disposal of sediments from the Slough. Results of the sediment treatability study will be provided to the US EPA to support the preparation of the EE/CA.

4.0 Project Description

Representatives of the US EPA will be completing a Sediment Waste Characterization Study "to more accurately estimate the costs for disposal of sediments for remedial alternatives considered in the EE/CA, waste characterization data will be collected and used in the EE/CA evaluation to assess potential disposal options."[1]

This workplan proposes the collection of additional sediment samples which will be obtained in close proximity to waste characterization sediment samples and evaluated for ex-situ sediment treatability efficacy. The goal of this treatability study is to characterize and quantify variations in sediment materials across the site as well as characterize dewatered sediment effluent quality.

[1] *Yosemite Creek Sediment Removal Assessment Report*, Ecology and Environment, Inc., May 2011, Contract No.: EP-S5-08-01

5.0 Data Quality Objectives for Measurement Data

This section establishes the QA objectives for measurements that are critical to the project. The QA objectives are developed for relevant data quality indicators. These indicators include the method detection limit, reporting limit, precision, accuracy, completeness, representativeness, and comparability. The data quality objectives (DQOs) are based on project requirements and ensure: (1) that the data generated during the project are of known quality and (2) that the quality is acceptable to achieve the project's technical objectives provided in the Work Plan. All analytical data will be provided by the laboratory using both an electronic data deliverable and Tier II quality assurance deliverable format.

Quantitation Limits are laboratory-specific and reflect those values achievable by the laboratory performing the analyses. However, in order to ensure that the analytical methodologies are capable of achieving the DQOs, measurement performance criteria have been set for the analytical measurements in terms of accuracy, precision, and completeness. The analytical methods to be used at this site will provide a level of data quality and can be used for purposes of conceptual engineering design of treatment system and used to evaluate remedial alternatives where remedial actions are required.

The overall QA objective is to develop and implement procedures for field sampling, chain-of-custody, laboratory analysis, and reporting which will provide results that are scientifically valid, and the levels of which are sufficient to meet DQOs. Specific procedures for sampling, chain of custody, laboratory instruments calibration, laboratory analysis, reporting of data, internal quality control, and corrective action are described in other sections of the QAPP.

5.1 Required Quantification Limit

The required quantification limit is the quantitative analytical level for individual analytes needed to make decisions relative to the objectives of the project. Quantitative limits may be expressed as the method detection limit or some quantitative level defined in terms relative to the program. It should be noted that there is some ambiguity in the definitions and use of terms that define quantification limits. The method detection limit (MDL) presented herein is a well-defined and accepted entity, although attainable only under ideal laboratory conditions.

Method Detection Limit: The MDL is the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte

concentration is greater than zero. MDL is determined from analysis of a sample in a given matrix type containing the analyte.

Practical Quantitation Limit: The practical quantitation limit (PQL) [also referred to as the reporting limit (RL)] is the concentration in the sample that corresponds to the lowest concentration standard of the calibration curve.

5.2 Accuracy

Accuracy is the closeness of agreement between an observed value and an accepted reference value. The difference between the observed value and the reference value includes components of both systematic error (bias) and random error.

Accuracy in the field is assessed through the adherence to all field instrument calibration procedures, sample handling, preservation, and holding time requirements, and through the collection of equipment blanks prior to the collection of samples for each type of equipment being used (e.g., sample liners, drilling shoe, or stainless –steel sampling implements).

The laboratory will assess the overall accuracy of their instruments and analytical methods (independent of sample or matrix effects) through the measurement of “standards,” materials of accepted reference value. Accuracy will vary from analysis to analysis because of individual sample and matrix effects. In an individual analysis, accuracy will be measured in terms of blank results, the percent recovery (%R) of surrogate compounds in organic analyses, or %R of spiked compounds in matrix spikes (MSs), matrix spike duplicates (MSDs) and/or laboratory control samples (LCSs). This gives an indication of expected recovery for analytes tending to behave chemically like the spiked or surrogate compounds. The laboratory accuracy will be evaluated in accordance with laboratory quality assurance plan and the laboratory standard operating procedures.

5.3 Precision

Precision is the agreement among a set of replicate measurements without consideration of the “true” or accurate value: i.e., variability between measurements of the same material for the same analyte. In environmental sampling, precision is the result of field sampling and analytical factors. Precision in the laboratory is easier to measure and control than precision in the field. Replicate laboratory analyses of the

same sample provide information on analytical precision; replicate field samples provide data on overall measurement precision.

The difference between the overall measurement precision and the analytical precision is attributed to sampling precision. Precision is measured in a variety of ways including statistically, such as calculating variance or standard deviation. The difference between the overall measurement precision and the analytical precision is attributed to sampling precision.

Precision in the field is assessed through the collection and measurement of field duplicates. Field duplicates will be collected at a frequency of one per twenty investigative samples per matrix per analytical parameter, with the exception of the waste characterization and special analysis samples. Precision will be measured through the calculation of relative percent differences (RPDs) as described below. The resulting information will be used to assess sampling and analytical variability. Duplicate samples are described below.

Precision in the laboratory is assessed through the calculation of RPD for duplicate samples. For organic analyses, laboratory precision will be assessed through the analysis of MS/MSD samples and field duplicates. For the inorganic analyses, laboratory precision will be assessed through the analysis of matrix duplicate pairs and field duplicate pairs. MS/MSD samples or matrix duplicate pairs will be performed at a frequency of one per twenty primary samples per matrix.

Field duplicates will not be collected at a rate of 1 sampler per 20 analytical methods for the treatability study workplan.

5.4 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. The objective for completeness is a sufficient amount of valid data to achieve a predetermined statistical level of confidence. Critical samples must be identified and plans must be formulated to secure requisite valid data for these samples.

Field completeness is a measure of the amount of (1) valid measurements obtained from all the measurements taken in the project and (2) valid samples collected. The field completeness objective is greater than 90 percent.

Laboratory completeness is a measure of the amount of valid measurements obtained from all valid samples submitted to the laboratory. The laboratory completeness objective is greater than 95 percent.

To ensure that these percentages are met, materials for crucial parameters will be retained if re-sampling is required and strict adherence to holding times will be required.

5.5 Representativeness

Representativeness is a qualitative parameter that expresses the degree to which data accurately and precisely represents either a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition within a defined spatial and/or temporal boundary. To ensure representativeness, the sampling locations have been selected to provide coverage over a wide area and to highlight potential trends in the data.

Representativeness is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the Work Plan is followed and that proper sampling, sample handling, and sample preservation techniques are used.

Representativeness in the laboratory is ensured by using the proper analytical procedures, appropriate methods, and meeting sample-holding times.

5.6 Comparability

Comparability is a qualitative parameter that expresses the confidence with which one data set can be compared to another. Comparability is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the Work Plan and SOPs are followed and that proper sampling techniques are used. Maximization of comparability with previous data sets is expected because the sampling design and field protocols are consistent with those previously used.

Comparability is dependent on the use of recognized EPA or equivalent analytical methods and the reporting of data in standardized units. To facilitate data comparison, the data-reporting format as presented below will be used:

- Conventions (units reported as): for solids (weight/unit weight [i.e., mg/kg]); for liquids (weight/unit volume [i.e., mg/L]); for air (weight/unit volume [i.e., mg/m3]).

- Use common chemical name with corresponding chemical abstract system (CAS) code.

- Report all data for soils and sediment on a dry-weight basis.

6.0 Training Requirements

All field team members will have OSHA hazardous waste operations worker training as defined in 29 CFR 1910.120. Also, sediment samplers will be trained for safe work over water. All samplers will be trained to wear air purifying respirators and comfortable with OSHA personal protective equipment strengths and limitations.

The field team will also receive hands-on training for operation of the vibratory sampling and modified piston core sampler. At least two field members will be trained in the operation and documentation of a hand-held Global Positioning System (GPS) unit. At least two field team members will be trained in data documentation procedures, photo-documentation procedures and chain-of-custody procedures.

7.0 Documentation and Records

7.1 Field Notes

Field notes documenting field activities will be maintained in a field logbook in general accordance with the workplan. Field logbooks will provide the means of recording the chronology of data collection activities performed during the investigation. The logbook will be a bound notebook with water-resistant pages. Logbook entries will be dated, legible, and contain accurate and inclusive documentation of the activity. Each page of the logbook will be signed in permanent ink and dated. No erasures or obliterations of field notes will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark which is signed and dated by the sampler. The correction shall be written adjacent to the error.

Field logbooks will be reviewed at regular intervals by the field team leader, site manager and project manager for completeness and representativeness. Logbooks will be supported by daily reports as described in the workplan.

7.2 Chain-of-Custody Records

Chain-of-custody records are initiated by the samplers in the field. The field portion of the custody documentation should include:

- the project name
- signature(s) of sampler (s) responsible for sample custody
- sample ID number
- date and time of collection
- whether the sample is grab or composite
- names of individuals involved in sampling
- air bill or other shipping number (if applicable)

On a regular basis (daily or on such a basis that all holding times will be met), samples will be transferred to the custody of the respective laboratories, via third-party commercial carriers or via laboratory courier service. Sample packaging and shipping procedures, and field chain-of-custody procedures are described in the sampling SOPs.

7.3 Sample Labeling

Each sample will be labeled with an adhesive label using indelible ink. The label should include the date and time of collection, sampler's initials, tests to be performed, preservative (if applicable), and a unique identification. The following identification scheme will be used:

Example sample name: TS-038-SC01-W

Sample naming key:

TS- A 2 letter designation indicating a treatability study sample

###- The 3-digit unique sample number assigned by the US EPA waste characterization sample team. The Waste Characterization workplan proposes sample numbers between 038 and 045.

SC A 2 letter designation indicating the treatability test that was used to generate the sample. The following minimum sample names shall be used for this treatability study.

RS – Raw sample which has not been manipulated

SC – Settling column sample

PA – Polymer addition sample

GT – Geotextile filtered sample

FP – Filter press sample

##- The 2-digit sample number assigned by the treatability study test technician. The numbers will be assigned consecutively for each treatability test and are expected to range from 01 to 10.

W A single letter designation of the type of sample media. For this workplan the media designation will be either W for an aqueous sample and S for a sediment sample.

The sample name as identified above is treatability sample 038, obtained from the vicinity of waste characterization sample YC-038. This is the first sample (01) which was taken from a settling column test (SC) and the sample is a water sample (W).

This sample label contains the authoritative information for the sample. Inconsistencies with other documents will be settled in favor of the vial or container label unless otherwise corrected in writing from the field personnel collecting samples or the Project Manager.

7.4 Sample Custody

The chain-of-custody provides a record of the custody of any environmental field sample from the time of collection to the delivery to the laboratory. Custody is one of several factors that are necessary for the admissibility of environmental data as evidence in a court of law. Custody procedures help to satisfy the two major requirements for admissibility: relevance and authenticity. Sample custody is addressed in three parts: field sample collection, laboratory analysis, and final evidence files.

A sample is considered to be under a person's custody if

- the item is in the actual possession of a person
- the item is in the view of the person after being in actual possession of the person
- the item was in the actual physical possession of the person but is locked up to prevent tampering
- the item is in a designated and identified secure area

7.5 Field Custody Procedures

Samples will be collected following the sampling procedures indicated in the Work Plan. These procedures will ensure that the samples will arrive at the laboratory with the chain-of-custody intact.

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

All bottles will be identified by the use of sample labels with sample numbers, sampling locations, date/time of collection, and type of analysis. The sample numbering system was presented previously in this document.

Sample labels will be completed for each sample using waterproof ink unless prohibited by weather conditions.

Samples will be accompanied by a completed chain-of-custody form. The sample numbers and locations will be listed on the chain-of-custody 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, and to the laboratory facility.

- All shipments will be accompanied by the chain-of-custody record identifying the contents. The original record will accompany the shipment, and copies will be retained by the sampler and placed in the project files.

- Samples will be properly packaged for shipment and dispatched to the appropriate laboratory for analysis, with a separate signed custody record enclosed in and secured to the inside top of each sample box or cooler. Shipping containers will be secured with strapping tape and custody seals for shipment to the laboratory. The custody seals will be attached to the cooler and covered with clear plastic tape after being signed by field personnel.

- If the samples are sent by common carrier, the air bill will be used. Air bills 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.

- Samples remain in the custody of the sampler until transfer of custody is completed. This consists of delivery of samples to the laboratory sample custodian, and signature of the laboratory sample custodian on chain-of-custody

document as receiving the samples and signature of sampler as relinquishing samples.

7.6 Laboratory Custody Procedures

After accepting custody of the shipping containers, the laboratory will document the receipt of the shipping containers by signing the chain-of-custody record. The laboratory will:

- Examine the shipping containers to verify that the custody tape is intact
- Examine all sample containers for damage
- Determine if the temperature required for the requested testing program has been maintained during shipment and document the temperature on the chain-of-custody records
- Compare samples received against those listed on the chain-of-custody
- Verify that sample holding times have not been exceeded
- Examine all shipping records for accuracy and completeness
- Determine sample pH (if applicable) and record on chain-of-custody forms
- Sign and date the chain-of-custody immediately (if shipment is accepted) and attach the air bill
- Note any problems associated with the coolers and/or samples on the cooler receipt form and notify the laboratory project manager, who will be responsible for contacting the NewFields data manager
- Attach laboratory sample container labels with unique laboratory identification and test
- Place the samples in the proper laboratory storage.

Following receipt, samples will be logged in according to the following procedure:

- The samples will be entered into the laboratory tracking system. At a minimum, the following information will be entered: project name or identification, unique sample numbers (both client and internal laboratory), type of sample, required tests, date and time of laboratory receipt of samples, and field ID provided by field personnel.

- The completed chain-of-custody, air bills, and any additional documentation will be placed in the final evidence file.

7.7 Field Instruments

Field instruments will be calibrated according to the manufacturer’s specifications. Air monitoring instruments will be calibrated to a known reference gas standard and ambient air outside the work zone. Calibration inspections will be completed daily. If

concentrations of VOCs are encountered above the reference gas standard, the soil screening PIDs may be calibrated or re-checked against the reference gas standard.

Water quality and soil pH meters will be calibrated with known reference solutions. All calibration procedures performed will be documented in the field logbook and will include the date/time of calibration, name of person performing the calibration, reference standard used, and the readings.

7.8 Laboratory Instruments

Calibration procedures for a specific laboratory instrument will consist of initial calibrations, initial calibration verifications, and/or continuing calibration verification. Detailed descriptions of the calibration procedures for a specific laboratory instrument are included in the laboratory's quality assurance plan, which describe the calibration procedures, their frequency, acceptance criteria, and the conditions that will require recalibration.

8.0 Sample Preparation and Analytical Procedures

Analytical samples will be collected in general accordance with industry standards and as specified in the Work Plan. Table 1 through Table 3 provides a sample collection matrix that is separated by media. Analytical samples will be collected into laboratory-preserved sample containers and will be preserved as indicated in Table 4.

9.0 Data Reduction, Validation, and Reporting

Appropriate QC measures will be used to ensure the generation of reliable data from sampling and analysis activities. Proper collection and organization of accurate information followed by clear and concise reporting of the data is a primary goal in this project. Complete data packages suitable for data validation to support the generation of a Data Usability Summary Report (DUSR) according to US EPA requirements will be provided by the analytical laboratory.

9.1 Field Data Evaluation

Measurements and sample collection information will be transcribed directly into the field logbook or onto standardized forms. If errors are made, results will be legibly crossed out, initialed and dated by the person recording the data, and corrected in a

space adjacent to the original (erroneous) entry. Reviews of the field records by the field team leader, site manager, and project manager will 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 record keeping procedures, 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 SOPs and Work Plan, and that any deviations were documented and approved by the appropriate personnel.

9.2 Analytical Data Validation

NewFields will be responsible for performing an independent validation of the analytical data. Project-specific procedures will be used to validate analytical laboratory data. The basis for the validation will be the USEPA CLP National Functional Guidelines for Organic Data Review (January 2005) and the USEPA CLP National Functional Guidelines for Inorganic Data Review (October 2004), modified to accommodate the criteria in the analytical methods used in this program, and Region II Standard Operating Procedures (SOPs) for CLP Organic Data review (Revision 11, June 1996) and Evaluation of Metals for the CLP Program (Revision 11, January 1992). Critical functions for determining the validity of generated data are: (1) strict adherence to the analytical methods, (2) assurance that the instrumentation employed was operated in accordance with defined operating procedures, (3) assurance that quality parameters built into the analytical procedures have been adhered to, and (4) confirmation that the DQOs have been met.

Table 4 highlight the QC criteria and holding time requirements for all analyses conducted under this program. These criteria will be used to evaluate and qualify the data during validation.

NewFields or qualified contracted personnel will validate all analytical samples collected as part of the workplan. Validation will include all technical holding times, as well as QC sample results (blanks, surrogate spikes, laboratory duplicates, MS/MSDs, and LCSs), tunes, internal standards, calibrations, target compound identification, and results calculations.

For all analyses, the laboratory will report results which are below the laboratory's reporting limit; these results will be qualified as estimated (J) by the laboratory. The

laboratory may be required to report tentatively identified compounds (TICs) for the VOC and SVOC analyses; this will be requested by NewFields on an as-needed basis

The overall completeness of the data package will also be evaluated by the laboratory's data validator. Completeness checks will be administered on all data to determine whether full data deliverables were provided. The reviewer will determine whether all required items are present and request copies of missing deliverables.

Upon completion of the validation, a report will be prepared. This report will summarize the samples reviewed, elements reviewed, any nonconformance with the established criteria, and validation actions. Data qualifiers will be consistent with EPA National Functional Guidelines.

Laboratory deliverables will consist of an original hard copy data package that is in general accordance with US EPA Protocol and electronica data deliverable requirements.

10.0 Internal Quality Control

Laboratory and field quality internal control checks will be used to ensure the data quality objectives. At a minimum, this will include:

- Matrix spike and/or matrix spike duplicate samples
- Matrix duplicate analyses
- Laboratory control spike samples
- Instrument calibrations
- Method and/or instrument blanks
- Surrogate spikes for organic analyses
- Detection limit determination and confirmation by analysis of low-level calibration standard

11.0 Performance and System Audits

Audits are an independent means of: 1) evaluating the operation or capability of a measurement system and 2) documenting the use of QC procedures designed to generate data of know and acceptable quality.

Field audits may be completed to assess sample collection protocols, determine the integrity of COC procedures, and evaluate sample documentation and data handling procedures. Field audits may be scheduled by the QA officer, PM, site manager or in-

house consultant, at their discretion. Written records of audits and any recommendations for corrective action will be submitted to the PM.

The QA officer is the interface between management and project activities in matters of project quality. The QA officer will review the implementation of the QAPP. Reviews will be conducted at the completion of field activities and will include the results of any audits and an evaluation of the data quality.

12.0 Preventative Maintenance

Preventative maintenance will be performed on field equipment in accordance with the manufacturer's recommendations. Preventative maintenance to field will be provided by equipment vendor, U.S Environmental Rental Corporation, Pine Environmental Services, or other selected vendors.

13.0 Corrective Action

If unacceptable conditions are identified as a result of audits or are observed during field sampling and analysis, the PM, Field Team Leader, and QA officer will document the condition and initiate corrective procedures. The specific condition or problem will be identified, its cause will be determined, and appropriate action will be implemented.

The entire sampling program will be under the direction of the PM and QA officer. The emphasis in this program is on preventing problems by identifying potential errors, discrepancies, and gaps in the data collection, laboratory analysis, and interpretation process. Any problems identified will be promptly resolved. Likewise, follow-up corrective action is always an option in the event that preventative corrective actions are not effective.

The acceptance limits for the sampling and analyses to be conducted in this program will be those stated in the method or defined by other means in the Work Plan and SOPs. Corrective actions are likely to be immediate in nature and most often will be implemented by the contracted laboratory analyst or the PM. The corrective action will usually involve recalculation, reanalysis, or repeating a sample run.

13.1 Immediate Corrective Action

Corrective action in the field may be needed when the sample requirements are changed (i.e., more/less samples, sampling locations other than those specified in the Work Plan), 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 Team Leader, Site Manager and PM will approve the corrective action and notify the QA officer. The PM and QA officer will approve the corrective measure. The Field Team Leader and Site Manager 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
- Any necessary approvals

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

Corrective action in the laboratory will be completed in accordance with the laboratory's quality assurance procedures. Any corrective actions completed by the laboratory will be documented in both the laboratory's corrective action files, and the narrative data report sent from the laboratory to the PM. If the corrective action does not rectify the situation, the laboratory will contact the PM, who will determine the action to be taken and inform the appropriate personnel.

If potential problems are not solved as an immediate corrective action, the contractor will apply formalized long-term corrective action if necessary.

FIGURES

1 inch = 2,000 feet

Legend

- Preliminary US EPA Yosemite Creek Site Boundary
- Road
- Buildings

Note:

1. Preliminary Site Boundary identified by US EPA contractor; Ecology and Environment, Inc. in Waste Characterization Study, Sampling and Analysis Plan.
2. Waste characterization sample locations were were provided by ENE following March 2012 sampling.
3. Treatability samples will be capture from 4 WCS sample locations; YC-038, YC-040, YC-041 and YC-043.

NEWFIELDS

Figure 1
Site Location Plan

Sediment Treatability Study Workplan
Yosemite Slough Sediment Site
San Francisco Bay, San Francisco, CA

1 inch = 2,000 feet

Note:

1. Preliminary Site Boundary identified by US EPA contractor; Ecology and Environment, Inc. in Waste Characterization Study, Sampling and Analysis Plan.

2. Waste characterization sample locations were were provided by ENE following March 2012 sampling.

3. Treatability samples will be capture from 4 WCS sample locations; YC-038, YC-040, YC-041 and YC-043.

Legend

- Preliminary US EPA Yosemite Creek Site Boundary
- Road
- Buildings

NEWFIELDS

Figure 2

Roadway and Area Location Plan

Sediment Treatability Study Workplan
Yosemite Slough Sediment Site
San Francisco Bay, San Francisco, CA

1 inch = 450 feet

Legend

- Preliminary US EPA Yosemite Creek Site Boundary
- Road
- Buildings

Note:

1. Preliminary Site Boundary identified by US EPA contractor; Ecology and Environment, Inc. in Waste Characterization Study, Sampling and Analysis Plan.
2. Waste characterization sample locations were were provided by ENE following March 2012 sampling.
3. Treatability samples will be capture from 4 WCS sample locations; YC-038, YC-040, YC-041 and YC-043.

NEWFIELDS

Figure 3
Investigation Area Plan

Sediment Treatability Study Workplan
Yosemite Slough Sediment Site
San Francisco Bay, San Francisco, CA

APPENDIX B

HEALTH and SAFETY PLAN

SITE-SPECIFIC HEALTH AND SAFETY PLAN

For

Yosemite Slough Sediment Area

March 23, 2012

Prepared for:

The City and County of San Francisco

Prepared by:

NewFields LLC

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Red Bank, New Jersey 07701
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1.0 GENERAL

1.1. Introduction

This Site-Specific Health & Safety Plan (HASP) has been developed to support sediment and surface water sampling and treatability testing as part of the Yosemite Slough sediment project, in San Francisco Bay, California.

The procedures and protocols in this plan have been established to ensure that a mechanism is in place to address project personnel in the event that hazards from site contamination are encountered during the project. This plan addresses typical on-site activities such as sediment sampling, water sampling, water quality measurements, sample management and air monitoring requirements. This HASP is not designed to replace existing procedures or to address all health and safety procedures that could be required during typical emergency response activities. The HASP covers those special and/or unique health and safety procedures ensuing from actual or potential contact with contaminated materials and the requirements pursuant to OSHA 1910 General Industry Standards, 1926 Construction Standards, and specifically, the OSHA Standard for Hazardous Waste Operations and Emergency Response (29 CFR 1910.120).

Compliance with this HASP is required from all authorized NewFields project personnel, project support personnel and visitors who enter the work areas of this project. Under no circumstances will any person enter an established restricted area or exclusion zone without meeting the requirements of this HASP.

The content of this HASP may change or undergo revision based upon field monitoring results, modifications to the technical scope of work or additional information made available to health and safety (H&S) personnel. Any proposed changes must also be reviewed and approved by designated NewFields personnel.

1.2 Project Location

SITE NAME:	Yosemite Slough Sediment Project
SITE LOCATION	San Francisco Bay, San Francisco, California
	Site is 37° 43' 25" North Latitude, 122° 23' 07" West Longitude
SITE TELEPHONE NUMBERS:	Not-Applicable – There are no structures, trailers or telephones at the site.

1.3 Project Personnel

This refers to NewFields project management personnel, and project support personnel. Project Personnel are divided into three categories including: Contact Project Personnel, Non-Contact Project Personnel and Project Support Personnel.

Contact Project Personnel - Refers to project personnel who have a reasonable potential to come into contact with hazardous material or vapors. The specific job tasks will be evaluated to determine personnel classifications. The Health & Safety Officer (HSO) or their designee will assist with this determination.

Non-Contact Project Personnel - Refers to Project Personnel who are not reasonably expected to come into contact with the impacted sediments, containerized materials, contaminated articles or decontamination solutions. The specific job tasks will be evaluated to determine personnel classifications. The HSO or their designee will assist with this determination.

Project Support Personnel - refers to all other persons who may enter the project work zone such as boat captains, shuttle drivers, and emergency crews (police, fire, ambulance) as well as any other personnel designated as a project visitor by NewFields.

Project Personnel Assignments

NewFields

Project Manager	David Puchalski	Cell - (732) 598-6279
Field Services Manager	Tim Hammermeister	Cell - (206) 890-8667
Site Safety Officer	Jay Word	Cell – (206) 779-9500
Site Support Personnel	Preston Martin	Cell – (206) 962-0214

1.4 Emergency Phone Numbers

Detailed emergency information is found in Section 13. Written hospital directions and an accompanying map can be found in Section 13 and **Appendix E**.

Police Department San Francisco Police Department – Bayview District	911 or (415) 671-2300 201 Williams St. San Francisco, CA 94124
Fire Department San Francisco Fire Department – Station 17	911 or (415) 558-3403 698 2nd Street San Francisco, CA 94107
Ambulance San Francisco Fire Department – Station 17	911
Hospital SF General Hospital Emergency Services 1001 Potrero Avenue, Suite 1E21 San Francisco, CA 94110	911 or (415) 206-8111
Poison Control Center	800-522-6337
Region 9 EPA Hotline	(415) 744-2000
California Office of Emergency Services	(800) 852-7550
National Response Center (NRC) for Oil/Chemical Spills	800-424-8802
City of San Francisco CIH	(415) 671-3171
California Underground Service Alert (Utility markout service)	811 or (800) 227-2600

2.0 HEALTH AND SAFETY PERSONNEL

The following briefly describes the health and safety designations and general responsibilities for this project.

2.1 Project Manager - *NewFields*

The Project Manager has overall executive responsibility for all activities and personnel on the site during all project activities described in this HASP.

2.2 On-Site Health and Safety Officer (HSO)

The HSO is responsible for the development of safety protocols and procedures, pursuant to the hazardous waste aspects of this project including development, implementation and enforcement of this HASP. The HSO has the authority to modify this HASP based on actual site working conditions and procedures. The HSO will also be responsible for the resolution of any outstanding health and safety issues which arise during the conduct of site work

Health and safety-related duties and responsibilities will be assigned only to qualified individuals by the HSO. The HSO will be on-site for all site activities that have the reasonable potential for bringing workers into contact with contaminated materials. The HSO will obtain and review applicable health and safety training and medical surveillance documents for personnel who may work in designated exclusion zones. The HSO has stop-work authorization, which will be executed upon determination of an imminent safety hazard, emergency situation, or other potentially dangerous situation, such as extreme weather conditions. An Authorization to Proceed with work will be issued by the HSO after such action. The HSO or designee will initiate and execute contact with support facilities and personnel when this action is appropriate. The HSO may periodically conduct QA/QC surveys of the health and safety procedures implemented onsite.

3.0 SITE AND PROJECT DESCRIPTION

3.1 History and Description of Proposed Work

The US EPA describes the Yosemite Slough Sediment Site (the Site) as an approximately 1,600-foot long channel that receives stormwater runoff and leads to the South Basin of the San Francisco Bay. There are three outfalls from the City's Combined Sewer Overflow System in the area. In addition, the US EPA defines the Site to include a portion of the South Basin at the mouth of Yosemite Slough, within the area designated as Parcel F of the U.S. Navy's Hunters Point Shipyard (Figures 1 and 2), where impacted sediments from multiple sources may have been, or are, commingled. Analytical data from previous and on-going investigations of multiple sites in the vicinity of the study area indicate Site sediments are contaminated with polychlorinated biphenyls (PCBs); metals including chromium, lead, mercury, and zinc; total petroleum hydrocarbons (TPH); and the pesticides chlordane, dieldrin, and dichlorodiphenyl-trichloroethane (DDT), at concentrations exceeding appropriate screening levels. (Battelle 2004, E&E 2011).

The South Basin area of the San Francisco Bay, in which the Site is located, has been the subject of numerous environmental investigations (Battelle 2004). Remedial investigations, feasibility studies, and remedial actions are ongoing at the Hunters Point Shipyard Superfund site, which includes the South Basin, under the U.S. Navy's Base Realignment and Closure Program. Additionally, the California State Parks Foundation conducted soil, groundwater, and sediment sampling for proposed wetlands creation areas in a 35-acre area that includes the Site.

Sediments at the site were investigated in December 1995 under the Bay Protection and Toxic Cleanup Program. Samples contained concentrations of mercury and PCBs exceeding the NOAA ERM guidelines (Battelle 2004).

As a part of ongoing Comprehensive Environmental Response, Compensation, and Liability Act remedial activities at Hunters Point Shipyard (see Figure 1), a remedial investigation and feasibility study was performed in 1996 by PRC Environmental Management, Inc. under the direction of the Navy at Parcel F, the portion of Hunters Point Shipyard that includes the South Basin shoreline and adjacent sediments. Sediment sample results from the South Basin and from the Site indicated elevated levels of mercury, PCBs, total DDT, and total chlordane. This investigation was conducted to evaluate contamination of the South Basin by the Navy but also addressed the potential for additional sources of contamination to the South Basin, including discharges to the Site (Battelle 2004).

Several reports are posted to the EPA's website that contain historical information about the area. The reader is encouraged to review those reports to understand the history of the area. The following hyperlink will open the EPA's Yosemite Creek Sediment web page.

> http://yosemite.epa.gov/r9/sfund/r9sfdocw.nsf/3dec8ba3252368428825742600743733/fb6e5165bed5dcbd88257983007e7b9e!OpenDocument

Site maps are located in **Appendix A**.

There are multiple contractors on this project site engaged in containment and cleanup activities. NewFields' project activities will be performed by NewFields personnel and, at times, as many as three (3) subcontractors. NewFields will continue the site investigation and remediation.

3.2 Scope of Work

3.2.1 Remedial Investigation – Sediment and Surface Water Sampling

Sediment and Surface Water samples will be collected to support a sediment treatability study. Specific field activities may include:

- Sediment sampling – Sediment samples are collected using a Vibracore sampling method, hand trowels, hand augers, and/or hand pushed sediment corers. It is anticipated that sediment intrusion activities will extend up to 5 feet below the sediment depth. The purpose of the sediment sampling is to evaluate the chemical and physical effects of dewatering in order to evaluate sediment removal costs.
- Surface water sampling and flow observations – Surface water flow measurements from site surface water bodies will be collected.

4.0 HAZARD ASSESSMENT

4.1 Introduction

Prior to project start-up, the exclusion zone, contamination-reduction zone and support zone will be clearly identified and marked. The primary areas of concern are the exclusion and contamination-reduction zones, which will be over water as part of this sediment investigation.

The work is being performed over water, in a location that is not easily accessible by the public. Site control will be put into through observation of nearby vessels and radio requests to avoid the work area.

Additional site control measures will be implemented in the support zone and to prevent unauthorized access into the exclusion zone.

4.2 Task Specific Hazard Assessment

This plan has established categories of work tasks based on worker exposure potential to site hazards.

Non-Contact -Work activities that have little or no reasonable potential for contact or exposure to hazardous site contaminants.

Contact -Work activities that have some reasonable potential for contact or exposure to hazardous site contaminants.

4.2.1 Non-Contact Personnel

Project Set-up - It is anticipated that the following activities require minimal contact, and should not result in contact with the contaminants present at the site or materials used for decontamination. In addition, the non-contact personnel will not be exposed to the physical hazards present at the site. These activities should not require additional H&S considerations beyond those H&S practices already in place for this type of construction project. These tasks may include:

Field Preparation
Air Monitoring activities
Project Administration

While potential exposure to hazardous materials or vapors is not anticipated during these activities, operations will be evaluated during the project and monitored as necessary. Access to the work zone is limited to Project Personnel, Project Support Personnel, and Authorized Visitors. Given the work will be conducted over water, initially exclusion zones will not be established for such activities. However, exclusion zones will be established if visual evidence of contamination is observed, and/or instrument readings exceeding the action levels detailed in **Section 7** are encountered.

In the event that contaminated materials are encountered, all project personnel involved in such areas (contact or non-contact) must meet the training requirements as defined in this HASP.

4.2.2 Contact Personnel

Project Activities – Contact with physical and chemical hazards

It is anticipated that personnel working in the following activities have some reasonable potential to come into contact with physical and chemical hazards present at the site. These activities may include:

- Sediment sampling
- Surface water sampling
- Bathymetric measurements
- Equipment and personnel decontamination procedures.

These activities will be evaluated and monitored by the HSO and his/her designee; Exclusion Zones will be established as required.

A hazard analysis was developed for the work activities that involved potential exposure to contamination at the site (contact work). The analysis was based on the potential for the contact regardless of the contaminant concentrations. **Tables 4-1a through 4-1c** outline the hazard analysis for the Contact Work Activities and summarize recommended controls, equipment, inspections and training requirements.

Table 4-1a – HAZARD ANALYSIS

ACTIVITY: Sediment & Surface Water Sampling ANALYZED BY/DATE: _____

TASK DESCRIPTION	POTENTIAL PHYSICAL/CHEMICAL SAFETY/HEALTH HAZARDS	RISK POTENTIAL	RECOMMENDED CONTROLS (SAFE WORK PRACTICES)
Sampling sediment and surface water for laboratory tests	Contact with potentially contaminated sediment	Mid – contaminated material may still be present	Wear personal protective equipment (gloves, chemical protective suits, filtering facepiece if in a dusty area) to minimize contact with contamination.
Vibracore Sampling equipment operation	Mechanical vibracore equipment head operation; Contact with potentially contaminated soil and water	Mid – high noise level resulting from VibraCore use. Contaminated material may be present.	• Qualified operator of Vibracore. • No loose clothing, hair or jewelry. • Delineate deck area around sample equipment to prevent injury to other boat personnel. • PPE required includes personal flotation device, hearing protection, gloves, chemical protective suits, filtering facepiece (if in a dusty area) to minimize contact with contamination.
EQUIPMENT / TOOLS / MATERIALS TO BE USED	**PPE, PERSONAL HYGIENE**	**INSPECTION REQUIREMENTS**	**TRAINING REQUIRMENTS**
Hand trowel, push core head, core liners plastic bags / flags	Gloves, chemical protective suits, filtering facepiece (if working in a dusty area)	Equipment inspected by user before and after use	OSHA HAZWOPER 40-Hour, 8-Hour Refresher, annual physical.
Vibracore System	PFD, No loose clothing, hearing protection.	Equipment inspected by operator before and after use	Qualified operator for VibraCore. OSHA HAZWOPER 40-Hour, 8-Hour Refresher, annual physical.

Table 4-1b - HAZARD ANALYSIS

ACTIVITY: Working over / on water ANALYZED BY/DATE: _____

TASK DESCRIPTION	POTENTIAL PHYSICAL/CHEMICAL SAFETY/HEALTH HAZARDS	RISK POTENTIAL	RECOMMENDED CONTROLS (SAFE WORK PRACTICES)
Small boat use to obtain sediment and water samples	Boat drift, falling into water	Mid – Risk of hypothermia in colder months, slight risk of drowning. Risk of heat stress in warmer months.	• Secure boat before getting on board, insure that boat will not drift while boarding • Use two people when boarding to insure secure footing and boat stabilization. • Wear personal flotation device (PFD) whenever working over or on water.
Boat handling	Debris in water	Mid – Debris in water may hang up / damage boat.	• Use spotter to check for debris and shallow areas. • Follow safe boat handling procedures • Wear PFD whenever working over or on water. • Ring buoy with at least 90 feet of rope • Lifesaving skiff, when using boats > 35 feet. • Minimum two people in boat at all times • Use air horn to signal for help if needed. • Have tow rope on boat at all times.
Working over water	Falling into water	Mid – risk of hypothermia in colder months; risk of impact injury; risk of drowning.	• Personal flotation device • Ring buoy with at least 90 feet of rope • Lifesaving skiff
EQUIPMENT / TOOLS / MATERIALS TO BE USED	**PPE, PERSONAL HYGIENE**	**INSPECTION REQUIREMENTS**	**TRAINING REQUIRMENTS**
Sediment sampling work boat	Personal flotation device	Boat and PFD must be inspected before and after each use.	• OSHA HAZWOPER 40-Hour, 8-Hour Refresher. • Site specific HASP requirements • Boat operator must possess CA Boat Operators' license.
Airhorn, ropes, ring buoy	Personal flotation device	Ropes and PFD must be inspected before and after each use. Insure working airhorn prior to placing on boat.	• OSHA HAZWOPER 40-Hour, 8-Hour Refresher. • Site specific HASP requirements • Boat operator must possess CA Boat Operators' license.

Table 4-1c - HAZARD ANALYSIS

ACTIVITY: Personnel and Equipment Decontamination

ANALYZED BY/DATE: _____

TASK DESCRIPTION	POTENTIAL PHYSICAL/CHEMICAL SAFETY/HEALTH HAZARDS	RISK POTENTIAL	RECOMMENDED CONTROLS (SAFE WORK PRACTICES)
Personnel and equipment exiting the EZ will enter the CRZ	Spread of contamination to unprotected personnel and areas	Mid – contamination will be removed in CRZ	• Personnel assisting with decontamination procedures must be in appropriate personal protective equipment. (E.g. If personnel leaving the EZ are wearing Level C protection, personnel assisting with decontamination must be wearing at least Level D Modified protection). • Personnel and equipment leaving the EZ are not to enter the SZ unless decontamination has been completed.
Disposal of decontaminated PPE, decontamination supplies, and decontamination solutions (if used).	Spread of contamination to unprotected personnel and areas.	Mid – contamination will be removed in CRZ	• PPE and decontamination supplies must be disposed in plastic bags and then placed in drums for disposal as hazardous waste. • Decontamination solutions (if used) must be contained and transferred to drums for disposal as hazardous waste.
EQUIPMENT / TOOLS / MATERIALS TO BE USED	**PPE, PERSONAL HYGIENE**	**INSPECTION REQUIREMENTS**	**TRAINING REQUIRMENTS**
Vibracore and other sediment handling materials.	Gloves, chemical protective suits, filtering facepiece (if working in a dusty area)	Inspected by operator before and after each use	• OSHA HAZWOPER 40-Hour, 8-Hour Refresher. • Must be a trained excavator operator. • Site specific HASP requirements • Equipment operators must be trained; and experienced with safe operations.
Hand Tools		Inspected by user before and after each use	

The following is a general discussion of the hazards that may be encountered on site. Additional information on any contaminants encountered during this project may be found in standard health and safety references, such as the NIOSH "Pocket Guide to Chemical Hazards." Internet site: http://www.cdc.gov/niosh/npg/npg.html

4.3 Chemical Hazards

Potential for exposure exists when activities associated with the sediment and surface water sampling. Sampling activities may result in airborne dust that must be controlled to prevent off-site migration. Work activities will take place in the exclusion zone. A contamination reduction zone (CRZ) will be designated for personnel and equipment decontamination; a support zone (SZ) will be designated for "clean activities." The support zone will be assessed by observation during site operations where the potential exists for contact with contaminants. Measures must be taken to prevent an uncontrolled release or exposure to vapor, liquid or solid contaminants by workers and/or the general public. Assessment and prevention strategies are discussed in other sections of this HASP and must be practiced on a continuing basis by all on-site personnel throughout this project.

Table 4-3 summarizes exposure limits and health hazards for expected contaminants. Material Safety Data Sheets for all expected contaminants, decontamination solutions, sampling materials, hydraulic fluid and lubricants will be maintained on site. More information regard specific health hazards of each material can be found in **Appendix B**.

Table 4-3. Permissible Limits and Health Hazards of Contaminants of Concern

Chemical	OSHA Permissible Exposure Limits	Primary Health Hazard (Target Organs)
	VOLATILE ORGANIC COMPOUNDS	
Benzene	10 ppm (8 hr TWA)	Carcinogen, Eyes, liver, central nervous system (CNS), Respiratory system
Toluene	200 ppm (8 hr TWA)	CNS, Respiratory system, skin
Xylenes	100 ppm	CNS, Respiratory system, skin
	SEMI-VOLATILE ORGANIC COMPOUNDS	
Polychlorinated biphenyls (PCB) 42% Chlorine	1 mg/m^3	Liver, reproductive system, potential carcinogen
Polychlorinated biphenyls (PCB) 54% Chlorine	0.5 mg/m^3	Liver, reproductive system, potential carcinogen
Polyaromatic Hydrocarbons (PAHs as a class)	0.2 mg/m^3	Skin, Potential Mutagenic and Tumorigenic compounds, Liver
	INORGANIC COMPOUNDS	
Lead	0.05 mg/m^3	Eyes, GI, central nervous system (CNS), kidneys, blood, gingival tissue
Arsenic	0.5 mg/m^3	Skin, respiratory system, CNS, kidneys, liver, GI tract, reproductive system
Mercury	0.1 mg/m^3 (Ceiling)	Eyes, skin, respiratory system, CNS, kidneys

A brief discussion of potential pathways of exposure and exposure control methods is presented below:

Inhalation - An inhalation exposure to volatile organic compounds and other contaminated soil particles would typically occur if work site activities resulted in the generation of dust, however given the work will be conducted with saturated sediments the potential to generate dust is low. Dust level awareness and if needed, dust control measures will be implemented to minimize the airborne soil particles.

Contact with Skin and Eyes – Contaminated sediment and surface water may come into contact with skin and eyes during work activities. Personal protective equipment as well as utilizing good hygiene/work practices will minimize the potential of exposure by this route.

Ingestion - Ingestion of contaminated materials may occur as a result of a hand-to-mouth contact (eating, drinking, smoking) in contaminated areas or prior to appropriate personal decontamination. Frequent and thorough washing of hands and face, prohibition of eating and smoking in the work area, proper use of work clothing and personal decontamination will control the potential for ingestion of contaminated materials.

If unanticipated conditions are identified or if work is required in additional areas, work activities will cease until the HSO develops appropriate procedures.

4.4 Chemical Affects

The project involves mechanical collection of saturated sediment. Potential hazards posed by acute exposure to contaminates within the sediment and surface water include mucous membrane irritation and skin irritation. Chronic exposure may result in central nervous system effects, GI effects, and reproductive system effects. Some contaminates are suspected carcinogens.

4.5 Physical Hazard Analysis

Potential hazards that are most likely to be encountered at this project site during field operations include, but are not limited to:

- Weather conditions (lightning, rain, excessive heat, excessive cold, and high winds, etc.)
- Slips, trips, falls on uneven/slippery surfaces
- Noise
- Heavy equipment use
- Working over / on water

Below is a summary of guidelines that may be used to eliminate/reduce the potential risk of physical hazards.

4.5.1. Weather

If severe weather occurs that may affect the safety of site workers, the NewFields PM or their designee shall stop affected field operations. The PM or their designee will resume operations when weather conditions improve to acceptable levels.

4.5.2 Heat and Cold Stress

Depending on the time of year and weather conditions, cold or heat stress may be a potential problem. The PM will ensure that the heat and cold stress programs are implemented and that adequate rest breaks and liquid (i.e., water, Gatorade) consumption occur.

Proposed work/rest schedules will be dependent upon the weather conditions encountered and the level of personal protective equipment being utilized by on-site personnel. The PM will establish work/rest schedules prior to the commencement of the project tasks and will adjust as needed.

Suggested Frequency of Physiological Monitoring for Fit and Acclimatized Workers

Adjusted Temperature	Normal Work Ensemble	Impermeable Ensemble
90° F (32.2°C) or >	After each 45 min of work	After each 15 min of work
87.5-90°F (30.8-32.2°C)	After each 60 min of work	After each 30 min of work
82.5-87.5°F (28.1 -30.8°C)	After each 90 min of work	After each 60 min of work
77.5-82.5°F (25.3-28.1°C)	After each 120 min of work	After each 90 min of work.

4.5.3 Illumination

If work activities occur before sunrise and/or after sunset, lighting will be provided at each work area to meet the requirements of 29 CFR 1910.120(m). The OSHA Standard states that while any work is in progress, the general site areas shall be lighted to not less than 5 foot-candles; excavation, waste areas, access ways, active storage areas, loading platforms, and field maintenance areas shall be lighted to not less than 3 foot-candles; and first aid stations not less than 30 foot-candle.

4.5.4 Slip, Trip and Fall Hazards

As in any work area, it is expected that the ground may be uneven, the surface may be unreliable due to surface evenness, debris may be present, work is being performed on poly sheeting, and wet or muddy areas may exist. Therefore, the potential for slipping, tripping, and falling is present, especially considering that encapsulating suits and respiratory protection will which can impede vision. Severe trip hazards will be identified prior to commencement of project activities and demarcated by flags or caution tape.

4.5.5 Confined Space Entry

Permit Required Confined Space (PRCS) is not expected during this operation. If an entry is required into a PRCS (as defined by 29 CFR Part 1910.146) the PM will be responsible for implementation of the standard procedures for confined space operations, which includes permit entry system, pre-entry monitoring, and a buddy system according to the requirements of the NewFields Corporate Health and Safety Program

4.5.6 Electrical Hazards

Excavators and coring operations will maintain the following distance from energized overhead power lines:
1. 10 feet for up to 50kV
2. 4" additional for every 10kV over 50kV

The project tasks are not expected to disturb any live electrical wires. If any electrical equipment is needed, ground fault circuit interrupters will be used.

4.5.7 Underground Utilities

California's Underground Service Alert, the utility markout call system will be utilized before sediment sampling operations commence. Underground utilities will be marked out so as not to be impacted by sampling operations.

4.5.8 Heavy Equipment (Noise, Traffic)

Heavy equipment will be operated under the following conditions:

- The operation of heavy equipment will be limited to authorized personnel specifically trained in its operation. The subcontractor site supervisors must provide this information to the PM.
- The operator will use the safety devices provided with the equipment, including seat belts. Backup warning indicates and horns will be operable at all times.
- While in operation, all personnel not directly required in the area will keep a safe distance from the equipment.

Noise

Excessive noise may be a problem during certain activities on site, such as sawing, concrete busting, the use of machinery or powered hand tools. If necessary, as designated by the PM, when expected noise or sustained noise levels exceed 85dBA, the use of earplugs or other hearing protection equipment with a NRR of 25 or greater will be mandatory for personnel use in the immediate area. As a rule, the noise level is excessive if it is necessary to shout to be heard at a distance of three feet.

Traffic

Project personnel shall be required to wear safety vests when working on or adjacent to roadways or within high traffic areas and must comply with all applicable rules and regulations for traffic safety.

4.5.9 Manual Lifting

Manual lifting of heavy objects such as sections of pipe may be required. Failure to follow proper lifting technique can result in back injuries and strains. Site workers will be instructed to use power equipment to lift heavy loads whenever possible and to evaluate loads before trying to lift them (i.e. they should be able to easily tip the load and then return it to its original position).
Carrying heavy loads with a buddy and proper lifting techniques,
1) make sure footing is solid,

2) make back straight with no curving or slouching,
3) center body over feet,
4) grasp the object firmly and as close to your body as possible,
5) lift with legs, and
6) turn with your feet, don't twist, will be stressed.

Back injuries are a serious concern as they are the most common workplace injury, often resulting in lost or restricted work time, and long treatment and recovery periods. In addition, hand digging for pipes may present lifting/ergonomic hazards.

4.5.10 Excavation and Trenching

No excavations, excavating or trenching operations are proposed as part of the current workplan. The following information is included; if an emergency condition requires excavating or trenching.

The safety requirements for each excavation must be determined by a competent person who is capable of identifying existing and predictable hazards and work conditions that are unsanitary, hazardous, or dangerous to employees. The competent person must also have the authorization to take prompt corrective measures to eliminate unsatisfactory conditions.

The following are general requirements for work activities in and around excavations:

- Prior to initiation of any excavation activity, the location of underground installations will be determined. The California's Underground Service Alert call center will be contacted by the excavation subcontractor a minimum of 72 hours prior to excavation activities.
- All excavations will be inspected daily and documented by the competent person prior to commencement of work activities. Evidence of cave-ins, slides, sloughing, or surface cracks or excavations will be cause for work to cease until necessary precautions are taken to safeguard employees.
- Excavation and trenching will be performed in accordance with the requirements for Soil Type C. Shoring will be performed in accordance with the requirements of 29 CFR 1926 (c)(2) as indicated in **Table 4-5** below.
- Excavated and other materials or equipment that could fall or roll into the excavation shall be placed at least 5 feet from the edge of the excavation.

Table 4-5

(29 CFR 1926.651 TABLE C-1.3)

TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS *

SOIL TYPE C P(a) = 80 X H + 72 psf (2 ft Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (ACTUAL) AND SPACING OF MEMBERS ** CROSS BRACES						
	HORIZ. SPACING (FEET)	WIDTH OF TRENCH (FEET)					VERT. SPACING (FEET)
		UP TO 4	UP TO 6	UP TO 9	UP TO 12	UP TO 15	
5 TO 10	UP TO 6	6X8	6X8	6X8	8X8	8X8	5
	UP TO 8	8X8	8X8	8X8	8X8	8X10	5
	UP TO 10	8X10	8X10	8X10	8X10	10X10	5
	See Note 1						
10 TO 15	UP TO 6	8X8	8X8	8X8	8X8	8X10	5
	UP TO 8	8X10	8X10	8X10	8X10	10X10	5
	See Note 1						
	See Note 1						
15 TO	UP TO 6	8X10	8X10	8X10	8X10	10X10	5
	See Note 1						
	See Note 1						

20	See Note 1						
OVER 20	PROFESSIONAL ENGINEER CERTIFICATION REQUIRED						

TABLE C-1.3

TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS *

SOIL TYPE C P(a) = 80 X H + 72 psf (2 ft Surcharge)

[Continued]

DEPTH OF TRENCH (FEET)	SIZE (ACTUAL) AND SPACING OF MEMBERS **						
	WALES		UPRIGHTS				
	SIZE (IN)	VERT. SPACING (FEET)	MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET)				
			CLOSE				
5 TO 10	8X10	5	2X6				
	10X12	5	2X6				
	12X12	5	2X6				
10 TO 15	10X12	5	2X6				
	12X12	5	2X6				
	12X12	5	3X6				

15 TO 20							
OVER 20	PROFESSIONAL ENGINEER CERTIFICATION REQUIRED						

* Mixed oak or equivalent with a bending strength not less than 850 psi.
** Manufactured members of equivalent strength may be substituted for wood.

4.5.11 Biological Hazards

The location of the former project location is such that biological hazards may be of significance. The biological hazards that may be present include, but are not limited to:

Ticks
Plants such as poison ivy, oak and sumac
Small animals and insects

All employees with the potential to contact the flora and fauna indicated above should be cautious when working in areas that may support these types of hazards. The HSO will assess suspect areas and warn workers when there is a possibility of contact with these items.

<u>Ticks and Lyme Disease</u>

Lyme disease is caused by infection from a deer tick that carries a spirochete. During the painless tick bite, the spirochete may be transmitted into the bloodstream that could lead to the worker contracting Lyme disease.

Lyme disease may cause a variety of medical conditions including arthritis, which can be treated successfully if the symptoms are recognized early and medical attention is received. Treatment with antibodies has been successful in preventing more serious symptoms from developing. Early signs may include a flu-like illness, an expanding skin rash and joint pain. If left untreated, Lyme disease can cause serious nerve or heart problems as well as a disabling type of arthritis.

Symptoms can include a stiff neck, chills, fever, sore throat, headache, fatigue and joint pain. This flu-like illness is out of season, commonly happening between May and October when ticks are most active. A large expanding skin rash usually develops around the area of the bite. More than one rash may occur. The rash may feel hot to the touch and may be painful. Rashes vary in size, shape, and color, but often look like a red ring with a clear center. The outer edges expand in size.

It's easy to miss the rash and the connection between the rash and a tick bite. The rash develops from three days to as long as a month after the tick bite. Almost one third of those with Lyme disease never get the rash.

Joint or muscle pain may be an early sign of Lyme disease. These aches and pains may be easy to confuse with the pain that comes with other types of arthritis. However, unlike many other types of arthritis, this pain seems to move or travel from joint to joint.

Lyme disease can affect the nervous system. Symptoms include stiff neck, severe headache, and fatigue usually linked to meningitis. Symptoms may also include pain and drooping of the muscles on the face, called Bell's Palsy. Lyme disease may also mimic symptoms of multiple sclerosis or other types of paralysis.

The disease can also cause serious but reversible heart problems, such as irregular heartbeat. Finally, Lyme disease can result in a disabling, chronic type of arthritis that most often affects the knees. Treatment is more difficult and less successful in later stages. Often, the effects of Lyme disease may be confused with other medical problems.

It is recommended that personnel check themselves when in areas that could harbor deer ticks, wear light color clothing and visually check themselves and their buddy when coming from wooded or vegetated areas. If a tick is found biting an individual, the HSO should be contacted immediately. The tick can be removed by pulling gently at the head with tweezers. The affected area should then be disinfected with an antiseptic wipe. The employee will be offered the option for medical treatment by a physician, which typically involves prophylactic antibiotics. If personnel feel sick or have signs similar to those above, they should notify the HSO immediately.

Poisonous Plants

The potential for contact with poisonous plants exists when performing field work in undeveloped and wooded areas. Poison ivy, sumac, and oak may be present on site. Poison ivy can be found as vines on tree trunks or as upright bushes. Poison ivy consists of three leaflets with notched edges. Two leaflets form a pair on opposite sides of the stalk, and the third leaflet stands by itself at the tip. Poison ivy is red in the early spring and turns shiny green later in the spring. Poison sumac can be present in the form of a flat-topped shrub or tree. It has fern-like leaves, which are velvety dark green on top and pale underneath. The branches of immature trees have a velvety "down." Poison sumac has white, "hairy" berry clusters. Poison oak can be present as a sparingly branched shrub. Poison oak is similar to poison ivy in that it has the same leaflet configuration; however, the leaves have slightly deeper notches.

Prophylactic application of Tecnu may prevent the occurrence of exposure symptoms. Post exposure over the counter products are available and should be identified at the local pharmacist. Susceptible individuals should be identified by the HSO.

Contact with poison ivy, sumac, or oak may lead to a skin rash, characterized by reddened, itchy, blistering skin which needs first aid treatment. If you believe you have contacted one of these plants, immediately wash skin thoroughly with soap and water, taking care not to touch your face or other body parts.

5.0 SITE CONTROL

A Site Control plan has been established to restrict access to work areas where potential contamination may be present, to select appropriate PPE for personnel working in each control zone and to prevent the accidental spread of contaminated materials. As part of this plan, three separate zones may be used at this site. These zones are identified as 1) the support zone, (SZ) (2) the exclusion zone (EZ), and 3) the contamination reduction zone (CRZ). Entry into any of these zones will be monitored by the HSO.

5.1 Support Zone

The Support Zone is the equipment storage area. The Support Zone is restricted to project (contact and non-contact) personnel and project support personnel and visitors as defined in this document. Entry into and out of the Support Zone will be monitored by the PM. The Support Zone is considered the non-contact area.

All personnel (project personnel, project support personnel, visitors) entering the Support Zone will be briefed by the PM prior to their initial entry. All personnel entering the Support Zone may be required to meet the Training and Medical requirements as outlined in **Sections 8 & 9**.

5.2 Exclusion Zones

The proposed work plan includes sediment and surface water sampling from a small boat. The Exclusion Zone and the Contamination Reduction Zone will be relatively small and isolated on the boat. The following text explains the handling and procedures for each of the work zones, regardless of their relative size.

The Exclusion Zone will be established at active work sites where contamination is anticipated, observed or measured leading to hazardous exposure potentials to workers. The PM will make the determination to establish an Exclusion Zone based upon work activities, work conditions, visual evidence of contamination, and/or other knowledge of the site which indicates an increase in the probability of worker exposure.

Access to the Exclusion Zone will be limited to contact project personnel that meet the training and medical requirements as outlined in **Sections 8 & 9.** All contact project personnel entering the Exclusion Zone will be briefed by the PM prior to initial entry.

The protective work clothing and equipment to be worn is defined in **Section 6** or as required by the HSO. All personnel and equipment exiting the Exclusion Zone will be decontaminated (see Section 12.0) in the CRZ or as the PM determines is necessary.

Once the project activities have been completed, the Exclusion Zone will be removed by the PM.

5.3 Contamination Reduction Zone (CRZ)

The proposed work plan includes sediment and surface water sampling from a small boat. The Exclusion Zone and the Contamination Reduction Zone will be relatively small and isolated on the boat. The following text explains the handling and procedures for each of the work zones, regardless of their relative size.

The CRZ is the area just outside of the Exclusion Zone where Contact Project Personnel undergo decontamination. This zone will be contiguous with the Exclusion Zone. The area will be marked using flagging tape or other means to readily identify the boundary of the zone. Access to this zone will be limited to Contact Project Personnel exiting the Exclusion Zone and personnel assisting with decontamination.

The CRZ will be used to decontaminate the drill rig and other equipment as they leave the EZ. Dust and loose material will be brushed off the wheels and other potentially contaminated areas. An equipment decontamination facility will be required for cleaning large equipment used for drilling, excavation or other activities within the Main Site or Peripheral Properties.

6.0 WORK CLOTHING AND LEVELS OF PERSONNEL PROTECTION

6.1 Work Clothing

The PM will recommend appropriate levels of protective clothing to be worn in the event that hazardous materials are encountered. The levels of protection planned for this project are identified in **Table 6-2**.

6.2 Levels of Protection

The level of protection to be worn by field personnel will be defined and controlled by the PM. Below is a list of tasks and the respective levels of protection when working inside a project exclusion zone.

Table 6-2. Personal Protection Levels

Task	Head	Eye/Face	Feet	Hands	Body	Hearing	Respirator
Mobilization/Demobilization							
Mobilization/ Demobilization of equipment and supplies	Hard Hat	Safety Glasses	Steel Toed Boots	Leather work gloves (as needed)	Work Clothing	Ear Plugs as needed	None (dust mask if desired)
Establishment of site security, work zones and staging area	Hard Hat	Safety Glasses	Steel Toed Boots	Leather work gloves (as needed)	Work Clothing	Ear Plugs as needed	None (dust mask if desired)
Excavation and Trenching Activities							
Excavate material	Hard Hat	Safety Glasses, Full Face APR as needed	Steel Toed Boots, chemical-protective overboots	Nitrile gloves, Leather work gloves (as needed)	Work Clothing, Tyvek or Polytyvek as needed	Ear Plugs as needed	None initially; Full face air-purifying respirator as needed
Segregate material	Hard Hat	Safety Glasses, Full Face APR as needed	Steel Toed Boots, chemical-protective overboots	Nitrile gloves, Leather work gloves (as needed)	Work Clothing	Ear Plugs as needed	None initially; Full face air-purifying respirator as needed
Dewater excavation as needed	Hard Hat	Safety Glasses, Full Face APR as needed	Steel Toed Boots, chemical-protective overboots	Nitrile gloves, Leather work gloves (as needed)	Work Clothing	Ear Plugs as needed	None initially; Full face air-purifying respirator as needed.
Backfill excavation	Hard Hat	Safety Glasses	Steel Toed Boots, chemical-protective overboots	Leather work gloves (as needed)	Work Clothing, Tyvek or Polytyvek as needed	Ear Plugs as needed	None (dust mask if desired)
Trenching	Hard Hat	Safety Glasses	Steel Toed Boots plus overboots for entry	Leather work gloves (as needed); Nitrile + surgical gloves for entry	Work Clothing; Tyvek or Polytyvek for entry	Ear Plugs or Ear Muffs as needed	As required based upon real-time monitoring results as compared to Action Level in Table 6.2
Site Restoration	Hard Hat	Safety Glasses	Steel Toed Boots	Leather work gloves (as needed)	Work Clothing	Ear Plugs as needed	None (dust mask if desired)
Heavy Equipment Decontamination	Hard Hat	Safety Glasses with Face shield	Steel Toed Boots, chemical-protective overboots	Nitrile + surgical gloves	Work Clothing plus Polytyvek	Ear Plugs as needed	None (dust mask if desired)

Definition of Levels of Protection:

Level D:	Work coveralls Gloves Appropriate work boots Hardhat Safety glasses with side shields or splash goggles as needed An air purifying respirator is not required. Personal Flotation Device (PFD) when working over water
Level C:	Chemical-resistant disposable coveralls Chemical-resistant outer gloves Chemical-resistant inner gloves Appropriate leather work boots with chemically resistant outer boots or chemically resistant rubber boots Hardhat Full or Half face, Air Purifying Respirator (APR) with combination HEPA - P,O,N 100 (dusts, fumes, aerosols) and chemical cartridge as appropriate for hazard
Level B:	Chemical-resistant disposable coveralls Chemical-resistant outer gloves Chemical-resistant inner gloves Appropriate leather work boots with chemically resistant outer boots or chemically resistant rubber boots Hardhat Supplied air - air line or self-contained breathing apparatus (SCBA)
Level A:	Fully encapsulating chemical-resistant/gas tight suit Attached chemical-resistant outer gloves Chemical-resistant inner gloves Attached chemical-resistant boots. Self-contained breathing apparatus

6.3 Donning and Doffing

Manufacturers procedures for donning and removing PPE ensembles will be followed in order to prevent damage to PPE, reduce and eliminate migration from the work area and a transfer of contaminants to the wearer's body or others.

6.4 Storage and Inspection

Protective equipment will be stored and maintained in the company vehicles on site. Items such as gloves, protective suits, and hearing protection will be kept within a suitable storage area.

Respirators will be stored in plastic bags when not in use.

Employees are responsible for inspecting personal protective equipment prior to donning, during use and at the end of the shift. Defective equipment shall be removed from service and reported to the PM. All reusable equipment will be maintained in a sanitary condition, in accordance with the manufacturer's recommendations.

7.0 MONITORING PROCEDURES

7.1 Monitoring During Site Operations

All field personnel shall be diligent in monitoring the work zone dust conditions. The potential to generate dust from the saturated sediments is low, however during a period of high dust generation or high dust potential, the field team shall work to alleviate the dust condition. Real time air monitoring to assess the level of air borne particles during periods of high dust generation may be implemented. Dust monitoring shall be conducted near personal breathing zones and the surrounding work area (e.g., perimeter of the work boat).

If required, initial air monitoring shall be performed of those employees likely to have the highest exposures to hazardous substances above the Occupational Safety and Health Administration (OSHA) action level (AL) and permissible exposure limits (PEL) or published exposure levels by using personal sampling frequently enough to characterize employee exposures. Perimeter air monitoring around the limits of the work boat shall be performed downwind of sediment disturbance activities. Air monitoring forms are located in **Appendix C**.

Employees likely to have the highest exposure include but are not limited to those involved in sediment sampling and handling. Representative air monitoring may also be conducted at the discretion of the HSO to identify any areas where an IDLH condition may develop during site activities.

Periodic monitoring shall be conducted when the possibility of an IDLH condition has developed or when there is indication that exposures may have risen over permissible exposure limits (PEL) or published exposure levels since prior monitoring.

Sampling collection and analysis for personal air monitoring will be conducted according to the procedures set forth in either the NIOSH Manual of Analytical Methods or the OSHA Analytical Methods Manual. An American Industrial Hygiene Association (AIHA) accredited laboratory will be used for sample analysis. All analytical results will be compared to published 8-hour Action Levels and OSHA Permissible Exposure Limits (PELs) or ACGIH Threshold Limit Valves (TLVs).

<u>Exclusion Zone Monitoring</u>

The frequency of real-time monitoring in exclusion zone work areas will be determined by the HSO and/or according to the task being conducted and whether potentially hazardous sediment will be

contacted.

Real-time monitoring in restricted work zone areas may be conducted under the following conditions: prior to the beginning of any new job task; prior to the beginning of a job task in any new area; periodically for a long-term job task; during an activity which would have the highest probability of worker exposure as determined by the HSO; visible presence of contamination; or at the discretion of the HSO.

Background Monitoring

Real-time monitoring will also be conducted at locations such as in any of the staging areas as part of determining atmospheric background levels. Background levels will be established before conducting real-time monitoring in any restricted or Exclusion Zone work area.

Permissible Exposure Limits and IDLHs of Contaminants of Concern

Chemical	OSHA PEL/IDLH
Pesticides/Herbicides	PEL Range: 0.25 mg/m3 – 10 mg/m3 IDLH Range: 25 mg/m3 – 250 mg/m3
Polychlorinated biphenyls (PCB) 42% Chlorine	1 mg/m^3
Polychlorinated biphenyls (PCB) 54% Chlorine	0.5 mg/m^3
Polyaromatic Hydrocarbons (PAHs as a class)	0.2 mg/m^3

Dust levels may be monitored during activities that have the potential for sediment disturbance. Dust level measurements may be performed with a Rae Systems Data Ram (direct read and data logging total dust monitor). Dust control measures will be implemented if needed. Dust control measures may include the use of water to control dust levels during work activities.

Personal monitoring for dust will be performed for one worker every two (2) hours. In addition, personal monitoring will be performed whenever visible dust is observed

Based on the previous investigations and the tasks to be performed, the HSO will perform monitoring in the work area during sediment sampling activities. **Table 7-1** shows the type of instruments that **can be used** for different contaminants.

Table 7- 1. Air Monitoring Instrumentation

Air Monitoring Instrument Name	Acronym	Contaminant(s) Monitored

Photoionization Detector	PID	Organic Vapors (for soil screening to detect the presence of volatile organic chemicals)
Flame Ionization Detector	FID	Organic Vapors (for soil screening)
Rae Systems DataRam		Total Dust
Combustible Gas Indicator	CGI	Combustible gas, oxygen, carbon monoxide, hydrogen sulfide
NIOSH Methods 5501 and 5502		Aldrin; 2,4-D, and 2,4,5-T

7.2 Action Level Criteria

A summary of the action levels to be used, action required and the types of instrumentation which may be utilized at the discretion of the HSO is presented in **Table 7-2**.

Table 7- 2a. Suggested Action Levels and Actions to be Taken

Air Monitoring Instrumentation	Monitoring Location	Action Level	Site Action
PID/FID	Breathing Zone	2.0 ppm	Use detector tube for benzene to verify if concentration is benzene.
PID/FID	Breathing Zone	0 – 10 ppm	No respiratory protection is needed.
		10 – 250 ppm	Stop work, withdrawal from work area, institute engineering controls, if levels persist Upgrade to Level C
		>250 ppm	Stop work, withdraw from work area
Oxygen Level (Combustible gas meter)	Breathing Zone	< 19.5%	Stop work; withdraw from work area; ventilate area
		> 22 %	Stop work; withdraw from work area; ventilate area
Hydrogen Sulfide (H2S) Level (Combustible gas meter)	Breathing Zone	< 5 ppm	No respiratory protection is needed.
		> 5 ppm	Stop work, cover excavation, withdraw from work area, institute engineering controls
Rae Systems Data Ram pDR 1000	Perimeter	Visible dust or downwind dust greater than 1 mg/m3 above upwind dust	Level C personal protective equipment. Stop work activities and utilize dust control measures (water, plastic sheeting).

Table 7-2b Action Levels for Total Volatile Organic Chemicals and Total Dust

Action Level (active construction work area)	Level of Protection	Action to be Taken
INTRUSIVE ACTIVITIES		
Background (BKGD) to 5 units above BKGD – PID measurement	Construction work clothing	Continue working using Good Work Practices.
Greater than 5 units above BKGD – PID measurement for greater than 5 minutes duration.	Level C PPE	Personnel must be in Level C PPE. Ventilate to reduce level. Check perimeter.
Visible dust or downwind dust greater than 1 mg/m3 above upwind dust	Level C PPE	Use dust control (water, plastic sheeting)
Action Level (Perimeter)	**Level of Protection**	**Action to be Taken**
Greater than 1 unit above BKGD continuously for 15 minutes.	Construction work clothing	Stop work and take measures to reduce vapors (plastic sheeting, ventilation)

7.3 Calibration

All applicable monitoring equipment will be tested or calibrated at least once per day before each day's use. The calibration results will be recorded. Monitoring equipment will be maintained on a schedule corresponding to the manufacturer's suggested maintenance schedule.

7.4 Additional Sampling

All aspects of the field sampling activities will be documented within permanent, write-in-the-rain field books or waterproof field data sheets. The following data milestones will be recorded at each day and at each sample location. Individual and unique field sheets as well as individual field book pages will be used for each sample day.

- The day of week and date of each work day
- The names, company affiliations and general work activities conducted for all sample team members
- An inventory of major sampling equipment including a description of the vibratory hammer, the GPS unit, the digital camera and the piston core sampler.
- A log of sample locations and sample collection activities including the location and time each sediment core is recovered and containerized.
- A log of all photographs including daily time synchronization of the GPS unit with the digital camera, all samples, labeled sample containers, photographs of the sample equipment and photographs of the GPS locations.
- A chronologic summary of daily activities including at a minimum the meeting time for the team, the time of the health and safety meeting, the start time on the water, the time

individual sample activities begin at a sample location, the time individual sample activities end at a location, the transit time between sample locations, the time off the water and the time all team members exit the site.

- A tabular list of the samples that were collected including the sample location, the sample times, the sample containers, the preservation techniques and/or chemicals used, the sampler's name, the sample identification name, the proposed laboratory and the proposed shipping method.
- A tabular list of field readings including water quality measurements, water depths, and the time of each reading.
- A description of the individual samples including color, texture, odor, sediment content, water content, sample depth, supplemental materials within the sample and any other characteristic of interest.
- A site sketch to supplement the GPS sample location grid.
- The shipping method and shipping documentation for the samples, including way bill or transport identification numbers if immediately available.
- A name and signature line for each team member that entered data into the field log or onto the field data sheets.

7.4.1 Sediment Sampling

Sediment samples will be collected in accordance with the current workplan, US EPA protocols, the project SOPs and the NJDEP Field Sampling Procedures Manual.

Sediment samples will be collected with a vibracore, vibratory sampler or a modified direct push piston sampler. The samples will be extracted and inspected / manipulated using dedicated stainless steel or polyethylene scoops and placed into laboratory supplied glassware.

7.4.2 Trip and Field Blanks

Field blanks and trip blanks are not proposed for this Treatability Study workplan.

If field blanks and/or trip blanks are collected they will be collected at a frequency of 1 field blank sample per 20 sediment samples and 1 trip blank for each 3 days of field activities. Field blanks will be collected for organic chemical analysis similar to sediment sample analysis using laboratory supplied containers and water for the blank collection. Trip blanks will be submitted with aqueous samples only at a frequency of one sample per day.

8.0 TRAINING

8.1 Initial Site Training

Initial site briefing will be provided on-site by the PM or his /her designee for all Project Personnel (Contact and Non-Contact), Project Support Personnel prior to initial entry onto the site. Site training will also be provided on an as needed basis to specifically address the activities, procedures, monitoring, and equipment for the site operations. Such training will include site and facility layout, hazards, and emergency services at the site, and will detail all provisions contained within this HASP. This training will be documented.

8.2 Contact Project Personnel Training

All Contact Project Personnel designated to work in the Exclusion Zone as outlined in **Section 5**, are required to have successfully met the initial and refresher training requirements pursuant to OSHA 29 CFR 1910.120(e).

8.3 Confined Space Training

If confined spaces are involved, employees shall be trained to recognize confined spaces, the hazards of working in a confined space, and the requirements of this procedure. Any confined space entry will be conducted using the OSHA Confined Space Standard for General Industry (29 CFR 1910.146) as a guideline.

9.0 MEDICAL SURVEILLANCE

All Contact Project Personnel engaged in on-site activities on this project must have baseline physical examinations and be participants in their employer's medical surveillance program. This program must meet the requirements of 29 CFR 1910.120(f). Medical procedures beyond baseline physical and routine medical surveillance are not planned for this project. Medical records for employees are maintained at the corporate office and by the company's medical group. Medical records are maintained in accordance with the record keeping requirements of 29 CFR 1910.20. Additionally, any employee required to wear a respirator for Level C PPE or above must be approved by a licensed health care provider for respirator use as defined in the OSHA Respiratory Standard 29 CFR 1910.134.

In the unlikely event of an exposure event occurring, the affected employee will be sent for any evaluation and treatment that may be needed to the designated hospital. See **Appendix E** for hospital for written directions and route map.

10.0 COMMUNICATIONS

10.1 Hazard Communication

The HSO or his/her designee is responsible for site specific training, maintaining and updating the site

chemical inventory list, assuring adequate labeling, obtaining and maintaining MSDS and notifying employees and contractors of the hazards associated with non-routine tasks. The HSO shall inform NewFields personnel of the potential hazards that may be encountered in the area where they will be working, should the HSO have such knowledge of these hazards.

10.2 General Communication

A means of communication will be provided at the project site. This may include two-way radios or cellular phones. Project personnel will be informed of the communication procedures during site briefings. Two blasts from an air horn will be the means of communicating an emergency situation at the site.

11.0 DECONTAMINATION PROCEDURES

11.1 General

All personnel and equipment that have been within established exclusion zones shall be decontaminated. All decontamination facilities will be under the control of the HSO, HSO or his/her designee. Cleanup activities may also occur for operations outside of the established exclusion zones. Such cleanup is part of typical monitoring and sampling, construction, and other support operations.

11.2 Personnel Decontamination

Personnel field decontamination equipment, supplies and/or facilities will exist at the exits to the established exclusion zones, in the contamination reduction zones (CRZs). If possible, these field decontamination facilities will be located upwind of the exclusion zone. The field decontamination facilities will be under the control of the HSO.

The detailed extent of the decontamination will be a site-specific decision by the HSO based on the extent of personnel contamination. Full field decontamination procedures will require all personnel exiting exclusion zones to go remove their PPE. Contaminated PPE will be placed into garbage bags and disposed in accordance with state, federal and local regulations.

11.3 Wash-up Facility

Portable wash-up materials will exist in the main support area of the work zone. These will be under the control of the HSO.

After exiting a field decontamination facility, personnel may now use the "wash-up" setup**. <u>All</u> personnel (contact and non-contact) working at the site must wash their hands and faces prior to eating, drinking or smoking and practice good personal hygiene.** Potable water or Deionized

Water will be available at the site.

11.4 Equipment Decontamination

Equipment decontamination will take place at the contamination reduction zone on the workboat or at a land-based CRZ (as needed). Waste water generated by decontamination activities will be collected, characterized, and inspected. The decontamination water will be containerized, returned to the land based site area, transferred into US DOT hazardous waste drums, sampled and disposed at an approved TSD facility.

12.0 DISPOSAL PROCEDURES

It is possible that solid and liquid waste from the project tasks may be generated. Any waste material containerized during the course of the project shall be appropriately marked pending sampling results and ultimate disposal.

Used PPE, disposable sampling equipment and package materials will be managed together and minimized whenever possible. These wastes are not considered hazardous and can be sent to a municipal landfill. These wastes will be stored within heavy duty, rip-stop trash bags until filled to 80% capacity. The bags will be compacted using manual pressure, standing air will be removed to the extent practical and the bags taped shut. If a bag contains sharp objects or there is a potential for the bag to rip, the bag will be isolated with an outer over-pack bag.

13.0 EMERGENCY PLAN

Emergency situations can be characterized as a fire or explosion, an environmental release, or accident or injury to the field personnel. For incidents other than minor injuries to on site personnel, evacuation of the area will be conducted. The Project Manager will be notified immediately in the event of an evacuation. Two (2) blasts of an air horn will be used to communicate an emergency situation to the site workers.

Emergency phone numbers are listed in **Section 1 or Appendix E** of this Health and Safety Plan. In case of emergency, it is important that the following Incident Reporting Procedure be observed:

It is important to assure the rapid and accurate transfer of information appropriate personnel in the event of an emergency situation. To simplify the procedure, emergency situations can be reported by dialing 911. This includes incidents requiring police assistance, fire department, or medical emergencies.

Be sure to provide the following information to the dispatcher:

1. Caller full name

2. The nature of the incident (i.e. "Fire")

3. The location of the incident (i.e., "Street location and nearest intersection") The more specific the better.

4. What you need (i.e. "Fire Department and First Aid")

5. If you are able, where you will meet emergency responders (i.e. At end of West Street, near train tracks)

6. If applicable, a call back number or your pager number (e.g., "I'll be at the scene; my pager number is 123-4567").

7. Status of the situation. (e.g., is the situation stabilized or "I have the fire under control")

8. If anyone is injured or in need of emergency assistance (e.g., "A mechanic working on a pump was burned.")

13.1 Site Emergency Coordinator

Site Emergency Coordinator: *David Puchalski - as NewFields PM*
Tim Hammermeister - as NewFields FSM
Jay Word – as NewFields Field Team Leader

13.2 Evacuation

In the event of an emergency situation, all personnel will evacuate and assemble at the main entrance to the slough area or at the dock area. Should it not be possible to assemble at the main entrance the Emergency Coordinator will designate an alternate site upwind from the emergency area. For efficient and safe area evacuation and assessment of the emergency situation, the Site Emergency Coordinator or alternate will have authority to initiate proper action if outside services are required. The Site Emergency Coordinator will ensure that access for emergency equipment is provided and that all combustion apparatus (e.g.; operating machinery) has been shut down once an emergency situation has been identified.

13.3 Personnel Injury

In the event of an emergency situation, the local emergency response group will be called. In case of a life-threatening situation, emergency first aid may be applied on-site as deemed necessary. The individual should be cleaned up and/or decontaminated and then transported to the nearest medical facility if needed.

The local rescue squad shall be contacted for transport as necessary in an emergency. Since some situations may require transport of an injured party by other means, transportation by automobile

may be required.

13.4 Personnel Exposure Treatment

SKIN CONTACT:	Use copious amounts of soap and water. Wash and/or rinse affected area thoroughly, then provide appropriate medical attention. Eyes should be thoroughly rinsed with water for at least 15 minutes.
INHALATION:	Move to fresh air and, if necessary, decon/transport to hospital.
INGESTION:	Decontaminate and transport to emergency medical facility.
PUNCTURE WOUND OR LACERATION:	Decontaminate, if possible, and transport to emergency medical facility.

13.5 Hospital

Two (2) hospitals with Emergency Room services are within the immediate vicinity of the site.

San Francisco General Hospital Emergency Services will be the primary hospital
1001 Potrero Avenue, Suite 1E21
San Francisco, CA 94110

OR

California Pacific Medical Center-St. Luke's Campus will be the secondary hospital
3555 Cesar Chavez
San Francisco, CA 94110

Directions and a map depicting the route to each hospital are provided in **Appendix E.**

13.6 Safety Equipment

Basic emergency and first aid equipment will be made available. This shall include a first aid kit, emergency eyewash & safety shower and other safety-related equipment.

14.0 RECORDKEEPING

The HSO and/or designee will maintain health and safety information records for the site. The following information will be recorded as needed:

Weather conditions (temperature, wind speed and direction)
Training Records
Health and Safety Audit records
Description of operation(s)
Description of accident(s) (OSHA 300 log)
Non-compliance with the HASP

15.0 AUTHORIZATIONS

Personnel authorized to enter the project work zones and exclusion zones at this site must be approved by the HSO or their designee. Authorization will involve completion of appropriate training courses and medical examination requirements as outlined by this HASP, as well as the signature of the individual on the Acknowledgement Form recognizing a complete understanding of this HASP (see **Appendix D**).

APPENDICES

APPENDIX A – Site Maps

APPENDIX B – Chemical Specific Information

Compound	CAS #	ACGIH TLV	OSHA PEL	Route of Exposure	Symptoms of Exposure	Target Organs	Physical Data
Lead	7439-92-1	0.050 mg/m^3	0.050 mg/m^3	Inhalation, Ingestion, Skin Contact,	Weak, lass, insomnia; facial pallor; pal eye, anorexia, low-wgt, malnut; constip, abdom pain, colic; anemia; gingival lead line; tremor; para wrist, ankles; eye irritation	Eyes, GI tract, CNS, kidneys, blood, gingival tissue	A heavy, ductile, soft, gray solid. FP: NA IP: NA LEL: NA UEL: NA VP: 0 mm
Arsenic	7440-38-2	0.01 mg/m^3	0.01 mg/m^3	Inhalation Skin Absorption Ingestion Skin Contact	Ulceration of nasal septum, dermititis, GI disturbances, peripheral neuropathy, respiratory irritation, hyper pigmentation of skin, possible carcinogen	Liver, kidneys, skin, lungs, lymphatic system	Metal: Silver-white, odorless solid FP: NA IP: NA LEL: NA UEL: NA VP: 0 mm
Copper	7440-50-8	1 mg/m^3	1 mg/m^3	Inhalation, Ingestion, Skin Contact	Irritant to eyes, nose, pharynx	Respiratory system, skin, eyes, liver, kidney	Reddish, lustrous, malleable, odorless solid FP: NA IP: NA LEL: NA UEL: NA VP: 0 mm
Mercury	7439-97-6	0.05 mg/m^3 (skin)	C - 0.10 mg/m^3	Inhalation Skin Absorption Ingestion Skin Contact	Irritate eyes; skin, chest pain, tremor	Skin, eyes, respiratory system, CNS, kidneys	Silver-white, heavy, odorless solid FP: NA IP: NA LEL: NA UEL: NA VP: 0 mm
Cadmium	7440-43-9	0.005 mg/m^3	0.005 mg/m^3	Inhalation Skin Absorption Ingestion Skin Contact	Pulmonary edema, chest tighness, muscle aches, nausea, vomiting, diarrhea	Respiratory system, kidneys, prostate, blood	Silver-white metal, blue tinged, lustrous, odorless solid FP: NA IP: NA LEL: NA UEL: NA VP: 0 mm
Aldrin	309-00-2	.025 mg/m^3	.025 mg/m^3	Inhalation Skin Absorption Ingestion Skin Contact	Eye irritant, dizziness, weakness, confusion, convulsions, blurred vision, abdominal pain	Eyes, skin, respiratory system, CNS, CVS	Colorless to dark brown crystalline solid with a mild chemical odor FP: NA IP: NA LEL: NA UEL: NA VP: 0.00008 mm

Compound	CAS #	ACGIH TLV	OSHA PEL	Route of Exposure	Symptoms of Exposure	Target Organs	Physical Data
Chlorodiphenyl (42% Chlorine) **(PCB)**	53469-21-9	0.001 mg/m^3	1 mg/m^3	Inhalation, Ingestion, Skin Contact	Irritation in the eyes, chloracne; liver damage; reproductive effects	Skin, eyes, liver, reproductive system	Colorless to light-colored, viscous liquid with a mild, hydrocarbon odor. FP: NA IP: ?? LEL: NA UEL: NA VP: 0.001 mm Hg
Chlorodiphenyl (54% Chlorine) **(PCB)**	11097-69-1	0.001 mg/m^3	0.5 mg/m^3	Inhalation, Ingestion, Skin Contact,	Irritation in the eyes, chloracne; liver damage; reproductive effects	Skin, eyes, liver, reproductive system	Colorless to pale-yellow, viscous liquid or solid (below 50°F) with a mild, hydrocarbon odor. FP: NA IP: ?? LEL: NA UEL: NA VP: 0.000,06 mm Hg
Dieldrin	60-57-1	0.25 mg/m^3 (skin)	0.25 mg/m^3	Inhalation Skin Absorption Ingestion Skin Contact	Headache, dizziness, nausea, vomiting, convulsions, coma	CNS, liver, kidneys, skin	Colorless to light tan crystals with a mild, chemical odor FP: NA IP: NA LEL: NA UEL: NA VP: 8×10^{-7} mm
4-4' – DDT	50-29-3	0.5 mg/m^3	1 mg/m^3 (skin)	Inhalation, Ingestion, Skin Contact	Irritant to eyes, skin, tongue, lips, face, tremor, dizziness, confusion, vomiting	Eyes, skin, CNS, kidneys, liver, PNS	Colorless crystals or off-white powder with a slight aromatic odor FP: NA IP: NA LEL: NA UEL: NA VP: 2×10^{-6}mm
Lindane	58-89-9	0.025 mg/m^3	0.025 mg/m^3	Inhalation Skin Absorption Ingestion Skin Contact	Irritate eyes; skin, nose, throat, headache, nausea, convulsions, respiratory difficulty, cyanosis, aplastic anemia, muscle spasms	Eyes, skin, respiratory system, CNS, blood, liver, kidneys	White to yellow crystalline powder with a slight musty odor FP: NA IP: NA LEL: NA UEL: NA VP: 0.00001 mm

Abbreviations

C	Ceiling limit, not to be exceeded
CVS	Cardiovascular System
CNS	Central Nervous System
eV	Electron volt
FP	Flash Point
IP	Ionization Potential
GI	Gastro – intestinal
LEL	Lower Explosive Limit
Mm	millimeter
NOIC	Notice of Intended Change
PPM	Parts per Million
Skin	Significant route of exposure
STEL	Short Term Exposure Limit (15 minutes)
TWA	Time Weighted Average (8 hours)
UEL	Upper Explosive Limit
VP	Vapor pressure approximately 68° F in mm Hg (mercury)

APPENDIX C – Air Monitoring Forms

AIR MONITORING DATA SHEET

Project Name _____ Project No. _____ Date _____

Personnel _____

General Operation and Location at Site _____

Instrument Type, Make, Model _____

Instrument Serial or ID No. _____ Battery Check Results_____

Date of Last Calibration or Check _____ Date of Last Service _____

Contaminant(s) Suspected _____

	Specific Location	Specific Operation or Work Phase	Employee Name (if Breathing Zone Monitored)	Time	Reading	Comments (i.e. duration, causation, etc.)
1						
2						
3						
4						
5						
6						

General Comments:

APPENDIX D - Field Sign Off

The Signatures Below Indicate That The Following People Have Read And Understand This Health and Safety Plan.

Print Name	Signature	Affiliation	Date

APPENDIX E – Emergency Information

APPENDIX E - Emergency Information
Emergency Phone Numbers

Emergency Phone Numbers

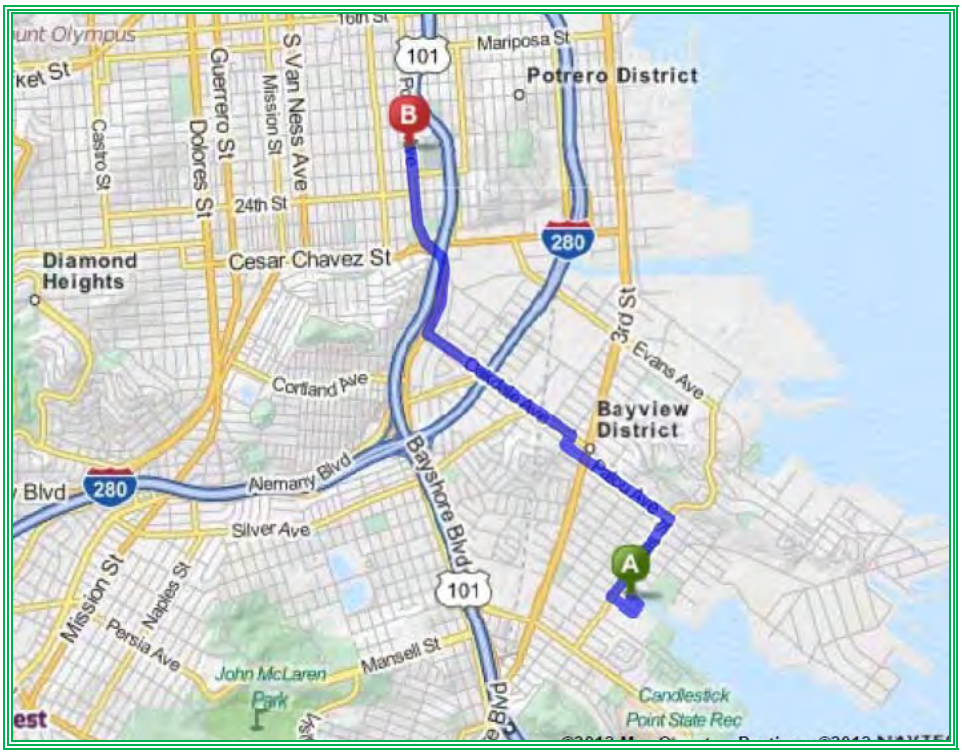
Police Department San Francisco Police Department – Bayview District	911 or (415) 671-2300 201 Williams St. San Francisco, CA 94124
Fire Department San Francisco Fire Department – Station 17	911 or (415) 558-3403 698 2nd Street San Francisco, CA 94107
Ambulance San Francisco Fire Department – Station 17	911
Hospital SF General Hospital Emergency Services 1001 Potrero Avenue, Suite 1E21 San Francisco, CA 94110 OR California Pacific Medical Center-St. Luke's Campus 3555 Cesar Chavez San Francisco, CA 94110	911 or (415) 206-8111 911 or (415) 647-8600
Poison Control Center	800-522-6337
Region 9 EPA Hotline	(415) 744-2000
California Office of Emergency Services	(800) 852-7550
National Response Center (NRC) for Oil/Chemical Spills	800-424-8802
City of San Francisco CIH	(415) 671-3171
California Underground Service Alert (Utility markout service)	811 or (800) 227-2600

Directions to SF General Hospital Emergency Services

1001 Potrero Avenue, Suite 1E21
San Francisco, CA 94110

Starting at the Yosemite Slough at Yosemite Avenue.

1. Start out going southeast on Yosemite Ave toward Hawes St (Portions unpaved).
   Travel 0.04 miles southeast
2. Take the 1st right onto Hawes St (Portions unpaved).
   Travel 0.05 miles southwest
3. Turn right onto Armstrong Ave (Portions unpaved)
   Travel 0.1 miles northwest
4. Take the 1st right onto Ingalls Street.
   Travel 0.5 miles northeast
5. Turn left onto Palou Ave. (Palou Ave is just past Quesada Ave)
   Travel 0.5 miles northwest
6. Turn right onto Newhall Street (If you reach Phelps St. you've god too far.)
   Travel 0.05 miles northeast
7. Take a quick left onto Oakdale Avenue
   Travel 0.9 miles northwest
8. Turn right onto Bayshore Boulevard (The Old Clam House is on the right)
   Travel 0.3 miles north
9. Turn slight left onto Potrero Avenue
   Travel 0.6 miles north, northwest
10. Hospital is on the right side
    1001 Portrero Avenue

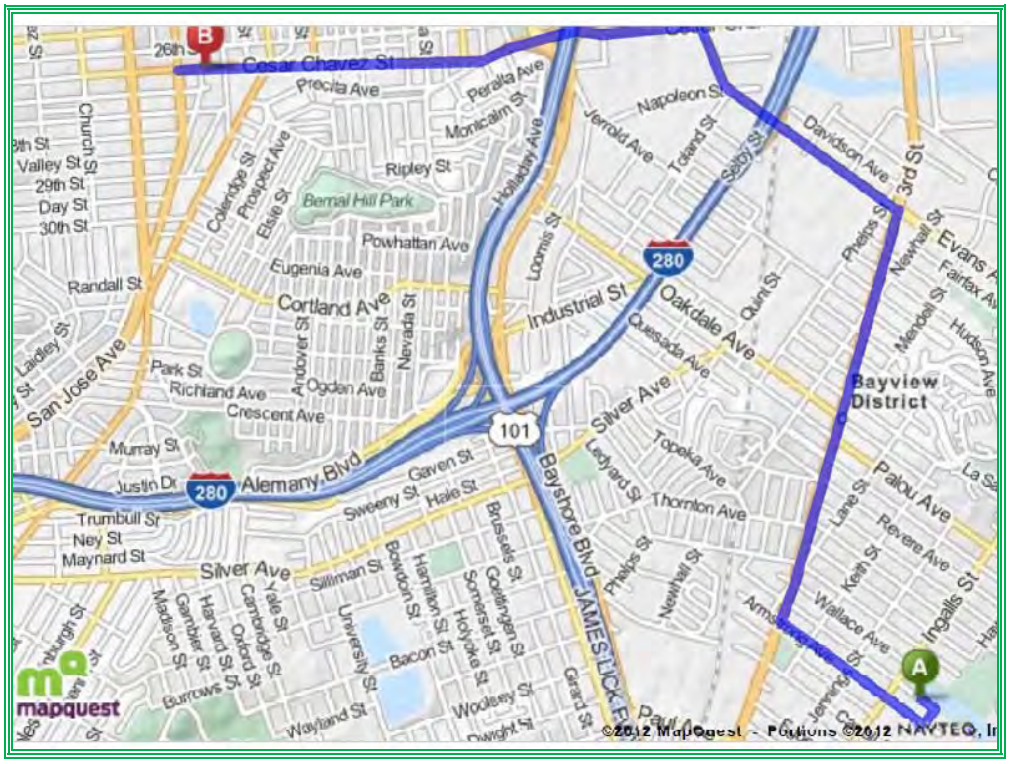


Directions to California Pacific Medical Center-St. Luke's Campus

3555 Cesar Chavez
San Francisco, CA 94110

Starting at the Yosemite Slough at Yosemite Avenue.

1. Start out going southeast on Yosemite Ave toward Hawes St (Portions unpaved).
   Travel 0.04 miles southeast
2. Take the 1st right onto Hawes St (Portions unpaved).
   Travel 0.05 miles southwest
3. Turn right onto Armstrong Ave (Portions unpaved)
   Travel 0.5 miles northwest
4. Turn right onto 3rd Street.
   Travel 1.1 miles north
5. Turn left onto Evans Avenue.
   Travel 0.7 miles northwest
6. Turn left on Cesar Chavex Street/ Cesar Chaves Army Street
   Travel 1.4 miles west
7. Make a U Turn at Gurero Street
   Travel 0.02 miles west
8. Travel EAST on Cesar Chavex Street/ Cesar Chaves Army Street
   Travel 0.02 mile east
9. Hospital is on the right side
   3555 Cesar Chavez



APPENDIX F – NAVIGATION PLAN

APPENDIX F – Navigation Plan

Category	Mission Details
Proposed sample date	On or about March 18, 2012 to April 8, 2012
Proposed Launch Location	Oyster Point Marina 5 Harbormaster Road, #1 South San Francisco, California 94080 650-952-0808 http://www.smharbor.com/oysterpoint/
Marina Driving Directions	Oyster Point Marina/Park is located in South San Francisco. Take Hwy 101 to South San Francisco/Oyster Point Blvd exit. Then one mile East on Oyster Point Blvd. Turn right on Marina Blvd., which is the entrance to the marina grounds. Harbor Master's Office is located at 95 Harbormaster Rd.
Distance from Marina to sample area	Approximately 5 miles. Marina is due south of the sample area
Estimated work time	Launch time ~ 6:45 Return time ~ 16:00
Overnight accommodations	Not applicable All work planned for daylight hours No overnight or night time work
Work boat inspections	Small craft inspection to be completed each day prior to the start of work
Probable navigation plan	See attached figure for conceptual navigation plan.

NewFields Staffing Plan and Contact Information

Project Manager	David Puchalski	Cell - (732) 598-6279
Field Services Manager	Tim Hammermeister	Cell - (206) 890-8667
Site Safety Officer	Jay Word	Cell – (206) 779-9500
Site Support Personnel	Preston Martin	Cell – (206) 962-0214

1 inch = 4,000 feet

Legend

- Treatabilty Study Navigation Plan
- Preliminary US EPA Yosemite Creek Site Boundary
- Road
- Buildings

Note:

1. Preliminary Site Boundary identified by US EPA contractor; Ecology and Environment, Inc. in Waste Characterization Study, Sampling and Analysis Plan.
2. Waste characterization sample locations were were provided by ENE following March 2012 sampling.
3. Treatability samples will be capture from 4 WCS sample locations; YC-038, YC-040, YC-041 and YC-043.

NEWFIELDS

Figure A
Proposed Navigation Plan

Sediment Treatability Study Workplan
Yosemite Slough Sediment Site
San Francisco Bay, San Francisco, CA

MATERIAL SAFETY DATA SHEET

ALCONOX®

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS, Australian WorkSafe, Japanese Industrial Standard JIS Z 7250:2000, and European Union REACH Regulations

SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME:	**ALCONOX®**
CHEMICAL FAMILY NAME:	Detergent.
PRODUCT USE:	Critical-cleaning detergent for laboratory, healthcare and industrial applications
U.N. NUMBER:	Not Applicable
U.N. DANGEROUS GOODS CLASS:	Non-Regulated Material
SUPPLIER/MANUFACTURER'S NAME:	Alconox, Inc.
ADDRESS:	30 Glenn St., Suite 309, White Plains, NY 10603. USA
EMERGENCY PHONE:	**TOLL-FREE in USA/Canada** 800-255-3924
	International calls 813-248-0585
BUSINESS PHONE:	914-948-4040
DATE OF PREPARATION:	May 2011
DATE OF LAST REVISION:	February 2008

SECTION 2 - HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: This product is a white granular powder with little or no odor. Exposure can be irritating to eyes, respiratory system and skin. It is a non-flammable solid. The Environmental effects of this product have not been investigated.

US DOT SYMBOLS

Non-Regulated

CANADA (WHMIS) SYMBOLS

EUROPEAN and (GHS) Hazard Symbols

Signal Word: **Warning!**

EU LABELING AND CLASSIFICATION:

Classification of the substance or mixture according to Regulation (EC) No1272/2008 Annex 1
EC# 205-633-8 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 268-356-1 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 231-838-7 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 231-767-1 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 207-638-8 Index# 011-005-00-2
EC# 205-788-1 This substance is not classified in the Annex I of Directive 67/548/EEC

GHS Hazard Classification(s):

Eye Irritant Category 2A

Hazard Statement(s):

H319: Causes serious eye irritation

Precautionary Statement(s):

P260: Do not breath dust/fume/gas/mist/vapors/spray
P264: Wash hands thoroughly after handling
P271: Use only in well ventilated area.
P280: Wear protective gloves/protective clothing/eye protection/face protection/

Hazard Symbol(s):

[Xi] Irritant

Risk Phrases:
R20: Harmful by inhalation
R36/37/38: Irritating to eyes, respiratory system and skin

Safety Phrases:
S8: Keep container dry
S22: Do not breath dust
S24/25: Avoid contact with skin and eyes

HEALTH HAZARDS OR RISKS FROM EXPOSURE:

ACUTE: Exposure to this product may cause irritation of the eyes, respiratory system and skin. Ingestion may cause gastrointestinal irritation including pain, vomiting or diarrhea.

CHRONIC: This product contains an ingredient which may be corrosive.

TARGET ORGANS: ACUTE: Eye, respiratory System, Skin CHRONIC: None Known

SECTION 3 - COMPOSITION and INFORMATION ON INGREDIENTS

HAZARDOUS INGREDIENTS:	CAS #	EINECS #	ICSC #	WT %	HAZARD CLASSIFICATION; RISK PHRASES
Sodium Bicarbonate	144-55-8	205-633-8	1044	33 - 43%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium (C10 – C16) Alkylbenzene Sulfonate	68081-81-2	268-356-1	Not Listed	10 – 20%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium Tripolyphosphate	7758-29-4	231-838-7	1469	5 - 15%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Tetrasodium Pyrophosphate	7722-88-5	231-767-1	1140	5 - 15%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium Carbonate	497-19-8	207-638-8	1135	1 - 10%	HAZARD CLASSIFICATION: [Xi] Irritant RISK PHRASES: R36
Sodium Alcohol Sulfate	151-21-3	205-788-1	0502	1 – 5%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Balance of other ingredients are non-hazardous or less than 1% in concentration (or 0.1% for carcinogens, reproductive toxins, or respiratory sensitizers).					

NOTE: ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-2004 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR, EU Directives and the Japanese Industrial Standard *JIS Z 7250: 2000*.

SECTION 4 - FIRST-AID MEASURES

Contaminated individuals of chemical exposure must be taken for medical attention if any adverse effect occurs. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to health professional with contaminated individual.

EYE CONTACT: If product enters the eyes, open eyes while under gentle running water for at least 15 minutes. Seek medical attention if irritation persists.

SKIN CONTACT: Wash skin thoroughly after handling. Seek medical attention if irritation develops and persists. Remove contaminated clothing. Launder before re-use.

INHALATION: If breathing becomes difficult, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Seek medical attention if breathing dificulty continues.

INGESTION: If product is swallowed, call physician or poison control center for most current information. If professional advice is not available, do not induce vomiting. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow. Seek medical advice. Take a copy of the label and/or MSDS with the victim to the health professional.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing skin, or eye problems may be aggravated by prolonged contact.

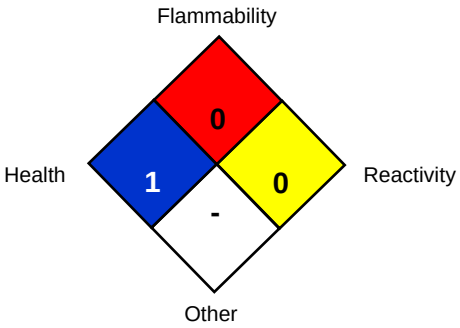
RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and reduce over-exposure.

SECTION 5 - FIRE-FIGHTING MEASURES

FLASH POINT: Not Flammable
AUTOIGNITION TEMPERATURE: Not Applicable
FLAMMABLE LIMITS (in air by volume, %): Lower (LEL): NA Upper (UEL): NA
FIRE EXTINGUISHING MATERIALS: As appropriate for surrounding fire. Carbon dioxide, foam, dry chemical, halon, or water spray.

UNUSUAL FIRE AND EXPLOSION HAZARDS: This product is non-flammable and has no known explosion hazards.
Explosion Sensitivity to Mechanical Impact: Not Sensitive.
Explosion Sensitivity to Static Discharge: Not Sensitive
SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Isolate materials not yet involved in the fire and protect personnel. Move containers from fire area if this can be done without risk; otherwise, cool with carefully applied water spray. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas.

NFPA RATING SYSTEM



HMIS RATING SYSTEM

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD (BLUE)	**1**
FLAMMABILITY HAZARD (RED)	**0**
PHYSICAL HAZARD (YELLOW)	**0**

PROTECTIVE EQUIPMENT

EYES	RESPIRATORY	HANDS	BODY
	See Sect 8		See Sect 8

For Routine Industrial Use and Handling Applications

Hazard Scale: 0 = Minimal **1** = Slight **2** = Moderate **3** = Serious **4** = Severe * = Chronic hazard

SECTION 6 - ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Personnel should be trained for spill response operations.
SPILLS: Contain spill if safe to do so. Prevent entry into drains, sewers, and other waterways. Sweep, shovel or vacuum spilled material and place in an appropriate container for re-use or disposal. Avoid dust generation if possible. Dispose of in accordance with applicable Federal, State, and local procedures (see Section 13, Disposal Considerations).

SECTION 7 - HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat, drink, smoke, or apply cosmetics while handling this product. Avoid breathing dusts generated by this product. Use in a well-ventilated location. Remove contaminated clothing immediately.

STORAGE AND HANDLING PRACTICES: Containers of this product must be properly labeled. Store containers in a cool, dry location. Keep container tightly closed when not in use. Store away from strong acids or oxidizers.

SECTION 8 - EXPOSURE CONTROLS - PERSONAL PROTECTION

EXPOSURE LIMITS/GUIDELINES:

Chemical Name	CAS#	ACGIH TWA	OSHA TWA	SWA
Sodium Bicarbonate	144-55-8	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Sodium (C10 – C16) Alkylbenzene Sulfonate	68081-81-2	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Sodium Tripolyphosphate	7758-29-4	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Tetrasodium Pyrophosphate	7722-88-5	5 mg/m³	5 mg/m³	5 mg/m³
Sodium Carbonate	497-19-8	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Sodium Alcohol Sulfate	151-21-3	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust

Currently, International exposure limits are not established for the components of this product. Please check with competent authority in each country for the most recent limits in place.

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure levels are maintained below the limits provided below. Use local exhaust ventilation to control airborne dust. Ensure eyewash/safety shower stations are available near areas where this product is used.

The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132) or equivalent standard of Canada, or standards of EU member states (including EN 149 for respiratory PPE, and EN 166 for face/eye protection), and those of Japan. Please reference applicable regulations and standards for relevant details.

RESPIRATORY PROTECTION: Based on test data, exposure limits should not be exceeded under normal use conditions when using Alconox Detergent. Maintain airborne contaminant concentrations below guidelines listed above, if applicable. If necessary, use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), equivalent U.S. State standards, Canadian CSA Standard Z94.4-93, the European Standard EN149, or EU member states.

EYE PROTECTION: Safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or appropriate Canadian Standards.

HAND PROTECTION: Use chemical resistant gloves to prevent skin contact.. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.

BODY PROTECTION: Use body protection appropriate to prevent contact (e.g. lab coat, overalls). If necessary, refer to appropriate Standards of Canada, or appropriate Standards of the EU, Australian Standards, or relevant Japanese Standards.

SECTION 9 - PHYSICAL and CHEMICAL PROPERTIES

PHYSICAL STATE:	Solid
APPEARANCE & ODOR:	White granular powder with little or no odor.
ODOR THRESHOLD (PPM):	Not Available
VAPOR PRESSURE (mmHg):	Not Applicable
VAPOR DENSITY (AIR=1):	Not Applicable.
BY WEIGHT:	Not Available
EVAPORATION RATE (nBuAc = 1):	Not Applicable.
BOILING POINT (C°):	Not Applicable.
FREEZING POINT (C°):	Not Applicable.
pH:	9.5 (1% aqueous solution)
SPECIFIC GRAVITY 20°C: (WATER =1)	0.85 – 1.1
SOLUBILITY IN WATER (%)	>10% w/w
COEFFICIENT OF WATER/OIL DIST.:	Not Available
VOC:	None
CHEMICAL FAMILY:	Detergent

SECTION 10 - STABILITY and REACTIVITY

STABILITY: Product is stable
DECOMPOSITION PRODUCTS: When heated to decomposition this product produces Oxides of carbon (COx)
MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong acids and strong oxidizing agents.
HAZARDOUS POLYMERIZATION: Will not occur.
CONDITIONS TO AVOID: Contact with incompatible materials and dust generation.

SECTION 11 - TOXICOLOGICAL INFORMATION

TOXICITY DATA: Toxicity data is available for mixture:

CAS# 497-19-8 LD50 Oral (Rat)	4090 mg/kg
CAS# 497-19-8 LD50 Oral (Mouse)	6600 mg/kg
CAS# 497-19-8 LC50 Inhalation (Rat)	2300 mg/m³ 2H
CAS# 497-19-8 LC50 Inhalation (Mouse)	1200 mg/m³ 2H
CAS# 7758-29-4 LD50 Oral (Rat)	3120 mg/kg
CAS# 7758-29-4 LD50 Oral (Mouse)	3100 mg/kg
CAS# 7722-88-5 LD50 Oral (Rat)	4000 mg/kg

SUSPECTED CANCER AGENT: None of the ingredients are found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, IARC and therefore is not considered to be, nor suspected to be a cancer-causing agent by these agencies.
IRRITANCY OF PRODUCT: Contact with this product can be irritating to exposed skin, eyes and respiratory system.
SENSITIZATION OF PRODUCT: This product is not considered a sensitizer.
REPRODUCTIVE TOXICITY INFORMATION: No information concerning the effects of this product and its components on the human reproductive system.

SECTION 12 - ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.
ENVIRONMENTAL STABILITY: No Data available at this time.
EFFECT OF MATERIAL ON PLANTS or ANIMALS: No evidence is currently available on this product's effects on plants or animals.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on this product's effects on aquatic life.

SECTION 13 - DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations, those of Canada, Australia, EU Member States and Japan.

SECTION 14 - TRANSPORTATION INFORMATION

US DOT; IATA; IMO; ADR:
THIS PRODUCT IS NOT HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.
PROPER SHIPPING NAME: Non-Regulated Material
HAZARD CLASS NUMBER and DESCRIPTION: Not Applicable
UN IDENTIFICATION NUMBER: Not Applicable
PACKING GROUP: Not Applicable.
DOT LABEL(S) REQUIRED: Not Applicable
NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2004): Not Applicable
MARINE POLLUTANT: None of the ingredients are classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B)

U.S. DEPARTMENT OF TRANSPORTATION (DOT) SHIPPING REGULATIONS:
This product is not classified as dangerous goods, per U.S. DOT regulations, under 49 CFR 172.101.

TRANSPORT CANADA, TRANSPORTATION OF DANGEROUS GOODS REGULATIONS:
This product is not classified as Dangerous Goods, per regulations of Transport Canada.

INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA):
This product is not classified as Dangerous Goods, by rules of IATA:

INTERNATIONAL MARITIME ORGANIZATION (IMO) DESIGNATION:
This product is not classified as Dangerous Goods by the International Maritime Organization.

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR):

This product is not classified by the United Nations Economic Commission for Europe to be dangerous goods.

SECTION 15 - REGULATORY INFORMATION

UNITED STATES REGULATIONS

SARA REPORTING REQUIREMENTS: This product is not subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act., as follows: None

TSCA: All components in this product are listed on the US Toxic Substances Control Act (TSCA) inventory of chemicals.

SARA 311/312:

Acute Health: Yes Chronic Health: No Fire: No Reactivity: No

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for this product. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lb (4,540 kg) may apply, per 40 CFR 370.20.

U.S. CERCLA REPORTABLE QUANTITY (RQ): None

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): None of the ingredients are on the California Proposition 65 lists.

CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: All of the components of this product are on the DSL Inventory

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: No component of this product is on the CEPA First Priorities Substance Lists.

CANADIAN WHMIS CLASSIFICATION and SYMBOLS: This product is categorized as a Controlled Product, Hazard Class D2B as per the Controlled Product Regulations

EUROPEAN ECONOMIC COMMUNITY INFORMATION:

EU LABELING AND CLASSIFICATION:

Classification of the mixture according to Regulation (EC) No1272/2008. See section 2 for details.

AUSTRALIAN INFORMATION FOR PRODUCT:

AUSTRALIAN INVENTORY OF CHEMICAL SUBSTANCES (AICS) STATUS: All components of this product are listed on the AICS.

STANDARD FOR THE UNIFORM SCHEDULING OF DRUGS AND POISONS: Not applicable.

JAPANESE INFORMATION FOR PRODUCT:

JAPANESE MINISTER OF INTERNATIONAL TRADE AND INDUSTRY (MITI) STATUS: The components of this product are not listed as Class I Specified Chemical Substances, Class II Specified Chemical Substances, or Designated Chemical Substances by the Japanese MITI.

INTERNATIONAL CHEMICAL INVENTORIES:

Listing of the components on individual country Chemical Inventories is as follows:

Asia-Pac:	Listed
Australian Inventory of Chemical Substances (AICS):	Listed
Korean Existing Chemicals List (ECL):	Listed
Japanese Existing National Inventory of Chemical Substances (ENCS):	Listed
Philippines Inventory if Chemicals and Chemical Substances (PICCS):	Listed
Swiss Giftliste List of Toxic Substances:	Listed
U.S. TSCA:	Listed

SECTION 16 - OTHER INFORMATION

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Disclaimer: To the best of Alconox, Inc. knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness is not guaranteed and no warranties of any type either express or implied are provided. The information contained herein relates only to this specific product.

ANNEX:

IDENTIFIED USES OF ALCONOX® AND DIRECTIONS FOR USE

Used to clean: Healthcare instruments, laboratory ware, vacuum equipment, tissue culture ware, personal protective equipment, sampling apparatus, catheters, tubing, pipes, radioactive contaminated articles, optical parts, electronic components, pharmaceutical apparatus, cosmetics manufacturing equipment, metal castings, forgings and stampings, industrial parts, tanks and reactors. Authorized by USDA for use in federally inspected meat and poultry plants. Passes inhibitory residue test for water analysis. FDA certified.

Used to remove: Soil, grit, grime, buffing compound, slime, grease, oils, blood, tissue, salts, deposits, particulates, solvents, chemicals, radioisotopes, radioactive contaminations, silicon oils, mold release agents.

Surfaces cleaned: Corrosion inhibited formulation recommended for glass, metal, stainless steel, porcelain, ceramic, plastic, rubber and fiberglass. Can be used on soft metals such as copper, aluminum, zinc and magnesium if rinsed promptly. Corrosion testing may be advisable.

Cleaning method: Soak, brush, sponge, cloth, ultrasonic, flow through clean-inplace. Will foam—not for spray or machine use.

Directions: Make a fresh 1% solution (2 1/2 Tbsp. per gal., 1 1/4 oz. per gal. or 10 grams per liter) in cold, warm, or hot water. If available use warm water. Use cold water for blood stains. For difficult soils, raise water temperature and use more detergent. Clean by soak, circulate, wipe, or ultrasonic method. Not for spray machines, will foam. For nonabrasive scouring, make paste. Use 2% solution to soak frozen stopcocks. To remove silver tarnish, soak in 1% solution in aluminum container. RINSE THOROUGHLY—preferably with running water. For critical cleaning, do final or all rinsing in distilled, deionized, or purified water. For food contact surfaces, rinse with potable water. Used on a wide range of glass, ceramic, plastic, and metal surfaces. Corrosion testing may be advisable.

Appendix C

Standard Operating Procedures

SOP for Sediment Sampling utilizing a VibraCore Sampler
SOP for Sediment Sampling utilizing a Hand Push Piston Core Sampler
SOP for Decontamination of Sampling Equipment in the Field
SOP for Documentation of Field Sampling

STANDARD OPERATING PROCEDURES
VIBRATORY HAMMER CORING SYSTEM (VIBRACORE)

1.0 SCOPE and SUMMARY OF PROCEDURES

A vibratory hammer coring system (vibracore) has the ability to obtain sediment samples from the surface to several feet below the sediment surface for chemical, biologic or physical testing. The vibracore system for this workplan combines relatively light weight mechanical tools, with manual operation to allow sampling in a wide range of water depths with a small equipment footprint.

In general, the process for sediment collection using a vibratory hammer corer (vibracore) is similar for using a direct push corer (e.g. manual push corer or piston corer); a tube is pushed into the substrate. The vibracore uses a head fitted with an electronically driven oscillating weight(s) that effectively shakes the core tube while pushing the tube into the sediment. The vibration of the core tube allows the core head and sleeve to move through sand, shell hash as well as softer substrates and can overcome the friction inside along the core tube as cores get longer. This sampling method is routinely used to characterize contaminants in freshwater and marine sediments and collects sufficient volumes to conduct both chemical and biological analyses.

The head of the corer is fitted with a core barrel of a pre-determined length, a cutter head, and a core-catcher (normally interlocking stainless-steel leaves that allow sediment to enter but prevent sediment loss). The core barrel and cutter head are normally reused and field decontaminated between each sampling location. Additionally, solid disposable core liners or plastic core sleeves may be installed within the core barrel to capture and isolate the sediment sample while maintaining the vertical integrity of the sample. Lexan® is the preferred core liner material; however, polycarbonate liners may be used.

To collect a sample, the corer (barrel, liner and drive head) is lifted off the deck of the sampling vessel and lowered to the sediment surface. The electric motor drives the core barrel with a low amplitude but high frequency oscillating action that liquefies a small section of the sediments within the shallow sample zone and along the outer edges of the core barrel. The vibratory corer pushes into the sediment using the weight of the vibratory head and the vibrations of the corer. Once the target sampling depth is achieved, the motor is turned off and the core pulled out of the sediment. Once onboard the vessel, the core is placed horizontally on the deck and the core extruded and processed. Generally, core processing involves pulling the liner (containing the sediment core) and placing it in a processing tray. The liner sleeve is cut on two sides along the length of the core and

the sediments are typically split with a decontaminated stainless-steel spatula, characterized for any stratigraphy, the presence of oil, or other salient qualities. Laboratory samples are then collected from only that portion of the core that has not been in contact with the liner.

A vibracore system is most commonly utilized as part of a sediment investigation project in areas where sediment profiles greater than 100-cm below the sediment surface are required. The vibracore sample method can provide extended length sediment samples in water depths ranging from 1.5 meters to approximately 15 meters without a sea floor frame system or submerged guide rail system. For this SOP the vibracore will be directly driven into the sediment sampling area via gravity, and controlled via visual alignment.

In deeper water depths or when multiple vertical vibracore barrels must be recovered, the vibracore system may include a guide rail drive system or a sea floor frame system. A guide rail drive system and sea floor frame system have the potential to disturb the surface sediments; however the systems allow deeper coring with easier operation and more stable core retrieval. Guide rails and sea floor frames may be added, if deeper sample depths are required and after surface sediments are sampled and inspected separately.

This SOP has been specifically developed for a direct push vibracore system.

2.0 DEFINITIONS

Vibratory Hammer Corer (vibracore) : A coring device that uses vibration and gravity to push an outer protective core barrel and inner liner sleeve into sediments in order to collect a vertical profile of sediments. Once recovered the sediments can be inspected, documented, and isolated for chemical and/or biological analysis. The coring system consists of a lightweight, crane supported drive head and vibratory motor. The drive head system is self contained and houses an electric motor and an oscillating drive weight. The drive head is attached to the metal core barrel (either aluminum or steel) with an estimated 4-inch interior diameter. The core barrel length and material are specified based on the goals of the project; however routine barrel lengths include 5-feet, 8-feet, 10-feet and 20-feet. A decontaminated plastic liner may be installed within the core barrel to create an inner sleeve to capture and contain the recovered sediment core. A cutter head that may or may not include interlocking stainless-steel leaves to retain the sediment core is attached to the end of the drive barrel. The leaves, referred to as a core catcher, move out of the way during core collection, but collapse on themselves during retrieval.

The coring system also includes a power pack, either electric generator or a hydraulic pump system. The power pack and drive head system create a low amplitude but high frequency oscillating action that liquefies a small section of the sediments within the shallow soil and along the outer edges of the drive tube. Upon reaching the pre-determined sediment depth, the drive hammer and the collection rods are removed via crane and lifted onto the work platform. This method can be used to recover vertically integrated samples or specific depth

horizons between the surface and the target sediment depth. The coring system is relatively portable and flexible.

GPS: Global Positioning System (GPS). A navigational system used to locate vessel position by determining the time displacement between various satellites. Current technology uses a WAAS antennae (or GPS equivalent) capable of an accuracy of ±2 meters. Field teams will include at least one dedicated hand-held GPS unit and preferably two independent units with constant track memory system recording whenever the team is operating on-the-water.

D.I. Water: Normally deionized or distilled water that is considered laboratory grade and contaminant free.

Sediment Core Sleeve or Core Liners: A polycarbonate, lexan or plastic acetate clear liner which contains the sediment core during core penetration, removal and stabilization. Individual core sleeves will be used for each sediment sample attempt.

Metal Core Barrel: An outer protective barrel, either aluminum or steel, which attaches to the drive head to transfer vibrations and weight from the drive head into the sediment. The drive barrel protects the sediment core sleeve by transferring vibratory motion to the sediments while penetrating the sediment profile.

3.0 EQUIPMENT

The following list defines the minimum equipment and materials that are required for vibracore operations.

Durable Equipment

- Vibratory hammer and control box
- Core cutter heads with and without core catchers
- Internal combustion engine powered electrical generator or equivalent shipboard power
- Core processing tray
- Fiberglass measuring tape with 2 lb. weighted line (lead line)
- Liner sleeve cradle
- Liner sleeve cutting tool
- Liner cutting knife blades
- Coring tool kit including miscellaneous wrenches and hand tools
- Global Positioning System
- Digital camera
- Water quality instruments
- Vibracore deployment cable and recovery winch system
- Vessel mounted A-Frame winch system or articulating jib crane

Expendable or Consumable Materials

- Core liners; normally polycarbonate clear liners with a 1/16-inch sidewall thickness.
- If required, core liner caps and internal core plugs
- Aluminum core tube (4”)
- Mechanical Clippers
- Stainless Steel or Teflon® spatulas
- Alconox (laboratory grade detergent)
- Deionized water
- Nitrile Gloves
- Sample collection glassware
- Sample containment coolers
- Station location list and station maps on waterproof paper
- Waterproof Log Book
- Field Data sheets
- Sample labels
- Sample jars
- Sampler preservatives (normally ice)

4.0 PROCEDURE

4.1 Vessel Procedures and Sampler Deployment

1. Select the sample vessel and support vessels based on the planned sample area, the water depth, the transport distance and the project team requirements. In general, a flat, open work platform with an A-frame crane or an articulating jib crane such as a work barge is best suited for vibracore sampling.

2. Inspect the sample vessels at the dock and discuss the workplan with the team members and vessel captains. Load and secure all equipment, materials and supplies. Conduct a health and safety meeting to discuss the job hazards associated with the project, as well as team communications and individual project responsibilities.

3. Navigate to the preselected sample coordinates using hand-held GPS units and aerial imagery mapping. The level of accuracy for sample station locations will be determined by the tolerance of the GPS units; however multiple GPS units should be used to minimize random errors.

4. Anchoring of the work boat is required to maintain a stable station location, as well as assuring the effectiveness of the vibracore drive sampler. A minimum two-point anchoring system shall be used however a spud anchoring system or three-point anchoring system is desirable.

5. On location, the water depth is measured using a weighted-line and recorded in the sampling log. Additional measurements such as water quality will be obtained and recorded, along with GPS locations, digital photographs and any additional site measurements.

6. Several core barrels shall be pre-cut and prepared prior to mobilization in the field. The core barrel shall be decontaminated using a minimum of laboratory grade detergents and DI water in accordance with the decontamination SOP developed for the work scope. The core barrel length shall be calculated by determining the targeted sediment sample length plus 2 feet additional. The field supplies shall include a minimum of two core barrels for each target sample length.

7. Prepare the sampler and work area for deployment starting with decontamination of all submerged parts and equipment that has the potential to contact sediments. Decontamination shall be conducted with a minimum of a dilute Alconox detergent wash, physical scrubbing using a bristled brush and a DI water rinse. All equipment will be visually inspected following decontamination procedures to assure the effectiveness of the decontamination activities. Similarly, the equipment rinsate will be inspected for a sheen or indications of continued oiling.

a. Field equipment decontamination shall include the core barrel, the cutter head, the drive head connection system, the liner cutting tool and sample processing tray.
b. Additionally, all sediment processing tools such as stainless steel spatulas, sample knives and sample collection shovels shall be decontaminated.
c. The sample liners, liner caps and core plugs will be decontaminated before each use.

8. Prepare the core barrel by placing a clean, decontaminated core sleeve within the barrel, attaching the cutter head and securing the core barrel to the drive head.

9. Secure the drive head to a crane supported winch line. The winch shall be rated for a minimum lifting capacity of 2,000 pounds. Slowly lift the core barrel and drive head from the deck, taking precautions not to allow the core barrel to touch unclean surfaces. Lower the sampler over the side of the boat at a slow velocity, generally less than 1 foot per second until the sampler is approximately 1-foot above the sediment surface.

10. Continue slowly lowering the sampler until the core barrel contacts sediments. If possible, attempt to allow the core barrel to gravity penetrate the upper 10-cm of sediments without initiating the vibratory head. This action may cause the core barrel to bind and may not be successful.

a. If required based on the sediment type, turn on the vibratory hammer and slowly lower the sampler onto the sediment surface.
b. Field notes shall document when the vibratory hammer is started; specifically before contacting sediment or after contacting the upper 10-cm of sediments.

11. The rate of core barrel penetration is controlled by the speed of the winch line and the velocity of the vibratory head. Slowly lower the core barrel, attempting to maintain a constant rate of penetration. Once the desired penetration depth has been achieved (based on a tape attached to the top of the hammer), turn off the vibratory hammer.

a. Using direct pull of the winch system, slowly retrieve the corer. Note the penetration depth based on the mudline on the core barrel.
b. Secure and if possible cap the bottom of the core barrel to maintain sediment profile integrity.
c. Rinse the core barrel of mud using bay water and secure on the deck, ensuring that the sediment is not lost from the head of the barrel.

12. If sample penetration or retrieval is less than the project specification, at least one additional attempt is necessary. Hard objects may be present and can impede penetration of the core barrel. Moving the vessel (within a 3-meter radius) to an alternate location may improve potential for success on the second effort. The team leader is responsible for deciding on the need to attempt additional cores within the guidelines of the plan.

a. All equipment that contacts sediments will be decontaminated between each sample attempt as per the decontamination SOP.

5.2 Core Processing

1. Following core barrel removal and placement on the work deck, the recovered core shall be stabilized in a clean location.

2. Remove rivets from the core cutter head and remove the head. Cap the end of the core sleeve with a clean, decontaminated cap and pull the core from the interior of the barrel. Place core sleeve on the decontaminated core processing tray and liner sleeve cradle.

3. Inspect the core profile, measure the core recovery and determine if the recovery length is satisfactory. If recovery is insufficient based on requirements in the workplan, a second sample may be required. All insufficient and unnecessary samples shall be documented and managed as per the evidence retention policies provided for the project.

4. Depending on the laboratory requirements for the individual targeted sample zones, some core samples may be processed on board the sampling vessel. Alternatively, the cores may be secured and transferred to a land-based processing area or archived for future analysis. The following section describes procedures for processing on board. Procedures for holding samples for later processing are described in a separate section below.

a. Using appropriate core cutting tools (based on liner type), cut the liner longitudinally on at least two sides. Remove a section of the cut core liner, being careful to minimize vertical disruption of the recovered sediment and any “bleed out” of liquefied sediments. Remove a minimum of ¼-inch of sediments that contact the liner. Split the remaining sediments apart with a clean, decontaminated stainless-steel spatula and separate the core profile into two halves or sections.

b. Record observations of the sample according to the field data sheet and/ or core log developed for the workplan.

i. Sediment colors, i.e. black, brown, grey, green, or tan (light or dark).

ii. Sediment horizons as defined by depth below the sediment surface.

iii. Any observed oiling indications including tarballs, petroleum streaking, vertical oiling or any other indications.

iv. Odor, especially hydrogen sulfide (H_2S) and petroleum products;

v. Sediment grain size (rocks, gravel, sand, silt, clay, shellhash). The most predominate size class is listed first, and others present are listed in descending order.

vi. Note any obvious strata – particularly if stratification is defining the sampling horizons.

vii. Photodocument all observations with a measuring stick or measurement tape included within all photos.

2. Collect, inspect and containerize all samples.

a. If chemistry samples are to be collected on site using clean, decontaminated sample utensils as necessary. Whenever practical, the field teams shall use disposable, clean equipment.

b. Containerize all samples within pre-cleaned glass sample jars. Label all samples, secure within a transportable container with the necessary preservation and within the guidelines of chain-of-custody procedures.

5.3 Shipping Cores for Remote Sampling or Archive

1. If cores are to be processed at a land based facility or will be archived, each core shall be drained of standing water, secure with an internal plug, capped at each end with the clean single use caps taped to the core liner.

2. Each core shall be labeled with the following minimum information: a unique sample identification number, the sample date, the sample time and the sampler's initials.

3. If sectioning the core to allow for storage in a cooler during shipping, cut the core with a clean, decontaminated tubing cutter prior to capping and securing the core. Label each section as noted above.

6.0 HEALTH AND SAFETY CONSIDERATIONS

Standard safety considerations for aquatic sampling, including caution deploying and retrieving heavy equipment overhead, utilizing proper clothing and safety gear. The field teams shall exhibit caution with footings and walkways during the vibracore sampling activities. A team safety officer will be designated each day, for each team. The safety officer shall monitor the safety and safe work practices of personnel. All work shall follow the Job Hazard Analysis and safe work practices defined in the Project Health and Safety Plan.

7.0 TYPICAL FIELD DATA SHEET INFORMATION

Each workplan shall prepare field data sheets to confirm thorough and consistent data collection and data presentation. The following minimum information shall be included with all workplans:

- GPS unit designation and location details of each sample location
- Names, date and signature of all field team members
- Chronology of field activities each day
- Description of all equipment including consumable materials

NEWFIELDS

CORE LOG

PROJECT/SURVEY			DATE	PROJECT MANAGER	RECORDER
STATION ID			NAV DATUM	LATITUDE	LONGITUDE
ATTEMPT	TIME STARTED	TIME FINISHED	WATER DEPTH (FT)	TIDE (FT)	MLLW (FT) = WATER DEPTH - TIDE
SAP DEPTH (FT)	SAP DEPTH - MLLW		TARGET CORE LENGTH (FT)	FINAL CORE LENGTH (FT)	CORE DIAMETER (IN) 4.0
START TAPE (FT)	FINISH TAPE (FT)		PENETRATION (FT) = FINISH - START		RECOVERY

PEN. DEP.(FT)	RETRV. DEP.(FT)	SEDIMENT TYPE	ODOR	COLOR (CHROMA/VALUE/HUE)	SAMPLE ID BY DEPTH	MISC
1	1					
2	2					
3	3					
4	4					
5	5					
6	6					
7	7					
8	8					
9	9					
10	10					

NOTES

Figure 1: Core Log.

STANDARD OPERATING PROCEDURES
HAND PUSH PISTON CORE SAMPLER

1.0 SCOPE and SUMMARY OF PROCEDURES

A hand-pushed piston core sampler, also known as a hand core sampler, or manual piston-core has the ability to obtain sediment samples from the surface to a maximum of 6-feet below the sediment surface for chemical, biologic or physical testing in very shallow water, while standing in the water or on shallow draft boats. As the name implies, the core equipment is manually deployed; pushed into the sediment and then manually retrieved. The hand-pushed piston core sampling system includes relatively light weight mechanical tools and a small equipment footprint.

The 6-feet long sediment depth limitation is established based on practical and safety considerations, given 6-feet of sediments in a 4-inch diameter core will require approximately 80-pounds of vertical lifting. NewFields has elected to limit the weight an individual team member is allowed to handle to less than 100-pounds for very short periods of time.

The process for sediment collection using a hand-pushed piston core sampler is similar to using a vibratory hammer corer, or a larger mechanically deployed piston core sampler. In general, a core barrel is pushed into the substrate to the selected sample depth or until sediment friction ceases further sample insertion. A tight sealing piston plug or a mechanical vacuum check valve creates a vacuum at the top of the core and the core is pulled from the sediment horizon. The core is pulled from the water and brought onto the sampling boat or processing vessel for sediment inspection.

This sampling method is routinely used to characterize contaminants in freshwater and marine sediments and collects sufficient volumes to conduct both chemical and biological analyses.

The head of the corer is mechanically threaded into metal push rods, also known as drive rods. A pre-cut core barrel made from polycarbonate, aluminum, brass or another high density plastic is fitted to the bottom of the core head and secured with clamps or screws. A water tight, self-sealing piston plug is placed in the bottom of the core. A textile rope is routed through the upper section of the core, through the core head and brought from the top of the plug to the surface to allow independent communication with the core.

To collect a sample, the corer (core barrel, core head, push rods and piston line) is lifted off the deck of the sampling vessel and lowered to the sediment surface. The metal push rods are manually threaded together as the head is lowered to the sediment surface. Once the core barrel reaches the sediment surface, the piston line is tied to a stable location such as a cleat of the boat. The core barrel pushes into the sediment using the weight of the core head and the downward push of the sediment sampler(s). Once the target sampling depth is achieved, the sampler(s) pulls the core from the sediment and lifts the sediment core and push rods to the surface.

Once onboard the vessel, the core may be placed horizontally on the deck and the core extruded and processed. Often, since the core length is limited, the core may be brought to the surface, capped

and maintained vertically with the core barrel.

Generally, core processing involves extruding the sediment from the core, or cutting the core in half and placing the sediment in a processing sleeve or specific processing area. The core liner may be cut on two sides along the length of the core and the sediments are split with a decontaminated stainless-steel spatula, characterized for any stratigraphy, the presence of oil, or other salient qualities. Laboratory samples are then collected from only that portion of the core that has not been in contact with the liner.

If not cut in half, the core barrels may be reused and field decontaminated between each sampling location or replaced with each core push, based on the workplan specifications

A hand pushed piston core sampler is most commonly utilized as part of a sediment investigation project in areas where sediment profiles less than 100-cm below the sediment surface are required. The hand pushed piston core sample method can provide targeted length sediment samples in water depths ranging from 0.10 meters to approximately 10 meters.

This SOP has been specifically developed for a hand pushed piston core sample system.

2.0 DEFINITIONS

Hand Pushed Piston Core Sampler: A coring device that uses gravity and manual force to push a protective core barrel into sediments in order to collect a vertical profile of sediments. Once recovered the sediments can be inspected, documented, and isolated for chemical and/or biological analysis. The coring system consists of a lightweight, manually deployed core head and approximately 5 to 8 feet long core rods as well as the core barrel.

This sediment sampling method can be used to recover vertically integrated samples or specific depth horizons between the surface and the target sediment depth. The coring system is relatively portable and flexible.

GPS: **Global Positioning System (GPS)**. A navigational system used to locate vessel position by determining the time displacement between various satellites. Current technology uses a WAAS antennae (or GPS equivalent) capable of an accuracy of ±2 meters. Field teams will include at least one dedicated hand-held GPS unit and preferably two independent units with constant track memory system recording whenever the team is operating on-the-water.

D.I. Water: Normally deionized or distilled water that is considered laboratory grade and contaminant free.

Sediment Core Sleeve or Core Liners: A polycarbonate, lexan or plastic acetate clear liner which contains the sediment core during core penetration, removal and stabilization. Individual core sleeves will be used for each sediment sample attempt.

Piston Plug: A rubber or rubber sealed plug that fits tightly within the core barrel or core sleeve to create a vacuum below the core plug.

3.0 EQUIPMENT

The following list defines the minimum equipment and materials that are required for vibracore operations.

Durable Equipment

- Stainless steel or machined aluminum core head
- Manual push rods; either metal concrete float rods, aluminum drill rods or galvanized metal pipe with individual threaded pins and sockets to thread the rods together
- Core processing tray
- Fiberglass measuring tape with 2 lb. weighted line (lead line)
- Liner sleeve cradle
- Liner sleeve cutting tool
- Liner cutting knife blades
- Coring tool kit including miscellaneous wrenches and hand tools
- Global Positioning System
- Digital camera
- Water quality instruments

Expendable or Consumable Materials

- Polycarbonate core tube (4”)
- If required, core liner caps and internal core plugs
- Mechanical Clippers
- Stainless Steel or Teflon® spatulas
- Alconox (laboratory grade detergent)
- Deionized water
- Nitrile Gloves
- Sample collection glassware
- Sample containment coolers
- Station location list and station maps on waterproof paper
- Waterproof Log Book
- Field Data sheets
- Sample labels
- Sample jars
- Sampler preservatives (normally ice)

4.0 PROCEDURE

4.1 Vessel Procedures and Sampler Deployment

1. Select the sample vessel and support vessels based on the planned sample area, the water depth, the transport distance and the project team requirements. In general, a flat, open work platform such as a Carolina skiff or a work barge is best suited for manual push core sampling.

2. Inspect the sample vessel at the dock and discuss the workplan with the team members and vessel captains. Load and secure all equipment, materials and supplies. Conduct a health and safety meeting to discuss the job hazards associated with the project, as well as team communications and individual project responsibilities.

3. Navigate to the preselected sample coordinates using hand-held GPS units and aerial imagery mapping. The level of accuracy for sample station locations will be determined by the tolerance of the GPS units; however multiple GPS units should be used to minimize random errors.

4. Anchoring of the work boat is required to maintain a stable station location, as well as assuring the effectiveness of the manual push core sampler. A minimum two-point anchoring system shall be used or three-point anchoring system is desirable.

5. On location, the water depth is measured using a weighted-line and recorded in the sampling log. Additional measurements such as water quality will be obtained and recorded, along with GPS locations, digital photographs and any additional site measurements.

6. Several core barrels shall be pre-cut and prepared prior to mobilization in the field. The core barrel shall be decontaminated using a minimum of laboratory grade detergents and DI water in accordance with the decontamination SOP developed for the work scope. The core barrel length shall be calculated by determining the targeted sediment sample length plus 6-inches additional length. The field supplies shall include a minimum of two core barrels for each target sample length.

7. Prepare the sampler and work area for deployment starting with decontamination of all submerged parts and equipment that has the potential to contact sediments. Decontamination shall be conducted with a minimum of a dilute Alconox detergent wash, physical scrubbing using a bristled brush and a DI water rinse. All equipment will be visually inspected following decontamination procedures to assure the effectiveness of the decontamination activities. Similarly, the equipment rinsate will be inspected for sheen or indications of continued oiling.

a. Field equipment decontamination shall include the core barrel, the core head, the liner cutting tool and sample processing tray.

b. Additionally, all sediment processing tools such as stainless steel spatulas, sample knives and sample collection shovels shall be decontaminated.
c. The sample liners, liner caps and core plugs will be decontaminated before each use.

8. Prepare the core head by placing a clean, decontaminated core barrel into the core head.

9. Secure the core head to at least one push rod. Have additional push rods readily available along with an assistant and tools to thread together additional rod as the head is lowered to the sediment surface.

10. Slowly lift the core barrel and core head from the deck, taking precautions not to allow the core barrel to touch unclean surfaces. Lower the sampler over the side of the boat at a slow velocity, generally less than 1 foot per second until the sampler is approximately 1-foot above the sediment surface.

11. Continue slowly lowering the sampler until the core barrel contacts sediments. If possible, attempt to allow the core barrel to gravity penetrate the upper 10-cm of sediments and stop the vertical penetration of the cores.

12. Once the core barrel contacts the sediments or penetrates no greater than 10-cm of sediments, the piston plug line will be secured to a stable boat cleat. Tying off the piston plug line will allow the core barrel to penetrate the sediments, while the piston plug remains at a stable elevation.

13. The rate of core barrel penetration is controlled by manual penetration and the downward weight applied to the core barrel.

14. Once the desired penetration depth has been achieved (based on markings on the push rods) or the resistance to penetration to the cores.

15. Using safe practices and safe lifting techniques manually lift the push rods and cores from the water.

16. Once the core barrel is retrieved from the water, note the penetration depth based on the mudline on the core barrel.

a. Secure and if possible cap the bottom of the core barrel to maintain sediment profile integrity.
b. Rinse the core barrel of mud using bay water and secure on the deck, ensuring that the sediment is not lost from the head of the barrel.

17. If sample penetration or retrieval is less than the project specification, at least one additional attempt is necessary. Hard objects may be present and can impede penetration of the core barrel. Moving the vessel (within a 3-meter radius) to an alternate location may improve potential for success on the second effort. The team leader is responsible for deciding on the need to attempt additional cores within the guidelines of the plan.

a. All equipment that contacts sediments will be decontaminated between each sample attempt as per the decontamination SOP.

5.2 Core Processing

1. Following core barrel removal and placement on the work deck, the recovered core shall be stabilized in a clean location.

2. Remove the retention clamps, retention screws or combination of both systems from the core head and separate the core head from the core barrel. Cap the end of the core barrel with a clean, decontaminated cap. Place core sleeve on the decontaminated core processing tray and liner sleeve cradle.

3. Inspect the core profile, measure the core recovery and determine if the recovery length is satisfactory. If recovery is insufficient based on requirements in the workplan, a second sample may be required. All insufficient and unnecessary samples shall be documented and managed as per the evidence retention policies provided for the project.

4. Depending on the laboratory requirements for the individual targeted sample zones, some core samples may be processed on board the sampling vessel. Alternatively, the cores may be secured and transferred to a land-based processing area or archived for future analysis. The following section describes procedures for processing on board.

a. One core inspection technique includes appropriate core cutting tools. Using the appropriate cutting tools, cut the core barrel longitudinally on at least two sides. Remove a section of the cut core barrel, being careful to minimize vertical disruption of the recovered sediment and any “bleed out” of liquefied sediments. Remove a minimum of ¼-inch of sediments that contact the liner. Split the remaining sediments apart with a clean, decontaminated stainless-steel spatula and separate the core profile into two halves or sections.

b. As an alternate technique, maintain the samples vertically and use long handled sediment spoons to remove a specific horizon from the interior of the core tube.

c. Record observations of the sample according to the field data sheet and/ or core log developed for the workplan.

i. Sediment colors, i.e. black, brown, grey, green, or tan (light or dark).

ii. Sediment horizons as defined by depth below the sediment surface.

iii. Any observed oiling indications including tarballs, petroleum streaking, vertical oiling or any other indications.

iv. Odor, especially hydrogen sulfide (H_2S) and petroleum products;

v. Sediment grain size (rocks, gravel, sand, silt, clay, shellhash). The most predominate size class is listed first, and others present are listed in descending order.

vi. Note any obvious strata – particularly if stratification is defining the sampling horizons.

vii. Photodocument all observations with a measuring stick or measurement tape included within all photos.

5. Collect, inspect and containerize all samples.

a. If chemistry samples are to be collected on site using clean, decontaminated sample utensils as necessary. Whenever practical, the field teams shall use disposable, clean equipment.

b. Containerize all samples within pre-cleaned glass sample jars. Label all samples, secure within a transportable container with the necessary preservation and within the guidelines of chain-of-custody procedures.

5.3 Shipping Cores for Remote Sampling or Archive

1. If cores are to be processed at a land based facility or will be archived, each core shall be drained of standing water, secure with an internal plug, capped at each end with the clean single use caps taped to the core liner.

2. Each core shall be labeled with the following minimum information: a unique sample identification number, the sample date, the sample time and the sampler's initials.

3. If sectioning the core to allow for storage in a cooler during shipping, cut the core with a clean, decontaminated tubing cutter prior to capping and securing the core. Label each section as noted above.

6.0 HEALTH AND SAFETY CONSIDERATIONS

Standard safety considerations for aquatic sampling, including caution deploying and retrieving heavy equipment overhead, utilizing proper clothing and safety gear. The field teams shall exhibit caution with footings and walkways during the piston core sampling activities. A team safety officer will be designated each day, for each team. The safety officer shall monitor the safety and safe work practices of personnel. All work shall follow the Job Hazard Analysis and safe work practices defined in the Project Health and Safety Plan.

7.0 TYPICAL FIELD DATA SHEET INFORMATION

Each workplan shall prepare field data sheets to confirm thorough and consistent data collection and

data presentation. The following minimum information shall be included with all workplans:

- GPS unit designation and location details of each sample location
- Names, date and signature of all field team members
- Chronology of field activities each day
- Description of all equipment including consumable materials

NEWFIELDS

CORE LOG

PROJECT/SURVEY			DATE	PROJECT MANAGER	RECORDER
STATION ID			NAV DATUM	LATITUDE	LONGITUDE
ATTEMPT	TIME STARTED	TIME FINISHED	WATER DEPTH (FT)	TIDE (FT)	MLLW (FT) = WATER DEPTH - TIDE
SAP DEPTH (FT)	SAP DEPTH - MLLW		TARGET CORE LENGTH (FT)	FINAL CORE LENGTH (FT)	CORE DIAMETER (IN) 4.0
START TAPE (FT)	FINISH TAPE (FT)		PENETRATION (FT) = FINISH - START		RECOVERY

PENETRATIO DEP.(FT)	RETRIEVAL DEP.(FT)	SEDIMENT TYPE	ODOR	COLOR (CHROMA/VALUE/HUE)	SAMPLE ID BY DEPTH	MISC
1	1					
2	2					
3	3					
4	4					
5	5					
6	6					
7	7					
8	8					
9	9					
10	10					

NOTES

Figure 1: Core Log.

STANDARD OPERATING PROCEDURES
LEVEL 1 SEDIMENT SAMPLING FIELD DECONTAMINATION PROCEDURES with WASTE STORAGE

1.0 SCOPE and SUMMARY OF PROCEDURES

This Standard Operating Procedure (SOP) describes equipment and field procedures necessary to properly decontaminate sediment sampling and handling equipment utilized for the collection of samples in an area of known or predictable compounds of concern. Typical sediment investigation goals might include geotechnical investigations, physical evaluations for potential dredge activities or zones with minimal or previously quantified laboratory analysis. This process is designed to minimize the potential for constituent migration and/or cross contamination. This procedure does not apply to personnel decontamination.

2.0 SUMMARY OF METHOD

The objective of a multimedia sampling program is to investigate and quantify the presence of compounds of interest and the physical characteristics of sediments in an area of known site characteristics. These decontamination procedures are appropriate to remove anthropogenic chemicals such as oils or background metals related to sediment handling. The decontamination procedures will improve the prevention of cross contamination and support the results of the field investigation. This SOP presents an adaptive approach to decontamination that ensures sufficiency of decontamination while minimizing the use of chemical solvents as well as exposure of field staff to chemical solvents.

3.0 DEFINITIONS

Bay Water: Surface water that is within immediate contact with the sediment of concern and contiguous to the investigation area.

D.I. Water: Normally deionized or distilled water that is considered laboratory grade and contaminant free.

Non-Phosphate Detergent or **Detergent**: A hydrocarbon emulsifying agent that dissolves in water and aids in the solution of naturally occurring sediment particles and many anthropogenic chemicals.

Potable Water: Water from a drinking water source or a water valve supplied by a drinking water purveyor.

PPE: Personal protective equipment

4.0 EQUIPMENT and SUPPLIES

The following list defines the minimum equipment and materials that are required for field decontamination of sediment sampling equipment which is used for treatability studies.

- PPE (including disposable Neoprene gloves, chemical splash goggles; see Section 5.0 below for additional information including safe work practices)
- Bristled Brushes compatible with the solutions being used
- Low Phosphate Detergent (Alconox or Liquinox), diluted in accordance with instructions provided with the product.
- Detergent delivery system, such as sealed and manually pressurized spray pump or solid container
- Distilled/DI water
- Clean Ambient/Tap water source
- Wash/rinse tubs compatible with the solutions being used
- Specified area of vessel for decon away from other contaminant sources and other personnel
- If collecting a rinsate blank, small container appropriate for the collection
- Sealable decontamination fluid storage container such as 5-gallon buckets with removable lids
- Decontamination fluid collection bins, tubs or water proof sheeting
- Field documentation materials
- Global Positioning System
- Digital camera

Expendable or Consumable Materials

- Core liners; normally polycarbonate clear liners with a 1/16-inch sidewall thickness.
- If required, core liner caps and internal core plugs
- Alconox (laboratory grade detergent)
- Deionized water
- Nitrile Gloves
- Sample collection glassware
- Sample containment coolers
- Waste containment/ IDW decontamination fluid storage drum

5.0 HEALTH AND SAFETY

Health and safety hazards associated with this procedure can be mitigated by the following engineering, administrative, and PPE controls:

Hazard	Control(s)
Bodily injury due to pinch points or dropped equipment	• Leather gloves and steel-toe boots should be worn while equipment is being handled. • Equipment safety features should be engaged while equipment is being handled.
Vapor inhalation from chemical solvents	• Use solvents only in well-ventilated areas • Remain upwind of solvent decon work • Advise other workers in the area of the nature of your task and ask them to remain upwind
Skin irritation	• Don proper chemical-resistant gloves prior to handling organic solvents • Rinse solvent from gloves before removing • Promptly wash any areas of skin which may have contacted or encountered organic solvents • Always wash hands after handling hazardous materials. • Attempt to maximize the use of disposable chemical resistant gloves.
Eye contact	• Don chemical splash goggles prior to retrieving and handling organic solvent • Do not use solvent wash bottle near face • Do not use solvent spray bottles for any purpose
Fire	• Store organic solvents in approved, leak-proof containers (ETFE plastic for many organic solvents) in a cool, shaded area. Do not store in direct sunlight. • Do not smoke near solvent storage or work areas. • Do not use or place solvent near flame or other heat source • 5 or 10-pound dry chemical fire extinguisher &Type BC or Type ABC) should be readily accessible during solvent decontamination processes.
Solvent spill	• Place equipment to be decontaminated in containers to capture rinsate • Inspect solvent containers for leaks prior to handling • Have an organic solvent spill kit available and near solvent storage or work areas. Workers should be trained in spill kit use before the start of each mission.

Environmental detriment	• Keep solvent bottles tightly capped to prevent leakage and minimize evaporation. Store in secondary containment vessels. • Promptly clean spilled solvent with paper towels and discard in solid waste container. • Maintain solid waste materials (e.g. paper towels, disposable gloves, sample packaging, etc.) in a bucket or container to prevent littering. • Promptly replace lids onto rinsate buckets and secondary containment buckets.

6.0 DECONTAMINATION EVALUATION

Levels of Decontamination Procedures and their Selection

All equipment and non-disposable materials that directly contact a sample medium shall undergo **Level 1** Decontamination (see below) or be pre-cleaned by the manufacturer, in compliance with the protocols described here. The Level 1 Decontamination procedure shall be the default decontamination procedure for all non-disposable equipment for this workplan.

Level 2 Decontamination is a repetitive decontamination procedure, identical to Level 1 decontamination processes. Level 2 includes an increased awareness and observation of the rinsate water and decontamination procedures that indicate residual contamination on the sample equipment.

Level 3 decontamination procedures utilize chemical solvents such as methanol and hexane solvents. If solvents are required for decontamination, the solvents and solvent rinsate shall be captured, containerized, stored and transported separately from all Level 1 and Level 2 decontamination fluids. In addition, the wash brushes for Level 1 decontamination shall not be used with Level 3 solvent decontamination. Please see the SOP for procedures and handling for Level 3 decontamination.

7.0 DECONTAMINATION PROCEDURES AND EVALUATION

The following procedures define the Level 1 decontamination process for this workscope.

a. Initial decontamination procedures shall begin with a visual inspection of the equipment and identification of solids and adhered sediments large than 5 millimeters.

b. A dedicated preliminary wash brush shall be used to wet the equipment with bay water and then to loosen sediments and solids through physical agitation. Once initially wet brushed, the equipment will be rinsed with a bay water rinse.

c. The field teams will mix 1-gallon quantities of Alconox detergent and deionized water within a 1-gallon spray bottle or a clean 5-gallon bucket. Fresh Alconox shall be used to perform decontamination of the used parts, over the decontamination collection bucket.

d. All equipment shall be washed with a wash brush similar to the round wash brush or the square wash brush in the equipment detail. Alconox detergent shall be applied directly onto the equipment or onto the wash brush. The equipment shall be scrubbed using an aggressive brushing action with constant brush movement over all surfaces of the equipment.

e. The wash brush shall not be placed directly into the decontamination detergent via immersion or direct dipping.

f. Level 1 decontamination fluid shall be collected over a decontamination fluid collection bucket. Clean, single use dilute detergent is sprayed across each piece of equipment over the collection bucket.

g. Following washing, the equipment will be rinsed clean to removal all remaining detergent residue. The preferred rinsing water shall be deionized water; however potable water may be used if the source of the potable water and the cleanliness of the containment vessels are known. The field teams shall document the source and type of rinse water.

h. Once the equipment is rinsed, it shall be inspected for residual solids, detergent residue or remaining materials. If required, the equipment may undergo a second rinse or decontamination procedure.

i. Captured decontamination fluid shall be inspected at each sample and decontamination location. The captured fluid will be inspected for oil droplets, oil sheens, chemical odors or unique discolorations indicating elevated contamination. The decontamination fluids shall be stored onsite in an approved and accepted temporary waste storage area.

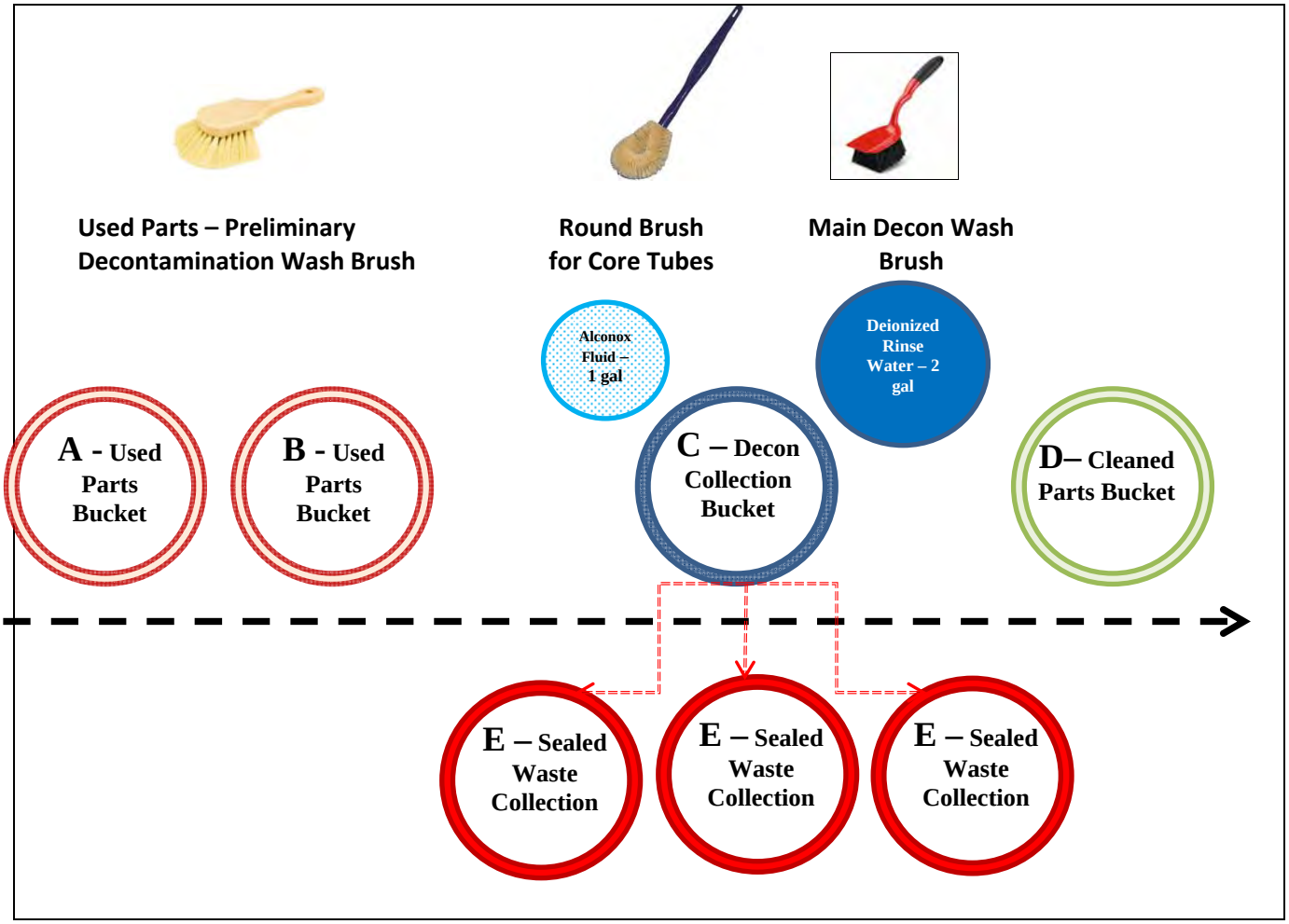
j. All decontamination fluid shall be characterized and disposed at a later date.

k. Once the equipment has been decontaminated, the equipment will be used as quickly as possible or stored in a clean isolated location (e.g. clean equipment cooler) where the equipment will not be dirtied by other boat activities.

l. Immediately upon usage of each decontaminated equipment item, the sampler shall move the equipment through the Bay water to determine the effectiveness of the equipment rinse action. If equipment rinsing was incomplete, the sampler may observe bubbling, discoloration or a rainbow sheen from the residual detergent. If required, the equipment will undergo another decontamination process starting at item d above.

Figure A presents a graphical layout of the decontamination equipment and spatial layout for the proposed field decontamination activities.

Figure A – Graphical Layout of Levels 1 & 2 Decontamination Work Flow
Graphical process from left to right presents contaminated to decontaminated equipment flow



8.0 TYPICAL FIELD DATA DOCUMENTATION

The sampling field team shall document all aspects of the equipment decontamination process. The The following minimum information shall be included with all field reports:

- A specific notation of the equipment that was decontaminated and when the decontamination processes occurred
- A notation of the field observations for each decontamination fluid inspection
- The source of the rinse water
- The volume of decontamination water generated
- The volume and placement of any containerized decontamination fluid which will require sampling and offsite disposal
- A description of all equipment including consumable materials

STANDARD OPERATING PROCEDURES
FIELD DOCUMENTATION PROCEDURES

1.0 SCOPE and SUMMARY OF PROCEDURES

This Standard Operating Procedure (SOP) describes the materials, procedures and practices to effectively and consistently document investigation activities in the field. All documentation activities shall be accurate, consistent, neat and clearly expressed at all times. This SOP shall be used by field investigators when documenting pertinent and factual information. This SOP describes the various types of information that should be included within the documentation as well as the procedures and recommendations for consistency in all documentation.

This SOP recognizes that writing styles, documentation methods, quantity estimation methods, sketching techniques and other input variables are dependent upon personal nuances, practices and skills. Documentation methods and practices may also be influenced by training processes. This SOP and procedures found within this document were prepared by persons deemed technically competent by NewFields, based on their knowledge, skills and abilities. Each field team members shall be trained on the SOP details and procedures and strive to maintain technical consistency at all times.

2.0 SUMMARY OF METHOD

Field documentation shall include both written information and electronic data. Whenever possible, each media should supplement each other with the ultimate goal of capturing all necessary information to detail the work tasks, work performance, quality assurance issues and all procedures.

3.0 DEFINITIONS

Logbook: A bound book of blank papers for capturing and maintaining notes and data collected by a field team when completing a site specific task. The logbook shall be permanently bound, preferably with water resistant write-in-the-rain paper and include pre-numbered pages. No paper shall ever be torn from a logbook. A logbook shall be assigned to a project team or an individual to complete a specific project. The logbook shall be the property of the company completing the work scope and not an individual or project employee.

Field Data Sheet: A group of pre-printed loose forms for the collection of project specific data associated with a specific work task. Each field data sheet shall specify the general work assignment; shall include a specific location for date of field work; included specific information on the data collector; include the name of the project and a page numbering format such as page X of Y on all pages.

Field Data: Project specific data that is collected with an instrument, meter or field tool that provides data that may be viewed, inspected, captured and documented as per this SOP. An example would include a water quality meter, a tape measure or a GPS unit. Field data is quantitative by definition and as opposed to observational data may be captured in specific units and data values by multiple members of a field team.

Observation Data: Project specific data that is collected through personal observation and/or estimation of a value. Commonly referred to as Estimated Data, the field team shall always document the source of observation data and the individual observer. The observational data phrase shall include modifiers of the estimate and a specific unit of measure for each estimate. An example would include an estimated distance from one point to another point, such as "approximately 100 meters northwest of MW-2".

Observational data will generally lack both data accuracy and data precision; however the field documentation team should provide a description of their methods of data estimation.

Field sketch: A field sketch is any drawing, mechanical detail or picture that was created to clarify or supplement the details presented in a field logbook or data sheet.

Estimated Data Values: Generally associated with observational data, estimated data values are numeric or written description of a value without precision or accuracy.

Units of Measure: Industry standard units shall be utilized for all measurements and captured data, e.g. feet, meters, degrees-C, etc. whenever applicable. The field team shall use consistent units of measurement throughout the completion of a work scope and shall record the units of measure for each data entry, whenever the units are not specifically requested.

4.0 EQUIPMENT and SUPPLIES

The following list defines the minimum equipment and materials that are required for field documentation.

- Bound logbook with write-in-the-rain water resistant paper
- Pens with permanent ink, preferably water resistant ink
- Permanent marker for labeling plastics
- Non-smear lead pencils with pencil sharpener
- Field data sheets for each work task or work scope
- Tape measures
- Global Positioning System (GPS)
- Drawing straight edge
- Chains of custody forms and laboratory sample labels.

5.0 PROCEDURES

Dedicated logbooks will be used for all projects and by each sampling team associated with a project. Logbook entries should be objective, factual, and free of personal feelings or other terminology which might prove inappropriate. All aspects of sample collection and handling, as well as visual observations, should be documented.

Any deviations from the quality assurance project plan that occur while in the field will be noted in the logbook(s). Logbook entries that may be considered privileged or confidential information will be handled in accordance with guidance provided by a legal advisor knowledgeable with the project. The logbooks will be maintained with the project file upon transmittal of the final report.

5.1 Field Data Integrity and Accountability

Logbooks will be bound and each page in the logbook numbered and dated. In order to facilitate accurate and complete documentation of many field sampling and measurement activities, project specific field data forms may be used to supplement the data within the field book. Project generated forms will be numbered using the page x of y format and bound prior to use in the field.

The field teams shall strive to minimize redundant data entries, e.g. water pH in the logbook and on the field data sheets.

The following applies to logbooks and project specific field data forms:

1. Observations, data, and calculations will be recorded at the time they are made.
2. Unless prohibited by weather, pens with permanent ink will be used to record all data. When weather conditions do not make it feasible to use permanent ink, entries should be made using a non-smear lead pencil (e.g., 2H or 3H). Upon returning from the field, the project leader will photocopy the penciled section of the logbook and certify, in writing, that the photocopied record is a true copy of the original logbook entry. The photocopy will be included in the project file.
3. Entries will be legible and contain pertinent, accurate and inclusive documentation of project activities.
4. Field investigators will draw a diagonal line through blank or unused portions of pages and initial to indicate the conclusion of an entry at 1) the end of all entries for each day, and 2) at the end of unfilled pages.
5. Upon completion of the field investigation, the end of project entries in the logbook and/or bound forms will be clearly indicated. This may be accomplished by noting "End" on the last page of notes and dating and initialing the notation.
6. In order to demonstrate continuity of the project and to preclude questioning of the integrity of the data collection process, pages should not be removed from bound logbooks and forms under any circumstances.

7. Data or other information that has been entered incorrectly will be corrected by drawing a line through the incorrect entry, initialing and dating the lined through entry. Under no circumstances should the incorrect material be erased, made illegible or obscured so that it cannot be read.
8. If pre-printed adhesive labels are used in logbooks or bound forms to facilitate organization of information entry, the field investigator who is responsible for taking notes will sign the label with the signature beginning on the label and ending on the page of the logbook such that the label cannot be removed without detection.

5.2 Logbook Entry Information

General Information Required in All Logbooks

The following information will be included either on the front cover or the first page of all logbooks:

1. Project name
2. Project location
3. Project identification number
4. Project leader (full name), initials and cell phone contact number
5. Sample team leader (full name) and initials
6. Sample team member(s) (full name) and initials
7. Company name for all subcontractors onsite
8. Names of onsite subcontractors or at a minimum the subcontractor foreman if more than 5 subcontractor employees are onsite

Information Required for Sample Collection

In addition to the information listed previously, the following information will be included in all logbooks when samples are collected:

1. Applicable project specific Standard Operating Procedures for field sampling
2. Date and time of collection
3. Station identification
4. Sample identification
5. Method of collection
6. Number and type of containers
7. Sample collection equipment
8. Field equipment identification number, if applicable
9. Physical description of sample
10. Matrix sampled
11. Sample team member duties (calibration, collection, deployment, etc.)
12. Sample preservation (including ice), if applicable

13. Conditions that may adversely impact quality of samples, if applicable (rain, wind, smoke, dust, extreme temperature, etc.)
14. GPS coordinates, if applicable
15. Location of electronic data file backups, if applicable
16. Monitoring of condition of ice in coolers or sampler
17. A log of location, time and number for all digital photographs
18. Other pertinent information.

Information Required for Field Measurements

In addition to the information listed in Section 2.4.1, the following information will be included in all logbooks when measurements are conducted:

1. Applicable Standard Operating Procedures for field measurements
2. Date and time of measurement or deployment
3. Sample identification
4. Station identification
5. Sample measurement equipment
6. Sample measurement equipment identification number
7. Manufacturer name, lot number and expiration date of all buffers and standards*
8. Calibration information, including before and after calibration readings*
9. Meter end check information
10. Deployment depth and total depth, if applicable
11. Identification number and frequency for deployed equipment, if applicable
12. Time of retrieval for deployed equipment, if applicable
13. Physical description of matrix
14. Sample team member duties (calibration, collection, deployment, etc.)
15. Measurement values for non-logging equipment
16. GPS coordinates (non-logging GPS units), if applicable
17. Location of electronic data file backups, if applicable
18. Ambient air temperature, where applicable
19. Conditions that may adversely impact quality of measurement (Ex. temperature extremes)
20. Maintenance performed, if applicable
21. Meter malfunctions, if applicable
22. Other pertinent information

* Entry of calibration information in logbooks is only required for calibrations conducted in the field. All calibrations conducted at the rental supply house, equipment calibration center or a laboratory station will be recorded in the appropriate equipment tracking logbook(s).

Additional Information for Inclusion

The following information may be included in logbooks as appropriate:

1. Maps/sketches
2. Photographic or video graphic log
3. Process diagrams
4. Decontamination procedures
5. Volume of Investigation Derived Waste Generated
6. Photologger of digital photographs
7. Global Positioning System unit information
8. GPS unit settings
9. Digital camera unit information
10. Quantity and size of sample coolers
11. Any 3rd party site visits, site inspections or personal requests for information

5.0 HEALTH AND SAFETY

Health and safety hazards associated with this procedure can be mitigated by the following engineering, administrative, and PPE controls:

Hazard	Control(s)
Bodily injury due to personal distractions while conducting field documentation	• Leather gloves, steel-toe boots and safety glasses should be worn while all equipment is being handled. • Latex gloves, steel toe shoes and safety glasses should be worn whenever making notes, writing documentation and conducting photo-documentation/ video-documentation
Electrical equipment including electrical chargers shall be handled with care	• Whenever possible self-contained, battery powered equipment should be used for field documentation, such as battery powered cameras, battery powered GPS units, battery powered monitoring equipment • If recharging of batteries is required while conducting field activities, all team members shall be informed of the equipment that is being charged, the source of the power supply and the secure placement of the equipment while recharging. • Whenever possible, spare batteries shall be included with all field equipment. All spare batteries shall be secured in a safe and non-contacting storage method.

Environmental detriment	• Filed documentation shall be viewed as a project specific task similar to well drilling, sediment sampling, air sampling, etc. • Field documentation shall not be conducted while a vehicle is moving or personnel are moving including walking, boating or riding as a passenger. The act of documentation requires the writer's attention which creates an opportunity for distraction and a detrimental impact to the environment and personnel safety.

6.0 DECONTAMINATION

Decontamination practices and procedures shall be conducted in accordance with the site specific Health and Safety Plan (HASP) and the individual standard operation procedures for each task and equipment.

No special decontamination procedures are normally associated with Field Documentation practices.