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Sampling Protocol for Post-Landfall Deepwater Horizon Oil Release, Gulf of Mexico, 2010

Addendum to Standard USGS Methods for the Collection of Water, Sediment, Benthic Invertebrates, and Microorganisms

By F.D. Wilde, S.C. Skrobialowski, and J.S. Hart

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Conversion Factors

Inch/Pound to SI

Multiply	By	To obtain
	Length	
inch (in.)	2.54	centimeter (cm)
inch (in.)	25.4	millimeter (mm)
foot (ft)	0.3048	meter (m)
	Volume	
ounce, fluid (oz)	0.02957	liter (L)
gallon (gal)	3.785	liter (L)

Temperature in degrees Celsius (°C) may be converted to degrees Fahrenheit (°F) as follows:

°F=(1.8×°C)+32

Temperature in degrees Fahrenheit (°F) may be converted to degrees Celsius (°C) as follows:

°C=(°F-32)/1.8

SI to Inch/Pound

Multiply	By	To obtain
	Length	
micrometer (µm)	3.937×10^{-5}	inch (in.)
centimeter (cm)	0.3937	inch (in.)
millimeter (mm)	0.03937	inch (in.)
meter (m)	3.281	foot
liter (L)	33.82	ounce, fluid (oz)
liter (L)	0.2642	gallon (gal)
mlliliter (mL)	0.0338	ounce, fluid (oz)
	Area	
square meter (m^2)	0.0002471	acre
	Mass	
gram (g)	0.03527	ounce, avoirdupois (oz)
kilogram (kg)	2.205	pound avoirdupois (lb)

Specific conductance is given in microsiemens per centimeter at 25 degrees Celsius (µS/cm).

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Technical Content

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Technical Reviewers

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Editorial, Graphics, Layout, and Bureau Approval

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1.0 Post-Landfall Sampling Protocol

Purpose and Scope

This document describes the sampling protocol for U.S. Geological Survey (USGS) multi-media sampling teams responding to the Deepwater Horizon oil spill, 2010, at the coastal environments in Alabama, Florida, Louisiana, Mississippi, and Texas. Sampling locations will be decided closer to the time of field deployment and largely selected from among the sites that were sampled previously to characterize pre-landfall water and sediment conditions (Appendix A). Development of this protocol is in support of a focused Science Plan that will describe the overall study design, including selection criteria for the specific sites to be sampled and the frequency of sample collection.

In general, analytical results of the post-landfall samples will be compared to the results from pre-landfall sampling to provide a record of the changes to the coastal environments as crude product intrudes the surf zone, beaches, and wetlands. Samples that represent constituents in the near-beach water column and coastal or wetland sediments will, for the most part, be collected below the product/media interface and at some time after initial landfall of petroleum-associated product. The collection of free-product samples is not addressed and is beyond the scope of this protocol.

This document is intended to be used as an addendum to the USGS *National Field Manual for the Collection of Water-Quality Data* (NFM) (http://pubs.water.usgs.gov/twri9A), which provides the basis for standard USGS sampling protocols. This document will provide updates to sections of the NFM that are needed to meet regulatory and logistical requirements associated with sampling beach and near-shore water, sediments, benthic invertebrates, and microorganisms (for example, ambient bacterial populations) from an oil-impacted environment. Post-landfall (sometimes referred to as "post-impact") refers to conditions along the Gulf of Mexico coastline following the shoreline arrival of oil from the Deepwater Horizon well failure and ocean-bottom oil release (fig. 1). Site deployment and sample collection under these conditions necessitate modifications of standard USGS sampling and analysis procedures.

Updates and Other Considerations

The information provided is subject to change as a result of the response of Unified Command (UC) to the fluid situation in the Gulf of Mexico and the development of the overall Department of the Interior (DOI) Science Plan for response to the Deepwater Horizon oil leakage, consequent environmental conditions, and identification of specific data and research needs. This sampling protocol and site-specific Health and Safety Plans will be updated accordingly.

Figure 1a. Pristine Louisiana coastal marsh. Photograph by Dennis Demcheck, USGS.

Figure 1b. Oil encroaching on Louisiana coastal marsh. Photograph by Dennis Demcheck, USGS

Figure 1. Louisiana coastal marsh: (a) pristine and (b) oiled.

2.0 Preparations for Multi-Media Sampling at Oil-Impacted Sites

Multi-media sampling associated with this document includes surface water, sediments, benthic invertebrates, and microorganisms at post-landfall sites along the Gulf of Mexico (GOM) coastline. The general preparations required to sample these media closely follow the *National Field Manual for the Collection of Water-Quality Data* (NFM), Chapter A1, *Preparations for Water Sampling*. The NFM currently does not, however, provide the detailed guidance needed for sample and data collection at field sites that are considered by regulatory agencies to include "hot zones" or "exclusion zones." This document augments the standard protocols given in the NFM to prepare for and implement the legal and scientific defensibility of data collection and associated field activities at sites considered to be hot zones in GOM coastal areas during the duration of the USGS response to the Deepwater Horizon oil spill.

Field personnel must allow sufficient time (at least two weeks) to obtain, test, quality-assure, and familiarize themselves with the equipment and supplies required for this water- and sediment-sampling operation. A list of the equipment and supplies needed has been compiled in Appendix B. Sample containers will be ordered either from the TestAmerica Laboratory (TAL) in Pensacola FL, from the USGS National Field Supply Service of the National Water Quality Laboratory (NWQL); WhirlPaks might need to be obtained on the open market and should be sterile. It is important to order a sufficient supply to bring at least one spare set of containers onsite, in addition to having a sufficient number of containers for collection of quality-control samples. Sample containers for analysis of oil and grease, trace metals, and nutrients are obtained from TAL and already contain the chemical preservative required for the respective analysis. These containers, therefore, must be handled with caution before, during, and after field operations.

Upon arrival at the field site, the field team must (1) evaluate and record field conditions with respect to provisions of the site-specific Health and Safety Plan (see Section 3.0); (2) define the exclusion zone, contamination reduction zone, safety zone, and contamination reduction corridor (described in Section 4.0) for sampling and equipment decontamination before sample collection can begin; (3) evaluate and document the nature and extent of apparent oil-spill-related contamination at the time of site visits; (4) refer to these protocols and previous sampling training and experience to select and implement the appropriate environmental and quality-control sampling and data-collection methods and procedures (Sections 4, 5, 6, 7, and 9); and (5) follow to the letter all chain-of-custody and documentation requirements (Section 8).

Sampling under post-landfall sampling conditions requires special training and procedures:

- "Hot zones," (referred to as "exclusion zones" or EZ in this protocol) as identified by the Deepwater Horizon Unified Command, are changing continually. USGS personnel are advised to contact the Incident Command (IC) for the area to report field activities planned for that day and for up-to-date information on officially designated exclusion zones when planning to sample at a given GOM location.
- Training required for all personnel who will be involved in Deepwater Horizon Post-Landfall field activities includes 40 hours of Hazardous Waste Operations (HazWOper) training (or the 8-hour HazWOper refresher for those having had the 40-hour training over 1 year ago); an additional 4 hours of training provided by British Petroleum (BP); USGS Water-Quality

Field Methods course (QW1028) or the Refresher course, completed within the last 5 years; and the Motorboat Operator Certification Course (MOCC).

- **Chain of Custody (COC) procedures must be followed to preserve the record and results of the samples and data collected as legally as well as scientifically viable and verifiable.** Section 8 of this document provides the procedures to be followed, including maintaining a logbook in which the date/time, place, personnel, visitors, site conditions, and procedures and methods used must be recorded.
- **The safety precautions outlined in this protocol are required when entering oil-contaminated areas** and are described in detail in Section 3. These include monitoring and mitigating the effect of exposure to toxic and combustible compounds associated with the oil release on field personnel, use of Personal Protective Equipment (PPE), and a familiarity with proper techniques to protect worker health and safety. These and other safety precautions should be thoroughly addressed in each site-specific Health and Safety Plan (HASP) and understood by all members of the Field Team. It is recommended that the HASP require the use of organic vapor analyzers and the appropriate PPE and medical screening for sampling activities (Appendix B).
- Before mobilizing for field work, each post-landfall field team should review thoroughly the site-specific field notes (and analytical results, if available) that were recorded during pre-landfall field work. A Global Positioning System (GPS) instrument will be used by each team to provide and verify site and sampling locations in addition to documentation through photographs, on maps, and in field notes, in order to identify the correct sampling locations (see Section 8.2.1). Label coolers/cartons clearly; e.g., Food; Water; H_2O containers; Sediment containers; Decontamination supplies; and so on.
- Some sampling locations must be accessed by boat; therefore, all training, certifications, and equipment necessary to conduct these activities safely and efficiently must be included in the site preparation (Section 3.0). Actions must be taken to ensure the proper decontamination of boats that may become coated with oil or transport invasive species of fauna or flora (Section 4.0).
- Field teams are advised that, in the course of developing this protocol, a trial-run to test these field procedures required several days to assemble the gear needed, two vehicles to transport all the gear, and an entire day to complete sampling and other field activities at one site.

Figure 2 provides a flowchart listing the major actions needed before deploying to the field site. These actions are described in greater detail in various sections of this protocol. This flowchart also is included in Appendix C along with similar flowcharts that summarize other stages of the field effort. Appendix D includes two tables, one for water sampling and one for sediment (solids) sampling, that list container requirements for each analysis, describe how the samples should be preserved and shipped, and list laboratory contacts and addresses.

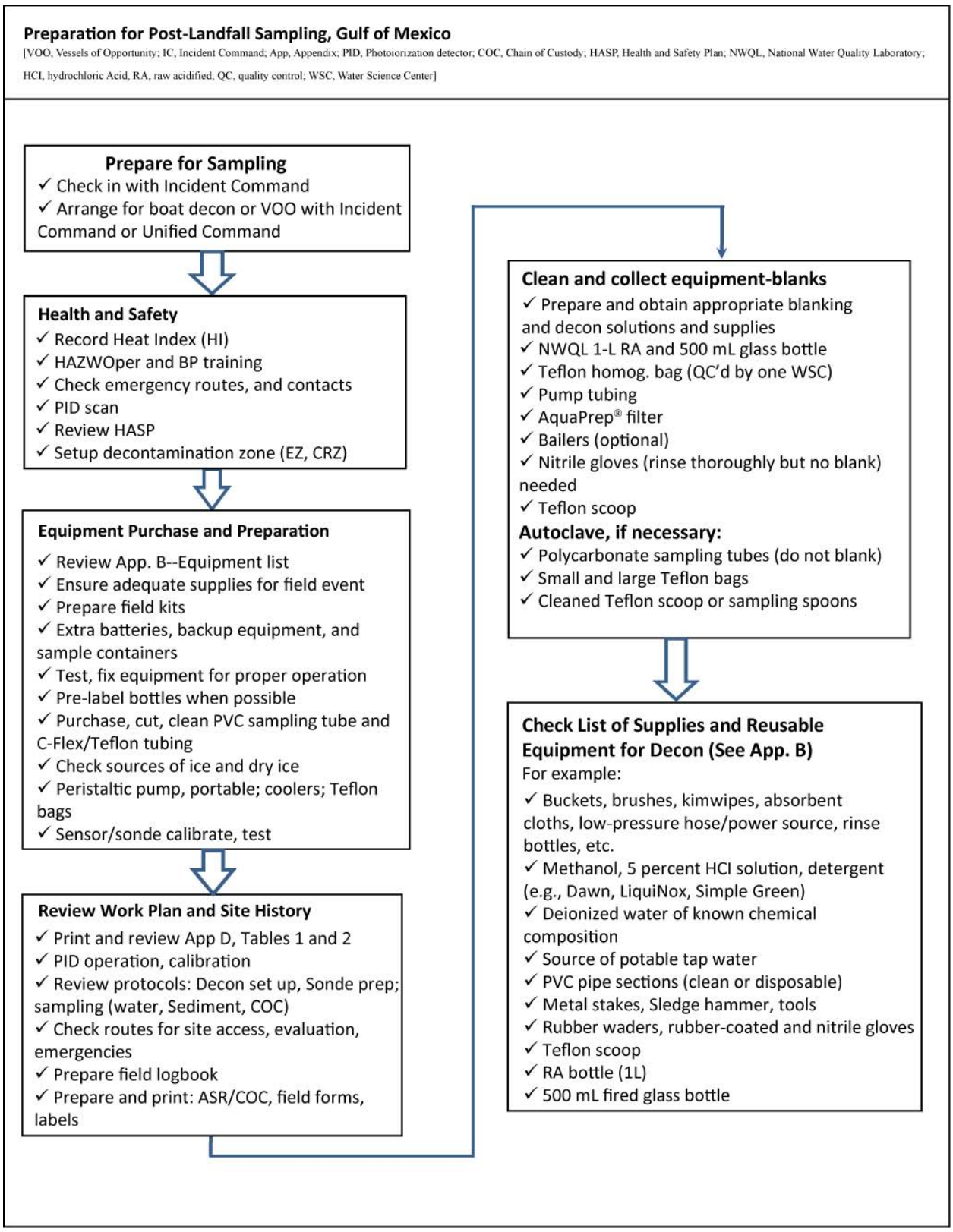

Figure 2. Preparation for post-landfall sampling, Gulf of Mexico.

3.0 Safety in Field Activities

Large-scale petroleum releases can result in various scenarios for human exposure. Exposure hazards should not be underestimated in planning for work in affected areas. The Health and Safety Plan and other safety procedures and precautions outlined in this section of the protocol are required for USGS personnel entering oil-contaminated areas. The protocol includes requirements for safe work practices, working in exclusion zones, personal protective equipment (PPE), training, and identification of contacts to assist with response to onsite conditions and emergencies. Much of the information covered in this section is included in greater detail in the HASP documents described below and in Appendix E. In brief, the safety requirements described in this section will mandate:

- Site-specific Health and Safety Plans (HASPs) and Job Hazard Analyses (JHA)
- HazWOper and British Petroleum (BP) GOM-specific training: **Plan on 24 or 40 hours of HazWOper training, plus an additional 4 hours of BP training** (see explanation in 3.2 below). (In addition, OSHA generally requires medical monitoring and CPR/First-Aid Certification training; this is not covered in this document.**)**
- 2-week Water-Quality Field Class training and Motorboat Operator training and certification.
- Air-quality monitoring. Photoionization detection (PID) that exceeds the 20 ppmv action level for total volatile organic compounds will result in evacuation of the field site.[1]
- PPE including Tyvek apparel, PFDs, latex overboots or rubberized waders, eye protection, rubberized elbow-length gloves and nitrile hand gloves, used as described in the protocols for sample collection and handling.

Familiarization with the guidance provided in this section does not replace the requirement to read and understand the HASP.

3.1 Health and Safety Plans

The Occupational Safety and Health Administration (OSHA) requires the development of site-specific Health and Safety Plans (HASPs) that must be provided in hard copy to each employee performing oil-response or site-cleanup activities. The field-team supervisor has a responsibility to ensure that the safety protocols and their expectations are understood by each field-team member. **CAUTION! Stop, rest at the first sign of heat discomfort. Do not push yourself.**

USGS HASP requirements for response to the Gulf of Mexico (GOM) Deepwater Horizon (DWH) oil spill are fulfilled by assembling a USGS DWH GOM HASP package, which should be kept on hand when deploying to the field site. This package includes the following

[1] Use of respirators and monitoring air quality for exposure to benzene are not included in this protocol as they are not relevant to the field conditions planned for USGS shoreline sampling.

documents, some of which are included in Appendix E and which USGS personnel can download by opening "HASP Package" found on the ***my.usgs.com OWQ_Deep_Oil wiki***[2]:

1. **Agency HASPs.** A HASP provided by the Incident Command (IC) or Agency under whose jurisdiction the work will be conducted is required. In this case, the HASP provided by the Fish and Wildlife Service (FWS) will suffice, unless directed otherwise.

    a. U.S. Coast Guard (http://www.uscg.mil/forms/ics/ICS_208_CG.pdf),

    b. Fish and Wildlife Service (http://internal.usgs.gov/ops/safetynet/FWS%20WIldlife%20Branch%20HASP%20(MC%20252%20Oil%20Spill).pdf)

2. **The Daily Operational and Safety Situational Report (the "shift" or operations plan).** The Shift Plan – which usually covers a 48-hour time period – is obtained from the designated IC safety or Industrial Hygiene staff on or for the day(s) of field deployment. Arrangements can be made to receive the Shift Plan via e-mail for the time period of planned field deployment to avoid delay of field work. The Shift Plan fulfills the requirement to ensure that the HASP includes the specific information to cover health, safety, and hazards conditions that may be unique to USGS sampling sites on the days of sampling.

    a. Field personnel must be briefed on the health and safety information given in the Shift Plan before commencing with field work; this includes, for example, weather conditions, heat-index values, official emergency evacuation plans, and current emergency contacts.

    b. An example shift plan is included in Appendix E for illustrative purposes only. The field-team leader or representative also should request information about the accessibility to 911 or other emergency contacts at the site(s) to be visited.

3. Evacuation plans generally are not included in the Shift Plan. Evacuation plans are specific to and provided by the Huoma, LA or Mobile, AL Incident Commands. Examples are included in Appendix E. The field team should request the latest evacuation plan when requesting the Shift Plan and include it in their HASP package.

4. Site-specific job and work-site hazards (Job Hazard Analysis or JHA). Those hazards that have not been included in the HASP or Daily Report should be added to the JHA that is provided in Appendix E. Any other hazards that are identified onsite also should be recorded on the JHA form upon arrival, along with the actions to be taken to eliminate or reduce the hazard(s) noted.

    a. JHAs for the handling of dry ice, chemical preservatives such as hydrochloric acid and formalin (see NFM 9.6), and other types of equipment can be accessed at the following URL, and should be downloaded and added to the HASP package http://1stop.usgs.gov/safety/topic/jha/index.html.

[2] https://my.usgs.gov/OWQ_Deep_OilWiki/wiki/Main; non-USGS parties may request access by contacting fwilde@usgs.gov or sski@usgs.gov.

b. Wildlife hazards, such as snakes (NFM 9.9.2), alligators (NFM 9.9.3), ticks and mosquitoes (NFM 9.9.1), and so forth, need to be identified and plans in place for a safe and appropriate response (see the following sections in Chapter 9 of the USGS Field Manual: 9.9.2; 9.9.3; 9.9.1, respectively).

5. Section 3.0 (this section) and figure 3 (decontamination flow chart) of this Sampling Protocol. Standard procedures for avoiding contact with and removal of hazardous materials, including setting up Exclusion and Contamination Reduction Zones, normally are included in the HASP for petroleum product releases. A copy of section 3.0 and the decontamination flow chart are linked on the HASP Package section of the wiki.

Consideration should be given to supplementing the current IC or Agency HASP with additional topical information that is provided within the *USGS HASP Template for Oil Impacted Areas*, as appropriate (http://internal.usgs.gov/ops/safetynet/HASP%20for%20Oil%20Spill%20Impacted%20Areas.doc). Supplemental information can be found at http://1stop.usgs.gov/safety/topic/jha/index.html .

Your Incident Command contact or USGS regional safety/industrial hygiene staff is available to provide additional assistance on HASP requirements, if needed. General contact information is described in section 3.6; more specific information, such as contact names and numbers that are given in Appendix E and on the HASP section of the Deep_Oil wiki are subject to change.

3.2 Training

Training is required for USGS personnel who perform field work in oil-impacted areas, who will be operating a motor boat, who will be engaged in data and sample collection, and for USGS personnel who are not subject to exposure but who provide IC office support (e.g., indoor work on finance, information technology/management, etc.).

3.2.1 HazWOper and BP Training

USGS personnel who will be entering the "exclusion zones" or "hot zones" (see Section 4 on equipment decontamination) to collect samples are required to complete HazWOper training, **plus an additional 4 hours of training**, as described below:

- The IC requirement stipulates a minimum of 24-hour HazWOper training for non-supervisory onsite personnel and 40-hour training for "supervisory" personnel (defined as one who has authority, control, and oversight of the activities performed at the site). All other onsite workers are to have a minimum of 24 hours of HazWOper training.
- Where no one has that onsite responsibility or an onsite supervisor is not present, then the individual who is remotely directing/supervising the activities is required to complete the 40-hour HazWOper training.
- The 8-hour refresher HazWOper training is required for personnel whose HazWOper training is not current. Initial and refresher training certification expires 12 months from the completion of the last training.

- **This protocol strongly recommends that all field personnel for this project complete the 40-hour HazWOper training, in addition to the mandatory 4-hour BP training, before deploying to the field.**

Various government agencies and private vendors offer HazWOper training.

- USGS employees can take HazWOper training online through the Fish and Wildlife Service (FWS) vendor at no cost. Select the course below to register, then select "US Fish and Wildlife" as the company name. Leave the bottom (payment) portion blank, as billing arrangements have been made. After clicking to submit your registration, the course opens immediately. If you leave your session before finishing, your place is saved automatically.
  - 40 Hour HazWOper - https://www.natlenvtrainers.com/register.html?course=40HazWOper
  - 24 Hour HazWOper - https://www.natlenvtrainers.com/register.html?course=24HazWOper
  - 8 Hour HazWOper Annual Refresher - https://www.natlenvtrainers.com/register.html?course=HazWOper
- USEPA- EPA OSHA Training Institute Education Centers.
- Approved HazWOper vendors are listed at: http://www.ertpvu.org/kc/login/login.asp?kc_ident=kc0001. Registration is required to access the site. Upon log on, select the external provider from the left side of the screen and then select the List of EPA Approved External Providers to locate vendors.
- On-site Instructor Led Training: Access https://www.pecpremier.com/files/bp-class-schedule.pdf for the schedule of classes being offered at various locations in Louisiana, Mississippi, Alabama and Florida.

In addition to the HazWOper training, all GOM field personnel MUST take the following 4-hour online BP training, regardless of previous/current HazWOper training:

- "Post Emergency Spilled Oil Cleanup (HSEREH004)" https://www2.virtualtrainingassistant.com/BPPublic/wc.dll?learner~cmenu
- Instructions for taking this training are provided in Appendix E.

3.2.2 Motorboat Operation

All USGS personnel who operate a motorized watercraft vessel, less than 26 feet in length, for mission work, are required to complete the Department of Interior Motorboat Operator Certification Course (MOCC). This course involves "hands-on" watercraft activities, including watercraft handling and maneuvering, docking, emergency procedures, fire suppression, and trailering exercises, as well as classroom instruction. MOCC Certification is valid for 5 years and re-certification is available either on-line or in combination with a MOCC Instructor.

3.2.3 Water-Quality Field-Methods Training

QW1028, the 2-week course on *Groundwater and Surface-Water Water-Quality Field Methods*, contains protocols and guidance on safety when sampling under a variety of environmental conditions, using various chemical agents. This course is based on the USGS National Field Manual, which also contains a chapter on *Safety in Field Activities* (Chapter A9). All USGS personnel engaged in GOM on-site sampling and data collection must have completed the 2-week classroom and hands-on course or its refresher course within the past 5 years and have experience implementing the protocols and procedures provided within each chapter of the Field Manual.

3.3 Air Monitoring

Air monitoring will be required to determine if a given area is receiving volatilized petroleum compounds that may present a hazard to human health. The Department of the Interior (DOI) has set a limit on respiratory exposure to total VOC (volatile organic compounds) of 20 parts per million by volume (ppmv) [3]. The U.S. Environmental Protection Agency (USEPA) maintains a database of air-monitoring results at http://www.epa.gov/bpspill/air.html.

In general, a combination meter that includes a photoionization detector (PID) and a lower explosive limit (LEL)/upper explosive limit (UEL) meter is recommended for field work with anticipated exposure to petroleum-based products. Depending on the situation, monitoring of benzene concentrations might need to be added to the HASP. [4] For the Gulf of Mexico shoreline work, a single function PID should be used to monitor for organic vapors in the ambient and breathing zone during sampling activities. An LEL/UEL meter is recommended if there is a source of ignition (e.g., a boat engine) in the area. Appendix B contains a checklist of field equipment, including PIDs.

All air-quality monitoring equipment shall be field-calibrated daily before use and in accordance with the manufacturer's instructions. Anyone calibrating or using the air-monitoring equipment should be trained and familiar with exposure-monitoring instrumentation as part of the Health and Safety Training Program. The time of calibration and ambient measurements are to be recorded in the field logbook and the data are to be recorded on the field form (Appendix F).

Personnel are to evacuate the immediate area if the total VOC concentration indicated by the PID reaches 20 parts per million by volume (ppmv). It is necessary to report exceedance conditions to the USGS or FWS Industrial Hygienist for input and guidance before reentering the area (2010, DOI Office of Occupational Health and Safety, 2010).

[3] 16 June 2010 e-mail from Robert J. Garbe, MPH, CIH, Office of Occupational Health and Safety, US Department of the Interior: A 5 ppm cut point for the PID is too low to minimize false positive readings. Recommend that a 20 ppm initial cut point be used. Also recommend any excursion above this level be reported to USGS Safety for input and guidance prior to reentering the area.

[4] OSHA (Occupational Safety and Health Administration) guidance stipulates a permissible exposure limit (PEL) of 1 ppm and a short-term exposure limit (STEL) of 5 ppm for benzene. The STEL is based on a 15-minute excursion average, while the PEL is based on an 8-hour average; i.e., over an 8-hour excursion the average benzene concentration is not to exceed 1 ppm.

- To avoid potential inhalation of vapors, personnel should be positioned upwind of free product in the water or on land and upwind of field vehicles or other petroleum-containing or -burning equipment. If this is not possible the team leader will determine if the health and safety of personnel are at risk and if sampling should be aborted.
- Field personnel must evacuate the site if PID action levels are exceeded. **Do not enter or re-enter the site until concentrations fall below the action limit**, unless properly fitted respirators are at hand and the team leader determines that sample or data collection can continue. Personnel will not be placed in any situation where respirators are required, i.e., concentrations above 20 ppmv.
- If personnel experience symptoms of exposure while in the site, even though air monitoring does not indicate excursions above the action limit, personnel are to evacuate the site and to contact the Safety Point of Contact (see Section 3.6) for specific guidance.

It is recommended that readings be recorded:

- Upon initial entry to the area
- Every 10 to 30 minutes, or as often as practical while in the breathing zone while work is in progress, as long as the PID reading does not appear to be increasing and does not exceed 20 ppmv.
- When weather conditions change,
- When adverse conditions are encountered, such as exposing fresh crude oil or noticing an increase in odors since initial entry.
- When work begins on another portion of the site (for example, moving from water sampling to collection of sediments and other solid materials).

Department of Interior (DOI) Industrial Hygienists are collecting air samples to characterize exposures for DOI employees involved in the response activities. USGS Safety and Health industrial hygienists are using this information to develop the safety and health requirements and guidelines provided in this document. At the end of field-related operations for a given period of sampling, the PID data should be sent to the Bureau Industrial Hygienist via e-mail or fax (azepeda@usgs.gov, 703-648-7592).

3.4 Personal Protective Equipment

The recommendations in this section regarding personal protective equipment (PPE) have been developed from information taken from U.S. Department of Health and Human Services, National Institutes of Health, regarding the crude oil spill, and from DOI and USGS Health and Safety officials. Appendix E contains PPE specifications. To the extent possible, disposable PPE will be used to minimize the risk of skin contact with potentially contaminated sediment or water and to minimize extensive PPE decontamination procedures. Protocols and procedures for discarding contaminated clothing and materials are described in Section 4.

- All personnel working in a near-shore or off-shore environment must wear a properly fitted Personal Floatation Device (PFD) as described in USGS Safety Bulletin “Personal Floatation

Device Selection/Use," issued 07/22/2010 (Appendix E). PFDs must be worn over the clothing and not under Tyvek or other apparel.

- Where there is a potential for oil contamination, the Revere Type V Model 280 Work Vest (nylon-buckle closure) PFD is recommended. This PFD should be used and modified as follows to meet DOI standards: Obtain pre-cut patches of SOLAS adhesive-backed reflective tape from the Bureau Watercraft Safety Program Manager (727-803-8747) along with a detailed drawing of where to attach the tape. The Type V Model 280 PFD can be cleaned of oil using soap and water or alcohol swabs, and may be used for USGS work other than that related to oil-spill related projects.
- The standard Type 3 PFD supplied to USGS personnel may be worn where there is no potential for oil contamination; however, should the PFD become contaminated with oil or oil-related product, the PFD may not be reused and must be discarded as hazardous waste.
- For personnel working in water affected by free product, modified Level D clothing is required, including: Disposable Tyvek coveralls or pants, safety glasses, and disposable nitrile gloves (for handing sample containers and chemical preservatives); and non-disposable (cleanable) PFDs, rubber waders, elbow-length rubber gloves, Hearing protection is recommended when working in the vicinity of boat motors or other loud equipment.
  - Waders should be worn over Tyvek apparel. If working under conditions where water could enter the waders, the top of the wader should be taped to the underlying apparel with duct or Chemron tape. If working in shallow water for which waders are not required, latex waterproof boots need to be worn over waders and duct-taped to the Tyvek pants to form a seal, as water will leak through Tyvek seams. Waders should be removed and cleaned once back on shore.
  - PFDs should be worn over the Tyvek and wader suspenders when working in water and adequately cleaned or discarded (see Section 4) if soiled by free product or other contaminant.
  - Elbow-length rubberized gloves are worn over layered nitrile gloves. Do not reach into contaminated water to collect samples without wearing appropriate gloves. Rubberized gloves can be cleaned as described in Section 4. Disposable (nitrile) gloves need to be replaced often in order to maintain chemical protection, and disposed as described in Section 4.
  - Splash shields or safety glasses are worn to protect eyes from splashes during sampling, decontamination procedures, or boat travel.
- When working on land, modified Level D clothing also is required.
  - Use latex boots in lieu of Tyvek booties, as Tyvek shreds readily when walking on beach sands.
  - The sediment sampling protocol calls for inserting gloved hands inside a clean Teflon bag before contacting the sample medium (Section 7). Do not reach into or mix contaminated sediments without wearing appropriate hand and arm covering.

CAUTION! Using the above-listed PPE can increase your risk for heat stress, exhaustion, and heat stroke in this field environment. Stay hydrated, and watch for signs of these conditions in yourself and others: Headaches, dizziness, nausea, cramps, and profuse sweating followed by no sweating. DO NOT PUSH YOURSELF. SWITCH SAMPLING DUTY AMONG TEAM MEMBERS EVERY 30 MINUTES OR LESS.

List of recommended PPE:

- Calibrated PID, possibly in combination with an explosimeter (LEL/UEL meter) and benzene sensor.
- National Institute of Standards and Technology (NIST)-traceable calibration gases and regulators for the specific instrumentation
- Operator's Manual for PID/UEL instrumentation
- Eye protection (safety glasses, splash shield, goggles, as appropriate)
- Nitrile gloves
- Rubberized gloves, elbow-length or longer
- Tyvek pants or coveralls
- Latex waterproof overboots (as appropriate)
- Rubberized (cleanable) hip or chest waders
- PFD, Revere Model 280 Type V work vest (available from, for example, WestMarine/Port Supply, "Model# 10967776)) with nylon-buckle closure. This PFD must be modified to conform to the USGS standard for PFD reflectivity (Section 3.3 above).
- PFD, standard Type 3, as specified in USGS Safety Bulletin 7/22/2010.
- Duct or Chemron tape
- Insect repellent (non-contaminating) and head nets
- Steel-toed shoes/boots (as specifically required by work task)
- Hard hat (as specifically required by work task)

3.5 Health Monitoring: Exposure and Heat-Stress

Ingestion of contaminated materials will be minimized by good personal hygiene and taking the appropriate cautions while handling materials and solutions associated with petrochemical contamination and equipment decontamination (i.e., thoroughly washing face and hands with soap and water, especially before eating or drinking).

The **Heat Index** (HI) is the temperature the body feels when heat and humidity are combined. It sometimes is referred to as the "apparent Temperature". The HI, given in degrees Fahrenheit (°F), is a measure of how hot it feels when relative humidity (RH) is added to the actual air temperature. NOAA posts a heat-index calculator at http://www.hpc.ncep.noaa.gov/html/heatindex.shtml; the heat index also can be found from the National Weather Forecast. HazWOper training and subsequent refresher training should include prevention and identification of heat stress-related injuries and illnesses. **Field personnel must record the Heat Index (HI) in their field notes (this information should be included in the Shift (Operational) Plan described in Section 3.1 above).**

The Heat Stress Prevention Program outlines exposure controls to protect employees working in hot environments and follows current American Conference of Industrial Hygienists (ACGIH), guidelines. These are general guidelines that need to be tailored to provide specific guidance for the work site. **The Heat Stress Prevention Program is implemented when work-area temperatures rise above 90°F when Level D PPE is worn.** Work practices and exposure controls are used to reduce the risk of elevating an employee's core body temperature. These work practices and exposure controls are detailed in the HASP package, include the following:

- Defining and adjusting employee work/rest intervals.
- Monitoring for physiological signs of heat stress.
- Providing cool liquids at the ratio recommended in the site-specific Shift Plan.
- Establishing and implementing acclimatization schedules.

3.6 Points of Contact

Points of Contact refer to offices or those individuals having responsibility over a specific function related to the DWH incident response. These personnel often rotate in and out of a given position along with their phone number, making it necessary for field personnel to obtain up-to-date contact information for the period of field work. This information is provided in the Shift (Operational) Plan that the team leader needs to obtain from the Houma or Mobile Unified Command Sector Safety Officer ahead of field deployment (Section 3.1). The information below shows which Office to contact for a given function or need and, if available, provides contact information that is persistent and therefore, generally, not subject to change. Contact information for individuals currently on duty is listed on the Deep_Oil wiki page under "Safety." **For this project, the FWS Safety Officer on duty is the primary coordinating contact.**

3.6.1 Incident Command Operations and Safety Officers/Industrial Hygienists

USGS personnel should notify the local Incident Command Center (IC) regarding the location and the type of work being done. The IC staff can advise on areas that are off limits, or if IC authorization is required to enter certain areas. USGS personnel can obtain current guidance on safety and health issues, such as known hazardous conditions, from their local and Regional Safety staff if primary points of contact are not available.

Incident Command

- **Houma LA Incident Command** - 1697 Highway 311, Houma LA 70395, Main 985-493-7600; Operations 985-493-3343; mc252decon@gmail.com
- **Mobile AL Incident Command** - One South Water Street Mobile AL 36602, 251-442-1938.
- **Houma Sector, Wildlife Branch, Safety Officer -- BP persistent cell phone (985-665-7093)**
- **BP-provided Safety Officer for Houma -** 985-709 5957
- **St. Petersburg FL Incident Command -** Fish and Wildlife Research Institute, 100 8th Avenue SE, St. Petersburg FL 33701, 904-755-8008

Contact information for the following individuals are listed at the Deep_Oil wiki site

- Fish and Wildlife Service (FWS) Safety Officer, Mobile, AL sector
- Fish and Wildlife Service Safety Officer, Houma, LA sector
- DOI Occupational Safety and Health Manager
- USGS Bureau Industrial Hygienist
- USGS Eastern Region Industrial Hygienist

PFD and other Watercraft Safety Issues.

- USGS Bureau Watercraft Safety Program Manager, USGS Center for Coastal and Wetland Studies, St. Petersburg FL

Online resources

- Joint Incident Command: http://www.deepwaterhorizonresponse.com/go/doctype/2931/53023
- DOI: http://www.doi.gov/deepwaterhorizon/, and https://www.smis.doi.gov/smisaux/OilSpillInfo.htm
- USGS: http://www.usgs.gov/deepwater_horizon/, and http://internalgov/ops/safetynet/oilspillworkers.html

3.6.2 Waste Disposal and Other Environmental Issues

Waste disposal and other environmental issues are covered in Section 4 and questions should be referred to the designated DOI IC staff at the Office of Environmental Policy and Compliance for Policy, Management, and Budget (See Appendix E or access the Deep_Oil wiki for more detailed contact information).

3.6.3 Watercraft Decontamination

- USGS personnel should notify the IC in advance regarding decontamination services for WSC vessels: Mobile, AL Incident Command Center, 985-493-3343
- mc252decon@gmail.com
- Mobile Decontamination Center 251-455-3010 (for locations of Mobile IC Region Decon Centers, see www.bpdecon.com)

Vessels of Opportunity (VOO)

- VOO coordination hotline: 866-279-7983 or 877-847-7470
- VOO Program Coordinator for Houma, LA (see the Deep_Oil wiki)

3.6.4 Air Monitoring

- Contact: The DOI Occupational Health Program Manager or the Industrial Hygienist at Houma, LA Incident Command Center (Main Office): 985-493-7600

Department of Interior (DOI) Industrial Hygienists are collecting air samples and air-sample data to characterize exposures for DOI employees involved in the response activities. USGS Safety and Health staff will use this information to develop the safety and health requirements and guidelines provided in this document. Send copies of the field form with air-monitoring results to the USGS Bureau Industrial Hygienist Air–monitoring results for the Gulf of Mexico can be found under the following URLs:

- USEPA: http://www.epa.gov/bpspill/air.html
- Current Air Quality along the Gulf Coast: http://gulfcoast.airnowtech.org/

3.6.5 Accident Reporting

All accidents shall be reported within the DOI Safety Management Information System (SMIS) accessible at https://www.smis.doi.gov/ and clicking on "Accident Reporting" tab. Note that under the "Special (Disaster Response Related) Accident Report" selection, the Department has added the following category "During the Response to the Gulf Oil Spill". Please mark this category when reporting accidents involving individuals who become ill or are injured during natural disaster relief efforts. On the injury selection page there is an entry button that allows the reporting supervisor to categorize an injury due to the Department's response. This specialized entry page has specific questions on PPE and training. Questions related to SMIS may be directed to the DOI Occupational Safety and Health Manager, 202-288-5549/202-904-0008 or USGS Headquarters Safety and Health Specialist 703-648-7553.

4.0 Decontamination

This section describes protocols and procedures for decontamination of sampling equipment to be used during hazardous waste operations as per 29 Code of Federal Regulations (CFR) 1910.120, including defining the boundaries for the "hot" or exclusion zone (EZ), contamination reduction zone (CRZ), and a contamination reduction corridor (CRC) (Section 4.1). The purpose of decontamination is to eliminate concerns of transferring contaminants, such as chemical substances and non-indigenous invasive species, to other samples and other sites., The guidance provided is to be used as an addendum to Chapter A3 of the National Field Manual (Field Manual, revised 2006) for working in oil-contaminated environments, such as those encountered in the Gulf of Mexico as a result of the Deepwater Horizon oil-rig explosion.

The extent to which all or some of the decontamination procedures described below should be implemented depends on site conditions during field operations, the types of equipment being used, and whether the equipment will be reused at another site. The team leader has the training to make the appropriate decisions, which must be documented in field notes. To the degree possible, disposable equipment will be used and disposable clothing will be worn to minimize the need for decontamination as well as to protect personnel who might come in contact with hazardous or contaminating substances. Protocols for decontamination and disposal of PPE are to be included in the HASP. Cleaning of multiparameter sondes is treated separately in Section 5.0 of this document.

4.1 Work-Zone Boundaries

Upon entering the field site, decontamination work zones need to be defined so that the level of contamination at the site decreases at the boundaries of the work zones. When boat access to the sampling site is required, a CRZ and SZ must be established on the vessel, as described in section 4.1.1 below. Figure 3 at the end of this section illustrates the steps involved in setting up work zones and decontamination (see also Appendix C).

- **The Hot Zone or Exclusion Zone (EZ)** includes the sample collection area, assumed to be the most heavily contaminated area. Only properly certified, trained, and equipped personnel should enter the EZ. Proper personal protective equipment and training required for entry into the EZ will be described in the HASP.
- **The Contamination Reduction Zone (CRZ)** is where decontamination of equipment takes place and where PPE is removed and cleaned and disposed of properly.
- **The Support or Safe Zone (SZ).** Once equipment has been decontaminated or containerized for disposal, the equipment can be moved to the outside the controlled area to the **SZ** where it will be packed for future use or disposal.
- **The Contamination Reduction Corridor (CRC)** is the pathway between the EZ, CRZ, and SZ. Anyone in the CRC should be wearing the level of protection designated for the decontamination crew.

Another corridor may be required for the entry and exit of heavy equipment. Sampling and monitoring equipment and sampling supplies are all maintained outside of the CRZ. Personnel don their equipment away from the CRZ and enter the exclusion zone through a separate access control point. One person (or more) should be dedicated to equipment decontamination.

4.1.1 Contamination Reduction Zone Setup for Small Equipment

The Contamination Reduction Zone (CRZ) is the area designated for cleaning and decontamination of hand-held equipment including non-disposable PPE, and for disposal of single-use clothing and equipment. Decontamination stations are set up within the designated CRZ during site mobilization and before sampling. Referring to figure 3, the decision as to whether all five stations will be set up depends on the type of reusable equipment to be employed for field work, whether two or more sites will be sampled on the same day, and the decision of the field team or program plan as to whether equipment requiring an acid and/or organic-solvent rinse is best accomplished on site or within the office laboratory facilities under controlled conditions. The information provided about this five-station setup reflects standard operating procedure for environmental studies for which containment of hazardous waste is a concern. USGS field teams will, however, employ single-use, disposable equipment in a manner that minimizes the amount of solid waste and maximizes containment of hazardous substances and may not need to set up for the acid or methanol rinse described below.

1. Lay down plastic sheeting within the CRZ sufficiently large to contain all decontamination station over spray (typically 4 feet by 10 feet for hand-held sampling equipment requiring only two to three 5-gallon buckets per station). Modify the CRZ as appropriate for boats.

2. Station 1: Dry brush or scrape station, where either (a) disposable contaminated or soiled PPE and equipment will be placed into a properly labeled solid waste canister (e.g., Tyvek, nitrile gloves, stake, bucket liners, plastic sheeting) or (b) where surface soil is removed from cleanable PPE and equipment (rubberized waders and gloves, buckets, any equipment for reuse).
3. Station 2: 5-gallon bucket with approximately 3 gallons of tap water and surfactant detergent solution; scrub brush for first wash; and low-pressure rinse dispenser with potable water captured in a 5-gallon canister.
4. Station 3: 5-gallon bucket with approximately 3 gallons of tap water and scrub brush for second wash; low-pressure rinse dispenser with de-ionized water captured in a 5-gallon canister; 5-percent hydrochloric acid spray or rinse captured in a separate container; second low-pressure rinse dispenser with distilled/de-ionized water, captured in an acid-waste storage container.
5. Station 4: 5-gallon bucket with approximately 3 gallons of de-ionized water and scrub brush for third wash; low-pressure rinse dispenser with de-ionized water captured in a 5-gallon canister; laboratory-grade methanol-rinse dispenser, captured in an organic-solvent storage canister; aluminum foil-covered tray for methanol-rinsed equipment (to allow methanol evaporation); low-pressure rinse dispenser with distilled/de-ionized captured in the organic-solvent storage container or canister.
6. Station 5: portable rubbish can with heavy-duty trash bag liner for soiled, disposable PPE.

Sampling operations that require boat-access to a site at which on-land decontamination zones cannot be established need to plan for on-board equipment decontamination as described above to the extent that this is possible. As an absolute minimum, Steps 1–3 should be completed, including rinsing sediments and wiping oily residues off of all sampling equipment. Completion of decontamination procedures should be executed at the boat launch or later at office facilities.

4.1.2 Decontamination Setup for Large Sampling Equipment

If a boat or other large equipment is required to sample within oil-impacted waters, a decontamination plan must be put in place. Boats can be decontaminated either offsite or onsite. Offsite and onsite decontamination procedures are described below.

4.1.2.1 Offsite Decontamination

USGS Science Centers may decide either to use Bureau watercraft or contract Vessels of Opportunity (VOO). At the time of this writing, decontamination operations were underway at 17 Unified Command (UC) staging stations, which were available for decontamination of USGS boats as well as for VOO. The number and location of decontamination stations changes and needs to be verified before plans are established.

- To coordinate boat decontamination, contact the Decontamination Center at Houma IC Decon Center: 985-493-3343; mc252decon@gmail.com; or Mobile IC Decon Center

251-455-3010. You will be directed to the nearest decontamination center. Watercraft decontamination locations, including latitude/longitude data for the decontamination sites managed by Houma IC, are shown on at the end of Appendix E.

- Information for finding VOO is available through the VOO Hotline, (866) 279-7983, (877) 847-7470 or by contacting Vince Mitchell, the VOO Program Coordinator for Houma, LA, at 427-773-9983.
- It is recommended that Bureau watercraft be sprayed down with clean water and allowed to dry before mobilizing offsite, to prevent spread of contaminants.

4.1.2.2 Onsite decontamination

Onsite decontamination of a vessel is to be avoided in favor of using IC decontamination stations, if possible. For onsite decontamination, setting up a decontamination pad is recommended. The decontamination pad consists of a bermed area of appropriate size to the equipment to be decontaminated, lined with 2 layers of 10-mil plastic sheeting. Berms may be constructed of 2 x 6 lumber, and the pad should contain a low-spot or sump from which fluids can be pumped into the required containers for disposal (properly labeled Department of Transportation (DOT)-rated containers) and subsequently transported to the IC Decontamination Station or other regulated facility that accepts hazardous waste.

- Prepare a soapy solution of potable tap water and surfactant detergent, such as Liqui-Nox or Dawn,and use it to scrub-brush large-equipment surfaces.
- A gas-powered steam cleaner is used to steam clean the heavy equipment while on the decontamination pad.

4.2 Method Summary

Removing or neutralizing contaminants from equipment minimizes the likelihood of sample cross contamination, reduces or eliminates transfer of contaminants to clean areas, and prevents mixing of incompatible substances.

- All the equipment to be used for sampling that actually or potentially will contact the sample must be cleaned and stored according to standard USGS protocol (NFM Ch. 3) in preparation for the site visit. This protocol includes collection and analysis of equipment blanks.
- Reused sampling equipment, including nondisposable clothing, must be decontaminated or otherwise cleaned appropriately after each use according to the procedures provided in this protocol. Rubberized waders, elbow-length rubber, and Type V Model 280 PFDs are examples of clothing to be cleaned using the methods described in steps 1 through 3 below (Section 4.2.1; see also fig. 3).
- Generally, equipment only undergoes full decontamination at the field site in the event that the equipment will be reused at another site on the same day and additional sets of precleaned equipment are not available.

4.2.1 Five-Step Generalized Equipment-Cleaning Method

Gross contamination of equipment is removed using a combination of mechanical and chemical methods, as summarized in the five steps that follow (these may be modified for site specificity and in accordance with the type of equipment used and the sample analyses to be performed**). It is left to the best professional judgment of the field-team leader to decide whether an acid rinse and (or) methanol rinse is required and whether it should be performed onsite or in the office laboratory.** If decontamination of small equipment is to be completed in the laboratory, steps 1 through the tap-water rinse in step 3 listed below should be completed onsite, while in the CRZ. The washed and rinsed equipment is then stored in an extra-heavy trash bag labeled "contaminated equipment," for transport and subsequent decontamination.

1. Physically scrape mud or caked oil from equipment and PPE. Scrapings may be left onsite.
2. Wash with soap and water to remove visible particulate matter and residual oils and grease. Contaminated, soapy wash water must be containerized for offsite disposal to avoid bias to the surfactant-sample or other sample analyses.
3. Wash with tap water and rinse with distilled/de-ionized water to remove the detergent. Wastewater containment is the same as for Step 2.
4. Rinse with a low-pH acid (5-percent hydrochloric acid) solution to remove inorganic constituents (e.g., metals/trace elements and nutrients); follow with a thorough rinse using DI water). Containerize wastewater for offsite treatment and disposal.
5. Rinse with an organic solvent (laboratory-grade methanol) to remove trace organic compounds. Allow the solvent to evaporate completely before following with a thorough DI water rinse. Containerize wastewater for offsite disposal.

Containerized liquid and solid wastes from decontamination efforts must be disposed of in accordance with the prevailing State, local, or Federal regulations. Unified Command decontamination stations will accept properly containerized wastes.

4.2.2 Cleaning Agents

In general, decontamination procedures remove contaminants either by thorough or rigorous rinsing (flushing) or by forming a chemical complex.

1. Flushing or other mechanical actions
   a. Abrasive action: Abrasive materials, such as metal or nylon brushes, are used to remove the surface layer of grossly contaminated equipment. Care must be taken not to scratch or otherwise damage vulnerable surfaces of the equipment being cleaned.
   b. Water under low or high pressure: Low-pressure water using a slender nozzle and hose can be used to spray hard-to-reach places in smaller equipment onsite. High- pressure pump is used, generally offsite for boats or other large equipment, at pressure ranges from 340 to 680 atmospheres (atm) and flow rates from 20 to 140 liters per minute. Sometimes used with a low-sudsing, nonphosphate detergent.

c. Simple rinse: spraying or squeezing water through a dispenser bottle to rinse substances adhering to the exterior of bottles, sonde and sensor surfaces, and from equipment crevices. In this process contaminants are removed through dilution, physical attraction, and solubilization.
d. Damp or dry cloth: used to remove contaminants which may have adhered to equipment through airborne contaminants or from surfaces contacted, for example, by oil or sediment.

2. Chemical complex formation to inactivate contaminants by neutralization, chemical reaction, disinfection, or sterilization.
   a. Chemical agents: Use of chemical cleaning agents such as hydrochloric or sulfuric acid and a solvent such as methanol, whether in the field or laboratory, is understood and familiar to USGS personnel, who should follow NFM equipment cleaning protocols.
   b. Sterilization: equipment disinfection or autoclaving, when necessary, will be performed in the laboratory, following procedures given in NFM, Chapter 7.1.

Additional considerations:

- ASTM Type I deionized water to be used in a cleaning/decontamination procedure must be verified by laboratory analysis to be below the method detection level (specifically, below detection for the contaminants of concern).
- For equipment-cleaning purposes, use of an untreated potable water supply is not an acceptable substitute for tap water. Tap water from any municipal or industrial water treatment system may be used.
- Detergent or solvent residue must be completely removed before sampling to avoid possible bias to the analytical data.
- Manufacturer recommended cleaning procedures for multiparameter sondes and sensors that have contacted oil are provided in Section 5.3 of this document.

4.3 Post-Decontamination Procedures

Questions and general guidance with respect to the containment and disposal of hazardous waste materials should be directed to your local safety officer, Bureau Safety officer, or the Safety Officer of the National Water Quality Laboratory (Carlos Arozarena).

1. High-pressure pad area:
   a. Collect liquid and waste from the high-pressure pad and heavy-equipment decontamination area and store in appropriate drum or container. A sump pump can aid in the collection process. Refer to the DOT requirements for appropriate containers based on the contaminant of concern.
   b. Collect high-pressure pad and heavy equipment decontamination area solid waste and store in appropriate drum or container. Refer to the DOT requirements for appropriate containers based on the contaminant of concern.

2. Empty soap-and-water liquid wastes from basins and buckets and store in appropriate drum or container. Refer to the DOT requirements for appropriate containers based on the contaminant of concern.
3. Empty acid-rinse waste and place in appropriate container or neutralize with a base, such as marble chips or baking soda, and place in appropriate liquid-waste drum. pH paper or an equivalent pH test is required to ensure that the neutralization threshold of pH 6 or greater has been achieved .
4. Empty solvent-rinse sprayer and solvent waste into the appropriate container, such as an empty container in which it originally was contained at the time of purchase. Consult DOT requirements for appropriate drum for solvent rinse waste.
5. Using low-pressure sprayers, rinse basins, and brushes. Place liquid generated from this process into the wash-water rinse container.
6. Empty low-pressure sprayer water onto the ground.
7. Place all solid waste materials generated from the decontamination area (i.e., gloves and plastic sheeting, etc.) into an approved DOT drum. Refer to the DOT requirements for appropriate containers based on the contaminant of concern.
8. Label waste containers and make arrangements for disposal. Consult DOT regulations for the appropriate label for each drum generated from the decontamination process.

4.4 Equipment/Apparatus

Appendix B provides a list of suppliers and specifications for field equipment, in addition to the materials and tools recommended below for decontamination activities.

Decontamination Reagents and Solutions

- Non-phosphate detergent, such as Liqui-Nox or Dawn
- 5-percent hydrochloric acid solution in rinse bottle (for inorganics)
- Laboratory-grade methanol in Teflon rinse bottle (for organics)
- Tap water (with and without detergent) in 5-gallon buckets and spray bottle
- De-ionized water in 5-gallon buckets and spray bottles/garden sprayers
- Marble chips or baking soda (for acid neutralization)

Decontamination Tools/Supplies

- Long and short handled brushes
- Bottle brushes
- Drop cloth/plastic sheeting
- Kimwipes, oil-absorbent cloths (e.g., WypAll X70), paper towels
- 5-gallon buckets with handles and lids
- Disposable non-contaminating (Teflon) 5-gallon bucket liners
- Aluminum foil, heavy duty

Health and Safety Equipment

- Health and Safety PPE, as described in Section 2.4 and modified in the HASP.
- Copy of the HASP
- Materials Safety Data Sheets (MSDS) for all cleaning and decontamination agents to be used

Waste Disposal

- Trash bags, heavy duty
- Trash containers
- Department of Transportation (DOT)-certified metal/plastic containment canisters or drums for transportation and storage of decontamination solutions and liquid waste
- Labels to identify the nature of the waste

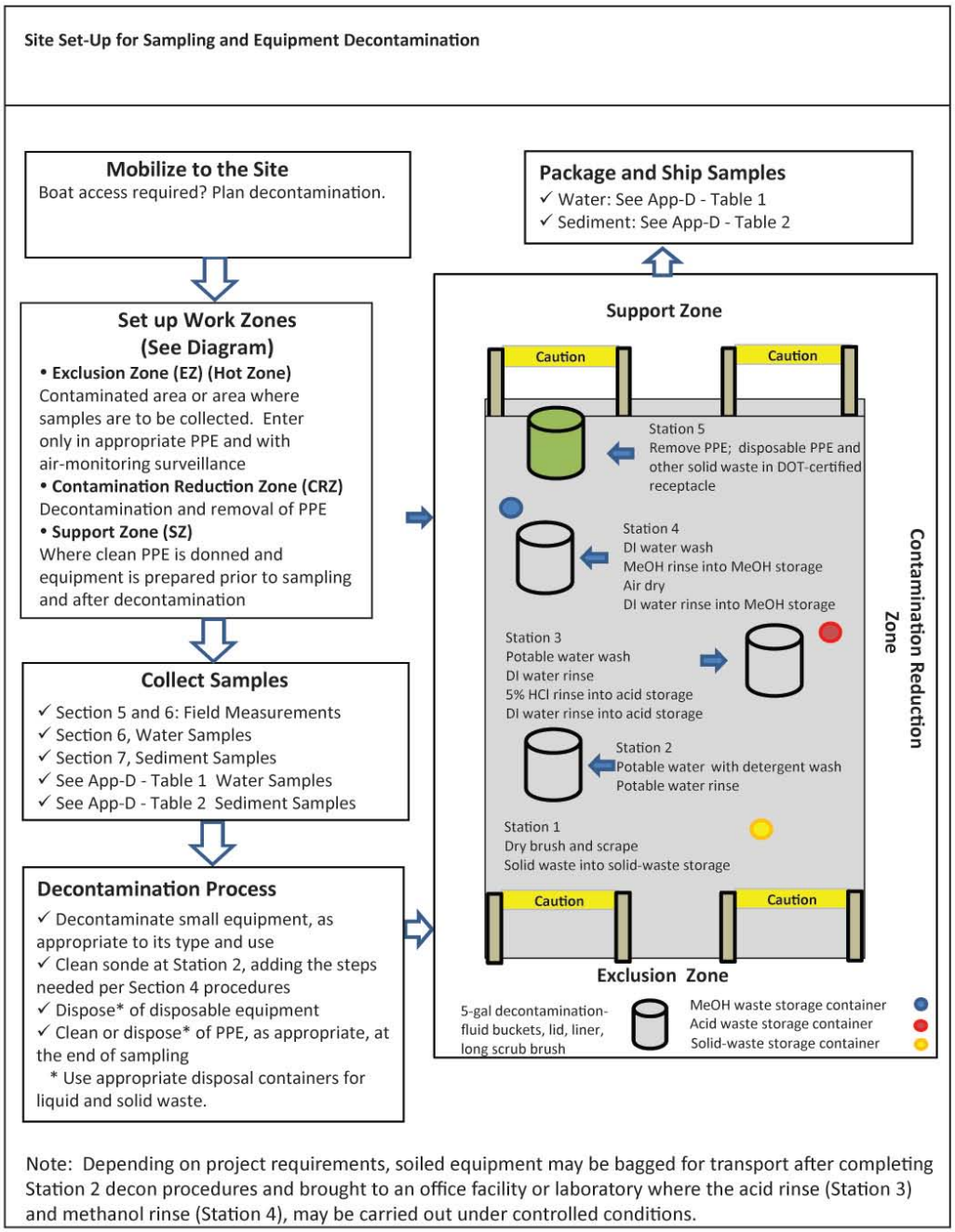

Figure 3. Site setup for sampling and equipment decontamination.

5.0 Multiparameter Sondes: Preparation, Deployment, and Cleaning Procedures

Ambient physical and chemical properties of Gulf water will be measured at specified locations in near-shore and wetlands environment of the Gulf of Mexico. This section of the Deepwater Horizon Post-Impact Sampling Plan has been developed as an addendum to the standard USGS protocols for field measurements found in Chapter A6 of the *National Field Manual for the Collection of Water-Quality Data* to address the special preparation and cleaning procedures needed for multiparamter sondes that might be immersed in saline, oil-laden waters. Protocols and procedures for sonde deployment and measurement of water properties are described in this section.

Measurement of in situ water-quality properties will employ multiparameter instruments containing data sondes attached to multimeter data output and recording devices. Temperature, specific conductance/salinity, pH, and dissolved-oxygen concentration/percent saturation (by luminescent optical sensor) are required measurements for the post-landfall USGS Deepwater Horizon Oil Spill 2010 investigation.

The effects of oily water on the response and sensitivity of multiparameter instrument sensors may vary somewhat, depending on the instrument in use. In this guidance, the YSI 6-series instrument will be used for illustrative purposes. Other equipment manufacturers may have slightly different procedures to address deployment of their instruments in oil-laden waters (Appendix G includes information provided by In Situ, Inc. and YSI, Inc.).

5.1 Sonde Preparation

This guidance focuses on deployment and decontamination methods of multiparameter sondes in an oily surface-water environment. Special considerations and procedures are required to address how to prepare and deploy multiparameter sondes under such conditions. A list of the materials and supplies recommended for sonde cleaning and deployment can be found at the end of this section (Section 5.0).

The instrument type and date, time, and method of calibration (using NFM 6.8 protocols) should be recorded in the field logbook; calibrations are recorded on field forms and in the meter calibration logbook, including a post-sampling calibration check.

- In situ field properties should be measured at the same location at which the samples will be collected.
- Measurements should be completed before collecting the samples for laboratory analysis.

YSI recommends the following procedure before deploying the multiparameter sonde in an oil-contaminated environment:

1. Apply C-Spray nanopolymer protective coating to exterior of YSI instrument, sensors, and cable, according to the YSI instruction sheet (Appendix G).5 (YSI reports that testing has

[5] Do not use C-Spray on instruments from other manufacturers without first consulting with that manufacturer.

demonstrated that C-Spray has no negative impacts on YSI optical sensors, ROX membranes, or YSI pH sensors.)
2. YSI ROX DO sensor: Spray and disperse C-Spray™ over membrane and sensor face. Allow to sit 5 minutes. Wipe excess spray off with a Kimwipe.
3. YSI pH: Spray sensor body including bulb and junction area. Allow to sit for 5 minutes. Shake off any excess spray.
4. All other optical sensors: Remove wiper, spray C-Spray onto sensor face and allow to sit for 5 minutes. Remove excess with Kimwipe and polish sensor face with dry Kimwipe to remove streaking. Inspect wipers and replace or reinstall.
5. Calibrate the sensors after C-Spray application, using standard USGS procedures (NFM 6.8).

5.2 Methods for Sonde Deployment

Three methods for sonde deployment are outlined below. The method selected depends primarily on the presence and thickness of product on the water surface and on surf conditions (Figure 4, section 6).

- Water surface with no visible oil or a light sheen, calm-sea conditions.
- Water surface with definite oil sheen, distributed oil pods (for example, as “mousse” or “pancake” pods), or light sheen with more active sea conditions.
- Water with heavy, measurable oil layer or active or rough sea conditions.

The same criteria are used when selecting a sampling method, as described in Section 6. Section 6 also contains the step-by-step instructions for collecting in situ water data and samples.

5.2.1 Direct-Dip (Sorbent-Sweep) Method

Use: No oil or light oily sheen in a calm-sea environment. This method parallels the direct-dip method for collecting water samples described in Section 6.4.3). Wearing appropriate PPE:

1. Clear the water surface by gently sweeping the surface with a disposable absorbent cloth so that the surface oil is not dispersed into the water column.
2. Discard the soiled absorbent in contaminant-designated trash bag.
3. Lower the sonde into the cleared water column per the step-by-step procedures given in Section 6.4 for conducting a profile and recording field measurements.
4. Remove the sonde, rinse with DI water, and store safely until it can be cleaned in a bucket of soapy water.

5.2.2 Plastic Bag Method[6]

Use: Definite surface sheen, "oil mousse" or widely distributed pods of oily product on the water surface, or more active surf condition (alternatively, use the PVC pipe method described in section 6.4.2). This method might parallel the peristaltic pump (or bailer) method used for sample collection, but also can be used if samples will be collected using the direct dip method (see Section 6.4.3). Refer to the diagrams that illustrate this method in Appendix G.

1. Place sonde in clean disposable plastic bag, covering the entire sonde.
2. Cut out the bottom of the bag.
3. Use rubber bands to close the bag above and at the bottom of the sonde.
4. Place third rubber band around the bag and body of sonde, above the sensors.
5. If feasible, avoid deploying sonde through oil. Alternatively, gently clear the oil layer from the water surface with a disposable absorbent cloth, taking care that the surface oil is not dispersed into the water column. Drop the soiled cloth into a trash bag for contaminated waste.
6. Deploy the sonde vertically, lowering it to below the oil layer.
7. Carefully clear any surface oil again (see step 5) before inserting gloved hands and arms into the water. Remove the lower rubber band, fold the bag up to and secure it with the rubber band at the middle of the sonde.
8. Follow the step-by-step "*Sampler 1 – Sampler 2*" procedures described in Section 6.4.3 for conducting a measurement profile and recording the field measurements.
9. Detach the securing rubber band, lower the bag back over the sonde to protect it from contact with product, and raise the sonde out of the water.
10. Remove bag and dispose into a contaminated-waste trash bag. Wipe down elbow-length rubber-coated gloves and discard along with the wipe in the contaminated-waste bag or remove and store in a dedicated trash bag for subsequent decontamination.
11. Rinse the sonde with DI water and store safely until it can be cleaned in a bucket of soapy water.

5.2.3 PVC Tube Method

Use: A heavy, measurable thickness of free product or densely distributed oil "pancakes", or active or rough surf condition. This method is parallel to the peristaltic pump or bailer method for collecting water samples, as described in Section 6.4.2, and requires installation of a stabilizing stake to which the PVC tube is secured; however, in deep marsh mud, the weight of the tube may cause progressive sinking of the stake, making this method difficult to carry out or requiring modification of the method to better suit site conditions.

1. Install the PVC tube; refer to Section 6.4.2 for detailed instructions.
2. Place sonde through the PVC tube, avoiding water contact.

[6] The plastic-bag method for sonde deployment was adapted from procedures recommended by YSI, Inc.

3. Follow the step-by-step procedures given in Section 6.4 for conducting a profile and recording the field measurements.
4. Remove the sonde from the tube.
5. Rinse the sonde with DI water and store safely until it can be cleaned in a bucket of soapy water.

5.3 Instrument Decontamination

Crude oil is thick and sticky and may affect the performance intervals of the sensor membranes and wipers on multiparameter instruments, in comparison with normal conditions. The YSI company has provided the following instructions for cleaning YSI 6-series™ multiparameter instruments that have become contaminated with crude oil (Section 5.4 lists the materials and supplies needed (see also Appendix B).

5.3.1 Cleaning Procedure

1. Wear gloves and eye protection when handling items contaminated with crude oil.
2. Spray all contaminated areas with Simple Green to remove as much contaminant as possible.
3. Use soft cloth or paper towels to wipe off excess oil from the sonde. Remove oil-coated wiper pads and brushes from sensors in accordance with the manufacturer's instructions and discard. Work carefully when cleaning around sensors or membranes.
4. Submerge instrument in warm, soapy water.
5. Use a soft brush to wipe away remaining oil.
6. Use a small brush to clean inside the cell containing the temperature and conductivity sensors.
7. Rinse in soapy water.
8. Repeat steps 5 through 7 as many times necessary to remove oily residue.
9. Rinse again, in a fresh container of warm soapy water. Rinse soap residue off of the sonde and sensors using clean tap water followed by DI water.
10. Dry the sonde gently.
11. Install new wiper pads and brushes, as instructed by the instrument manufacturer.
12. Dispose the oily water and oil-saturated wipers/brushes and cloths in proper receptacles and in accordance with local regulations for hazardous materials.
13. Check calibration of the sensors.

5.3.2 Decline in Sensor Sensitivity

The most common problems related to oil coating of sensors will be addressed by adhering to the steps for cleaning the sonde and sensors described above. However, the pH, depth, and dissolved-oxygen (luminescent/optical) sensors may require additional attention, as described below (contact the sonde manufacturer if additional guidance is needed):

- **pH:** The performance of the pH and pH/ORP sensors rely on the sensitivity of the glass bulb and reference junction. The pH sensor may require additional cleaning and **benefit from elevating the soapy water temperature to 35°C stirring the soapy solution rapidly**.
- **Depth:** Spray Simple Green into depth-port openings and use pipe cleaners to remove any contaminant.
- **ROX DO Membranes**: The DO membrane on the luminescent/optical sensor also benefits from **an elevated soapy-water temperature**. Stirring or gentle sweeps with a soft paint brush across the membrane should aid in cleaning.

5.4 Materials and Supplies

Materials and Supplies for Cleaning and Sonde Preparation[7]

Cleaning

- Gloves
- Eye protection (safety glasses with side shields; or goggles)
- Lint-free cloths or paper towels, such as Kimwipes
- Replacement sensor brushes and wipers; a hex wrench
- An effective, nonphosphate detergent liquid, such as Liqui-Nox or Dawn, and a degreaser, such as Simple Green
- Buckets
- Soft-bristle brushes for cleaning, including soft paint brush
- Laboratory-grade wipes for delicate membranes, such as Kimwipes
- Pipe cleaners and Q-Tips
- Waste-collection container
- Heating plate
- Magnetic stirrer and stir bars

Preparation

- Health and Safety PPE as described in Section 3.3 and modified in the SSHP (Appendix E)
- Field- (onsite-) calibrated multiparameter water-quality meter and sonde
- YSI C-Spray nanopolymer coating
- Disposable plastic bags
- Rubber bands, extra strength
- 1.5-foot long by 4-inch inside diameter (ID) PVC tube (through which sonde can fit)
- 5 to 6-ft long stakes to stabilize the PVC tube.
- Aluminum foil swatch caps for PVC pipe
- Dawn/Liqui-Nox non-phosphate detergent

[7] Appendix E provides a list of suppliers and specifications for these supplies and other field equipment.

- Buckets; Soft brushes and pipe cleaners (for cleaning)
- Heavy-duty disposable absorbent towels, such as WypAll X70 wipers for oil removal
- Trash bags
- Laboratory-grade wipes for delicate membranes, such as Kimwipes
- Replacement sensor brushes and wipers and hex wrench

6.0 Collection of Sonde Data and Water Samples

The protocols described in this section were developed to assist field personnel in collecting water data and samples in the marine near-shore environment during USGS post-landfall sampling efforts in the Gulf of Mexico, and should be used as an addendum to NFM Chapter A4[8]. Chain of Custody requirements will be followed strictly in the collection, processing, transport, handling, and storage of the samples and data collected.

6.1 Objectives and Method Overview

A primary objective of Deepwater Horizon post-landfall sample and data collection focuses on a comparison of the physical and chemical properties of a single set of grab samples collected at the same sites and sampling locations that were sampled for characterizing pre-landfall conditions. It is a primary goal of this sampling effort that the post-landfall water samples accurately represent ambient "normal conditions;" i.e., water properties at the given sampling location at the time of sample collection. To achieve this goal it is important that the data assembled during post-landfall sampling are collected using methods and protocols consistent with those used during the pre-landfall sampling, to the degree possible as appropriate for site conditions. However, field teams will exercise professional judgment to determine the most appropriate method for the given field conditions. Owing to the complexity of planned sampling operations, the large variety and types of samples to be collected, and potentially severe conditions that might affect health and safety when working in spill-impacted areas, **a two-person field team is mandatory and a three-person field team is strongly recommended; a third team member is required if a boat is used for access to the sampling site**. Field teams that will sample in locations that require boat access may determine that a four-person team would be needed.

Selection of sampling method depends on site conditions and characteristics at the time of sampling, including the presence, extent, and thickness of floating product. This protocol defines two methods as preferred for collecting water samples under anticipated sampling conditions:

- **Direct-Dip Method:** This method is used to collect samples when no oil is visible on the water surface or when a slight oil sheen is observed that can be easily removed for the duration of collecting field-measurement data and samples for laboratory analysis.
- **Peristaltic-Pump Method:** This method should be selected for sampling under conditions when free product either is observed in the area where samples will be collected or is close

[8] *Collection of Water Samples* (USGS *National Field Manual for the Collection of Water-Quality Data*, revised 2006).

enough so that it could intrude into the sampling location during field measurements and sample collection.

An alternative to the peristaltic-pump method, the disposable-bailer method, is provided in an addendum to this section. Field teams might elect to use the bailer method if it better fits the logistical and field conditions encountered.

6.2 Equipment and Supplies

Cross-contamination problems are to be eliminated or minimized in this project by using dedicated, disposable sampling equipment to the greatest extent possible. The sampling methods described require different sets of equipment. Selection of the sampling device should be based on the analyses to be performed and be certified through collection of equipment blanks to ensure that its use will not introduce to the sample the analytes for which the sample is being collected. First-use disposable equipment and non-disposable (reusable) equipment also will be quality-controlled and cleaned or decontaminated (as appropriate to the equipment type) in accordance with the protocols and procedures outlined in this protocol. A listing of the equipment and supplies needed for collection of Gulf of Mexico water samples can be found in Table 1 and in Appendix B.

Contrary to standard procedure, hydrochloric acid (HCl) will not be added to the volatile organic compounds (VOC) sample in the field for this project; VOC samples will be stored on ice and shipped to the laboratory (TAL) overnight on the day of collection to ensure that the 7-day maximum holding time for unacidified VOC samples is met. Adding acid to seawater samples having high carbonate concentrations can result in either an immediate or delayed effervescent reaction, potentially compromising the representativeness of the VOC analysis.

Table 1. Containers and Supplies Specific to Water-Column Sampling

[mL, milliliter; HNO_3, nitric acid; CIN, laboratory's analytical identification number; TAL, TestAmerica Laboratory; H_2SO_4, sulfuric acid; oz, ounce; HCl, hydrochloric acid; VOA, volatile organic analysis; BTEX, benzene toluene ethylbenzene xylenes; L, liter; TPH GRO, total petroleum hydrocarbons – gasoline-range organics; DRO/ORO, diesel-range organics; SVOC TCL, semivolatile organic compounds target compound list; PAH, polycyclic aromatic hydrocarbon; NWQL, National Water Quality Laboratory; DOC, dissolved organic carbon]

A. Containers Specific to Water-Column Sampling		
Sample Container Chemical Preservative	**Laboratory Analysis**	**Source**
1 x 250 mL wide-mouth poly. Contains HNO_3,	TestAmerica, Pensacola FL (TAL) Total metals[9] - CIN 50017 (Method 6020)	TAL
1 x 250 mL wide-mouth poly, brown. Contains H_2SO_4	TestAmerica, Pensacola FL Total Kjeldahl Nitrogen - CIN 50068 (TKN, Method 351.2) Total Phosphorus – CIN 50092 (TP, Method 365.4))	TAL
1 x 32 oz, fired glass, wide-mouth. Contains HCl	TestAmerica, Pensacola FL Oil and Grease - CIN 50136 (Method 1664A)	TAL
2 x VOA, 40 mL, no preservative	TestAmerica, Pensacola FL VOC, BTEX - CIN 50109 (Method 8260B)	TAL
2 x VOA, 40 mL, no preservative	TestAmerica, Pensacola FL TPH GRO - CIN 50114 (Method 8015B)	TAL
2 x 1L, fired, amber glass, no preservative	TestAmerica, Pensacola FL TPH DRO - CIN 50130 (Method 8015B)	TAL
2 x 1L, fired, amber glass, no preservative	TestAmerica, Pensacola FL SVOC TCL, PAH - CIN 50117 (Method 8270D)	TAL
1 x 1L poly bottle, acid-rinsed at NWQL	Sampling bottle for collection of samples for trace metals and nutrients into pre-preserved TAL containers	One Stop
2 x 1L Teflon bottle	E. Furlong, NWQL, Denver CO Surfactant	NWQL, precleaned
1x 125 mL, fired amber glass, DOC	G. Aiken, USGS, Boulder CO Dissolved Organic Carbon, field filtered	One Stop
1 x 500 mL, fired amber glass	Sampling bottle to collect whole water to be filtered for DOC	One Stop
1x 1 L, fired glass. certified	Eganhouse, USGS, Reston VA Isomeric Fingerprint	NWQL, I-Chem or equivalent
Add the extra sample containers needed when the work schedule calls for collection of quality-control samples.		

[9] Analyses include: Sb, As, Ba, Cd, Cr, Co, Cu, Pb, Mn, Mo, Ni, Se, Ag, Tl, Zn

B. **Supplies Specific to Water-Column Sampling**		
Equipment	**Description**	**Use**
Floatation device; backpack, coolers	Inner tube into which coolers can be inserted or backpack or field-determined alternative.	Transport bottles to shore
Filter	Pall AquaPrep.	DOC
Disposable absorbent towels	Kimwipes or WypAll X70 cloths.	Oil removal from water surface and equipment
Peristaltic pump and pump tubing	Dedicated, disposable precleaned, precut 8-ft lengths of C-Flex tubing.	Sampling method and DOC sample filtration
Bailers (optional)	1.5- inch diameter, Teflon, pressurizable, disposable.	Sampling method
PVC tube	4-inch diameter, from 1.5 ft to 5 ft in length.	Sampling method
Tape measure	1/100s of a ft graduated.	Water column
Survey markers	Stakes, flags, or buoys and anchors.	Stake out location
Multiparameter sonde	pH, luminescent DO, SC/salinity, temperature sensors.	Field measurements
Gloves	Rubber-coated outer gloves, elbow length (minimum two pair per sampler) – non-disposable. Nitrile inner gloves, (minimum five pair per sampler per site) – disposable.	Water sampling PPE
Adhesive Tape	Teflon, Duct, Electrical.	Seal sample caps
pH test strips	pH test strips.	Ck. pH of treated Oil and Grease samples
HCl ampoules	6 *N* HCl ampoules. (*N*, Normal)	Oil and Grease sample preservation
PPE	See Section 3, "Safety."	Personal safety

GENERAL USE	
• PID vapor analyzer • 2-lb sledge hammer • 4-ft (or longer) wooden (disposable) or metal stakes (one per site if disposable) • Stainless steel O-clamp(s) • Deionized water in spray bottle	• Ziploc bags 4-mil gauge • Industrial-strength rubber bands • ASR-COC and Field forms (Appendix F) • Wet Ice and Dry Ice • Trash bags to contain ice.

6.3 Sampling Location

Water samples will be collected in near-shore waters of the Gulf Coast and its barrier islands, wetlands, and marshes. Sampling and site conditions of the Gulf Coast vary widely; however, the general criteria that influence the selection of the specific sampling location at a site for this investigation include:

- The sampling location should be the same as, or close to, a pre-landfall sampling location, (Appendix A), unless samples will be collected to meet a different objective.
- The location is representative of observable physical and chemical conditions at the site. To this end, samples will be collected that represent "normal" surf and suspended sediment conditions at the time of sampling.
- Samples will be collected in wadeable water deep enough so as to minimize stirring up bed sediments, i.e. from about 2 to 3 feet deep. In areas with deep, mucky marsh sediments samples might have to be collected from a boat.
- Samples should be collected at mid-depth at 15 cm (0.5 ft) or more above the seabed to avoid entraining sediments.
- Samples should be collected at 15 cm (0.5 ft) below an oil layer in a manner that avoids collection or incorporation of free product in the sample.
- Sampling locations at barrier islands will be accessed by boat, but samples generally should not be collected from the boat unless necessary to maintain sample integrity.

6.4 Step-By-Step Procedures

Step-by-step procedures are given according to the sonde-deployment and sample-collection method determined by the field team as most appropriate for the onsite conditions observed (fig. 4). Field teams will customize the procedures described below as best meets their need; however, each team should record the procedure used in the logbook and, to the extent possible, use the same procedure for each of their sampling sites. **Field personnel will follow standard USGS (NFM) protocols for checking, preserving, handling, and in general maintaining sample integrity, unless otherwise stipulated in this sampling protocol.** All samples will be kept chilled or frozen (according to laboratory instructions, but not to exceed 4ºC (40ºF)) upon collection and during transport. All samples will be packaged and shipped for priority overnight delivery, and in compliance with strict Chain-Of-Custody (COC) dictates.

The protocol for determining representative measurements of temperature, pH, conductance/salinity, and dissolved oxygen (DO) is the same as is described in the Field Manual (NFM), Chapter 6, with the caveat that the DO reading in Gulf water should be checked, sporadically, against the results of a Winkler titration. Table 2 is adapted from a similar table in the NFM that provides the stabilization criteria for recording these field measurements. In addition to the field measurements that will be recorded as representative of the water column for a given site, readings will be recorded at points in the water-column profile to document the occurrence of stratification, as described in the procedures below.

Table 2. Stabilization Criteria for Field Measurements

In situ field measurement	Stablization criterion[1]
Temperature (Thermistor thermometer)	± 0.2°C (degrees Celsius)
Specific Electrical Conductance > 100 µS/cm (microsiemens per centimeter)	± 3 percent of five or more measurements
Salinity (Conductivity sensor)	Greater of: ± 1 percent of reading or 0.1 ppt (parts per thousand)
pH	± 0.2 pH unit
Dissolved oxygen (DO) (Luminescent optical sensors)	± 0.2 mg/L (milligrams per liter)

[1] The variability of the measurement should be within the criterion value shown for five or more measurements

6.4.1 Preparation and Order of Sample Collection

1. Don Tyvek apparel.
2. Prepare water bucket for post-use of the multiparameter sonde (Section 5.0), waste containers, and Kimwipes or absorbent cloths (absorbents) for oil skimming (if needed).
3. Assemble field-measurement and sampling equipment according to the method selected, either by Direct Dip or Peristaltic Pump.
4. Complete labels on all bottles with indelible (not fume-producing) ink (time, date, and sample name) and tape labels to bottles with wide clear tape (2-inch width). Appendix D Table 1 describes the sample containers, preservatives, holding times, and laboratory requirements for each aliquot.
5. Pack sample bottles and sampling equipment in a floating cooler, back pack, or other floatation device. The floating cooler, backpack, or other floatation device should be deployed inside a disposable drum liner.
6. Don PFDs, three layers of inner nitrile gloves (or as determined by field team), outer rubber-coated elbow (or full-arm)-length gloves, and other PPE as appropriate.
7. Record and characterize the presence of free-product, such as oil sheen, extent of floating product, and estimated diameter(s) and distribution of oil "pancakes."
   a. Determine the sonde-deployment method to be used: (1) Direct Dip, (2) Plastic Bag, or (3) PVC tube.
   b. Determine the sampling method to be used: (1) Direct Dip or (2) Peristaltic Pump (alternatively, Disposable Bailer).

8. Prepare the sonde before starting measurements according to the instructions given in Section 5.0.
9. Two-person team in proper PPE, including rubber outer and inner gloves, and supplies: Wade to the sampling location with a team of two samplers
    - As a rule of thumb, collect samples consistently with respect to wave or current direction; i.e., with ebb or flow, and record procedure used.
    - When sampling in marshes or heavily oiled, deep mud, or slick locations the safety of personnel must take priority, possibly necessitating sample collection from the boat instead of wading. Take the precautions needed to avoid becoming immobilized in deep mud. Avoid unnecessary movement to avoid suspending fine sediment.
10. Collect organic vapor readings with a PID, in the breathing zone and 6-inches above the water surface at the sampling location. Record readings on field forms or project logbook.
11. Record GPS location in the field logbook and on the field forms.
12. Measure and record to the nearest tenth of a foot the wave height and depth of the water column using the measuring tape. If possible, depth should be from 2 to 3 feet.
13. **Order of sample collection:**
    a. Field measurements: PID, oil thickness, and in situ water-quality properties
    b. Volatile Organic Compounds (VOCs collected in VOA (volatile organic analysis) vials)
    c. Total Petroleum Hydrocarbon compounds – Gasoline Range (TPH-GRO)
    d. Total Petroleum Hydrocarbon compounds – Diesel Range (TPH-DRO)
    e. Semivolatile (SVOC) and PAH organic compounds
    f. Isomeric fingerprinting
    g. Surfactants
    h. Trace metals/elements
    i. Nutrients
    j. Dissolved Organic Carbon
    k. Oil and Grease

6.4.2 Peristaltic-Pump Method

This method is selected because a definite sheen or measurable free-product has been observed.

- For samples to be analyzed at the TestAmerica Laboratory (TAL)in Pensacola, sample bottles for oil and grease, metals/trace elements, and nutrient analyses will be supplied that already contain the chemical preservative needed for the intended analysis.

- A portable peristaltic pump with battery can be transported in a sidepack or backpack to the sampling location by Sampler 1, while Sampler 2 backpacks, shoulder-bags, or otherwise transports the sample bottles.

- The step-by-step procedure that follows describes use of a PVC tube, through which the multiparameter sonde and peristaltic pump tubing are deployed.

- Maintaining the appropriate distance of the PVC tube above seabed may be difficult in soft marsh mud; the method may be modified as needed to maintain sample integrity.

To collect samples using the peristaltic-pump method:

1. **Install the PVC tube:**
   a. Drive a 5 to 6-ft stake 1 to 2 ft or more into the sediment with the sledge hammer.
   b. Cover bottom end of PVC tube with a plastic bag, the end of which has been cut open. Using industrial-strength rubber band, secure the bag to the PVC tube and close the loose end with a rubber band.
   c. Lower the plastic-covered end of the PVC tube through the water surface, but keeping it at least 1.5 ft above seabed and ensuring that product does not get inside the PVC pipe. Strap the tube to the stake using the Velcro straps.
   d. Remove the protective plastic covering from the end of the PVC pipe.
2. **Field Measurements:**
   a. The multiparameter sonde must have been calibrated and prepared per Section 5 of this document and in accordance with USGS standard protocols (NFM Chapter 6.8).
   b. Lower the sonde through the PVC tube to approximately mid-depth of the water column, but at least 1 ft above seabed.
   c. Measure and record depth of sensors below the water surface using a tape measure graduated in 1/10s and 1/100s, to one-tenth of a foot.
   d. Record stabilized measurements for pH, SC/salinity, DO, and temperature (table 2) on field forms. This is the record of in situ measurements for this site.
   e. Check for stratification within the water column by recording measurements at about 0.5 ft above and below the "mid-depth" site measurement, if possible. Be sure to stay at least 0.5 ft above seabed to avoid sediment suspension.
   f. Remove the sonde from the PVC pipe and store it in clean potable water, until the appropriate decontamination process can be completed (see Section 5).
3. **Prepare to collect samples** (do not field-rinse sample containers):
   a. *Sampler 2:* Remove the protective wrap from the intake end of the disposable, precleaned pump tubing and lower tubing through the PVC tube to the desired depth of sample collection.
   b. *Sampler 1*: Adjust and secure the location of the tubing intake end. Wipe down and remove rubber-coated elbow- or arm-length gloves and discard wipe and store gloves in their respective, dedicated waste and soiled equipment containers.
   c. *Sampler 2*: Wearing nitrile gloves, turn on the pump; adjust to a slow but steady rate of flow. Circulate water for a 3-volume tubing field rinse.
4. **Collect VOC and TPH-GRO samples** (TAL)
   For VOC – collect 2 VOA vials. For TPH-GRO – collect 2 VOA vials.
   a. *Sampler 1*: Uncap the first VOA vial and hold it for *Sampler 2*.
   b. *Sampler 2:* Fill VOA vial and cap to over-flowing, leaving a meniscus in both.

c. *Sampler 1*: Pour water from cap into VOA vial while capping the vial, to prevent bubbles from forming. Cap VOA vial, and check for bubbles (invert and tap vial). If bubbles are observed, uncap vial and repeat steps *4b* and *c* until no bubbles are observed.
d. *Sampler 1 and 2*: Repeat steps *4 a – c*, until the 4 VOA vials have been collected successfully.
e. *Sampler 2*: Clean and dry each vial, ensure cap is on securely, wrap or place vials in foam or bubble sleeves, place in doubled Ziploc bags, and store on ice in the appropriate cooler (vial caps should be sealed using Teflon tape when back on shore).

5. **Collect TPH-DRO, SVOC, PAH, and Isomeric Fingerprint samples.** Collect samples, adapting the *Sampler 1 – Sampler 2* technique**,** but leaving at least 1 inch of headspace:
   a. 1 x 1-L baked glass amber for TPH-DRO (TAL)
   b. 2 x 1-L baked glass for SVOC and PAH (TAL)
   c. 1-L certified glass for Isomeric Fingerprint (Eganhouse)
6. *Sampler 2*: Dry off each container, check labels, ensure cap is securely tightened, place glass containers in foam or bubble sleeves, place each sample container in doubled Ziploc bags, and store on ice in the appropriate cooler.
7. **Collect Surfactant samples.**
   a. 2 x 1-L Teflon for Surfactant (Furlong – NWQL)
   b. Using the same *Sampler 1 – Sampler 2* technique, fill the first Teflon bottle to two-thirds of capacity to allow for expansion when frozen. Cap it securely and repeat this procedure with the second Teflon bottle.
   c. *Sampler 2:* Dry each bottle, ensure cap is securely tightened, place into foam sleeve and then into doubled Ziploc bags. Store on dry ice or in wet ice until samples can be frozen and placed into the appropriate cooler.
8. **Collect Total Metals/Trace Element and Total Nutrient samples**. Fill sample containers, adapting the *Sampler 1 – Sampler 2* technique**,** but leaving at least one-half inch of headspace and taking care to prevent loss of the preservative:
      a. 250-mL pre-preserved poly for Total Metals/Trace Elements (TAL)
      b. 250-mL brown poly for Total Nutrients (TAL)
9. *Sampler 2*: Dry off each container, check labels, and ensure that cap is securely tightened. Invert each bottle at least three times to distribute the preservative. Place each sample container in doubled Ziploc bags and store on ice in the appropriate cooler.
10. **Collect the DOC sample** (Aiken)**.**
    a. *Sampler 1*: Don clean gloves. Unwrap the AquaPrep filter and secure it onto the pump tubing.
    b. *Sampler 2*: Uncap and hand the 125-mL baked glass for DOC to *Sampler 1*.
    c. *Sampler 1:* Pass about 50 ml water through the filter and then fill the DOC bottle to the shoulder. Cap the filtered sample and hand it to *Sampler 2*.
    d. *Sampler 2:* Dry off the bottle, check label, ensure cap is securely tightened, place into foam sleeve, then into doubled Ziploc bags, and store on ice in the appropriate cooler.

e. *Sampler 1:* Turn off the pump and discard tubing and used filter into a dedicated waste receptacle.

11. **Collect the Oil and Grease (O&G) sample by Direct Dip Method** (TAL)
    a. *Sampler 1 and 2*: Don long rubber gloves over nitrile gloves.
    b. *Sampler 2*: uncap and hand a 1-L HCl-preserved Oil and Grease sample container to *Sampler 1*.
    c. *Sampler 1:* Skim or scoop sample from the water surface into the HCl-preserved container carefully, capturing surface oil but taking care not to lose the HCl preservative (if possible), and leaving about 1-inch of headspace. Hand container to *Sampler 2.*
    d. *Sampler 2:* Recap and wipe the container clean to remove oily product. Check that the lid is secured tightly and that the container is marked with the type of preservative to ensure proper labeling. Invert 3 times to mix. Place into bubble or foam sleeve and then into doubled ziplock bags. Store on ice,
    e. *Sampler 1, 2, or 3:* Once on shore, if you suspect that preservative was lost, check the sample pH by decanting a small amount of sample, check pH with a pH strip; if pH is greater than 2, add contents of a HCl ampoule (2 mL 6*N* HCl) and record this information in the logbook. Rewrap the O&G container, tape the lid, and place on ice.
12. *Sampler 2*: Remove stake and PVC tube and return to decontamination area. A wooden stake can be discarded as solid hazardous waste; the PVC tube either is similarly discarded or contained for decontamination.
13. *Sampler 1:* Secure all samples, returning to shore. Decontaminate sample coolers and the equipment used to bring the samples to shore.
14. *Samplers 1, 2, and/or 3:* Ensure that lids are appropriately taped and containers are properly labeled and protected in foam or bubble sleeves. Pack bottles in appropriate shipping coolers, in dry ice or wet ice, as instructed by the laboratory, and ship priority for overnight or following day delivery to the respective laboratories.

6.4.3 Direct Dip Method

The direct dip method consists of collecting water samples directly into the pre-cleaned sampling containers at a pre-determined depth below the water surface (Natural Resource Damage Assessment and Restoration Program (NRDA), 2010). Procedures for measuring in situ water properties and collecting samples are given below. In the sampling scenario, Sampler 1 will collect the water samples. Sampler 2 will manage the sampling container before and after the sample is collected.

The following description of the general procedure to be used is a departure from NFM methods – please read carefully:

- For samples to be analyzed at the TestAmerica Laboratory (TAL) in Pensacola, sample bottles for oil and grease, metals/trace elements, and nutrient analyses will be supplied that already contain the chemical preservative needed for the intended analysis.

- Samples for metals/trace element and nutrient analyses will not be collected directly into TAL-provided preservative-containing sample bottle ("preserved containers"). Instead, a field-team pre-cleaned 1-L poly RA ("raw acidified") bottle will be used as the sampling device. Water is poured from the RA bottle into the appropriate TAL- supplied and preservative-containing sample bottle ("preserved" or "prepreserved" containers). This eliminates the need for field personnel to acidify the metals and nutrient samples.

1. **Field Measurements:** Prepare to use the Direct-Dip Method or Plastic-Bag Method, according to professional judgment
   a. The sonde must have been calibrated and prepared per Section 4 of this document and in accordance with USGS standard protocols (NFM 6.8.)
   b. Lower the water-quality sonde to the sampling depth (follow Plastic-Bag procedures in Section 5.2.2 if this method is to be used before deploying the sonde).
   c. Measure and record depth of sensors below the water surface using a tape measure graduated in 1/10s and 1/100s, to one-tenth of a foot.
   d. Record stabilized measurements for pH, SC/salinity, DO, and temperature on field forms. This is the record of in situ water properties for this site.
   e. Check for stratification within the water column by recording measurements at about 0.5 ft above and below the "mid-depth" site measurement, if possible. Be sure to stay at least 0.5 ft above seabed to avoid sediment suspension.
2. **Prepare to collect water samples** (do not field-rinse sample containers)
   a. *Sampler 1:* With rubber outer and inner gloves on, clear the sampling area of any surface oil by carefully sweeping the area with Kimwipes or sorbent towels, such as WypAll X70 and discard absorbents in dedicated trash bag.
   b. *Sampler 1*: Remove outer gloves and store in reusable storage bag for decontamination.
3. **VOC and TPH-GRO samples** (2 VOA vials per analysis):
   a. *Sampler 2* hands *Sampler 1* capped VOA vials, one at a time.
   b. *Sampler 1*: Submerge first VOA vial to the appropriate depth (between 0.5 ft and 1 ft below the water surface), uncap the vial until full, then recap under water.
   c. *Sampler 1*: remove VOA vial from the water, tip the VOA vial upside down, tap the bottom of the vial, and check for bubbles. If there are bubbles, resubmerge the capped vial, uncap the vial allowing all air to escape; repeat until no bubbles are observed.
   d. *Sampler 1*: Repeat steps *3a* and *b* with next three VOA vials.
   e. *Sampler 1:* Hand each completed VOA vial to *Sampler 2.*
   f. *Sampler 2:* Double check for bubble; if bubble is present, repeat the sampling (steps *b* and *c*) process. Dry each vial with a clean absorbent towel; check to make sure the lids are tight, the sample properly labeled, place in foam or bubble sleeves, double-bag in ziplocks, and store on ice. (Vial caps should be sealed with Teflon tape here or when back on shore).

4. **TPH-DRO, SVOC/PAH samples:**
   a. *Sampler 2* gives *Sampler 1* the 1-L glass amber container for TPH-DRO
   b. *Sampler 1:* Submerge the capped container to the appropriate depth, uncap and fill until full; recap the container and bring to the surface. Hand to Sampler 2.
   c. *Sampler 2*: Hand the capped container to Sampler 1. Dry, place in foam or bubble sleeve, double bag and store on ice.
   d. *Sampler 1*: Repeat steps *4a* through *c* to collect the SVOC and PAH samples:
   e. *Sampler 2* hands *Sampler 1* the 1-L bottle for SVOC/PAH, followed by the second 1-L SVOC/PAH bottle, and repeats steps *a* through *c* for each SVOC/PAH 1-L container.
   f. *Samper 2*: Once on shore, uncap the TPH-DRO and SVOC/PAH containers and decant sample to within about 1 inch of the top to leave room for expansion when chilled. Recap securely, wipe the containers clean and dry, secure the lid with Teflon tape, and check that the container is labeled properly. Replace the containers in bubble or foam sleeve and double-bag the samples. Store on ice.
5. **Isomeric Fingerprint**:
   a. *Sampler 2* hands Sampler 1 an NWQL 1-L lab-certified GCC bottle for Eganhouse lab.
   b. *Sampler 1:* Submerge the capped GCC bottle to the appropriate depth; uncap and fill until almost full leaving about 1-inch of headspace (decant if necessary to leave sufficient headspace to allow for expansion when chilled); recap the container and bring to the surface. Hand to Sampler 2.
   c. *Sampler 2:* Wipe the container clean and dry, check that the lid is tight, make sure the container is marked "GCC" to ensure proper labeling, place in foam or bubble sleeve and store upright on ice in doubled ziplock bags.
   d. *Sampler 1, 2, or 3:* Once on shore, retrieve the GCC bottle, check that the bottle is capped tightly, secure the cap with electrical tape, replace container in bubble or foam sleeve and double-bag the sample. Store the sample upright, on ice, and ship the same day if possible but no later than the next day.
6. **Surfactant sample** (no container field rinse):
   a. *Sampler 2* hands *Sampler 1* the 1-L Teflon bottles for Furlong lab, one at a time.
   b. *Sampler 1:* Submerge the capped Teflon bottle to the appropriate depth, uncap, and fill to two-thirds of capacity to allow expansion when frozen (decant if necessary to leave sufficient headspace). Recap the container and bring to the surface. Hand to Sampler 2.
   c. *Samper 2*: Decant some sample, if necessary. Recap, wipe the container clean and dry, check to make sure the lid is tight and the container is labeled properly, wrap in aluminum foil, and store on ice or dry ice in a protective wrap (App. D, Table 1),
   d. *Sampler 1 and 2*: Repeat steps *6b* and *c* with the second Teflon bottle.
7. **Metals/Trace Elements and Nutrients:**
   a. *Sampler 2* hands *Sampler 1* a NWQL 1-L RA bottle, precleaned and QC'ed at the WSC, for use as a sample-collection device.

b. *Sampler 1:* Submerge the capped RA bottle and uncap, field rinse 3 times, recap. Submerge the capped field-rinsed bottle to the appropriate depth, uncap, and fill to near the top. Recap the container and bring to the surface.
c. *Sampler 2*: Uncap a TAL 250-mL HNO_3-preserved container for metals analysis.
d. *Sampler 1*: Uncap the RA bottle. Carefully decant sample from the RA bottle into the HNO_3-preserved 250-mL container being held by Sampler 2, leaving about 1-inch of headspace. Recap the RA bottle.
e. *Sampler 2*: Cap the HNO_3-preserved 250-mL container, wipe the container clean and dry, check to make sure the lid is tight and the container is labeled properly for HNO_3 preservative, and store on ice in a protective wrap.
f. *Sampler 2*: Uncap a TAL 250-mL H_2SO_4-preserved container for nutrients (TKN and TP) analysis.
g. *Sampler 1*: Uncap the RA bottle. Carefully decant sample from the RA bottle into the H_2SO_4-preserved container being held by Sampler 2, leaving headspace. Discard any remaining sample from the RA bottle.
h. *Sampler 2*: Cap the H_2SO_4-preserved container. Wipe the container clean and dry, check to make sure the lid is tight and the container is labeled properly for H_2SO_4 preservative, and store on ice in a protective wrap.

8. **DOC sample**:
   a. *Sampler 2* hands *Sampler 1* a NWQL-fired 500-mL amber bottle labeled "DOC"
   b. *Sampler 1:* Submerge the capped NWQL bottled to the appropriate depth, uncap and fill until almost full.
   c. *Sampler 2:* Secure AquaPrep filter to the discharge end of the pump tubing. Hand inlet end of tubing to Sampler 1.
   d. *Sampler 1:* Insert pump tubing into 500-mL DOC sampling container, and turn pump on at low pump rate to rinse tubing and filter with about 50 mL of sample water.
   e. *Sampler 2:* Uncap the preserved DOC bottle. After tubing and filter field rinse, hold the discharge end of the filter over the DOC bottle and fill to shoulder. Recap firmly. Wipe the container clean and dry, check that the lid is tight, check that the "DOC" label is intact, and store on ice in a protective wrap,
   f. *Sampler 1:* Shut down the pump and discard extra sample to its source. Remove and discard pump tubing and RA sampling bottle.
9. **Oil and Grease** (no container field rinse):
   a. *Sampler 1 and 2*: Don long rubber gloves over nitrile gloves.
   b. *Sampler 2*: uncap and hand a 1-L HCl-preserved Oil and Grease sample container to *Sampler 1*.
   c. *Sampler 1:* Skim or scoop sample from the water surface into the HCl-preserved container carefully, capturing surface oil but taking care not to lose the HCl preservative (if possible), and leaving about 1-inch of headspace. Hand container to Sampler 2.

d. *Sampler 2:* Recap and wipe the container clean to remove oily product. Check that the lid is secured tightly and that the container is marked with the type of preservative to ensure proper labeling. Invert 3 times to mix. Place into bubble or foam sleeve and then into doubled ziplock bags. Store on ice.
e. *Sampler 1, 2, or 3:* Once on shore, if you suspect that preservative was lost, check the sample pH by decanting a small amount of sample, check pH with a pH strip; if pH > than 2, add a contents of a HCl ampoule (2 mL 6*N* HCl) and record this information in the logbook. Rewrap the O&G container, tape the lid, and place on ice.

10. Float or backpack/shoulder-pack the samples to shore, taking precautions to prevent Gulf water from wetting the samples. (Line cooler or backpack(s) with doubled clear trash bags into which samples are placed as collected; end collection by tying the bags closed).

6.5 Collection of Quality-Control Samples

Quality-control (QC) samples are to be collected by each WSC at one site, one time: the one possible exception is collection of blank VOC samples (see instructions for VOCs below). The QC sample types being collected include blanks, replicates, and matrix spikes for the sample types indicated below (Section 7 provides additional information about quality-control sampling for this project). In general, follow the standard USGS ppb/clean-hands procedures and precautions for collecting QC samples (NFM 4.3), but **note the following caveats**:

- Use a peristaltic-pump method for collecting blanks, including VOC blanks: lengths of Teflon® and other tubing are dedicated to the site and must be thoroughly precleaned per NFM 3, but **must not come in contact with methanol**.
- Use the TAL-supplied sample bottles-with-preservative (prepreserved containers) for metals/trace elements, nutrients, and Oil & Grease, if these are available. If not available, follow USGS routine.
- As soon as possible, and before starting sampling at the first site, collect an equipment blank (tubing blank) for each analysis and ship to lab immediately, requesting quick turn-around. This is a one-time requirement per WSC (unless lab results indicate a problem).
- For this project, it will **NOT** be necessary to collect field blanks in an enclosed chamber. These blanks should be exposed to onsite atmospheric conditions; i.e., they are all ambient blanks (e.g., the length of atmospheric exposure should mimic environmental sampling conditions).
- Ensure that any container or other supply or material that is/has been in contact with methanol is completely sealed and separated from sampling equipment and supplies in the office, during transport, and on-site. Please document how this has been done.
- VOAs for VOC analyses will be collected in duplicate (instead of in triplicate).

Samples will be bottled in accordance with the laboratory requirements. Table D-1 in Appendix D provides the laboratory requirements for these samples.

6.5.1 Blank Samples

Each WSC should process one complete ambient blank for analysis by TestAmerica Laboratory. Select the site at which to collect your one complete set of field blanks. Field blanks should be collected before collecting environmental samples and while at the sampling location, as follows:

1. Check and apply labels – container for each blank analysis requires a unique sample ID; labeled and recorded on the COC using the same procedure as for an environmental sample.
2. Purge peristaltic pump tubing with 3 tubing volumes of freshly-opened, laboratory-certified, Volatile/Pesticide-grade Blank Water (VPBW).
3. Ambient Blank for VOCs -- Check PID measurements. An ambient blank should be collected once per day at field sites where PID measurements exceed a reading of 15 ppmv total VOCs in the sampling zone.
   - **Do not** use prepreserved vials for VOCs.
   - Fill two VOA vials and caps to overflowing with VPBW for VOC analysis.
   - Cap securely, invert, tap, and check for gas bubbles. Check sample and hand bubble-free sample to partner.
   - Partner checks labels, packages sample, and chills samples in the same manner as environmental VOC samples.
   - Ship overnight, on the same day as sample collection.
4. Fill the set of organic-sample containers **except** for DOC. Pass completed set to partner to check caps/labels, wrap, and place on ice in the appropriate cooler.
5. Remove the filter and tubing using clean, colorless bags to keep them clean for later filtration of the environmental sample for DOC analysis.
6. Purge peristaltic pump tubing with 3 tubing volumes of freshly-opened, laboratory-certified, Inorganic-grade Blank Water (IBW).
7. Fill the set of inorganic-sample bottles with IBW, using the TAL prepreserved bottles (if available) in the following order:
   - Nutrients (TKN and total P)
   - Total metals/trace elements
8. Pass inorganic samples to partner to check caps/labels, (add preservative, if needed) wrap, and place on ice in the appropriate cooler.
9. DOC – Rinse the tubing by passing one tubing volume of VPBW to waste. Install the AquaPrep filter and field rinse by passing about 50 mL of VPBW through the filter to waste. Fill an **unpreserved** DOC bottle with VPBW. **Do not** preserve this sample. Pass to partner to check caps/labels, wrap, and place on ice in the cooler for the Aiken laboratory.
10. Ensure that a TAL-provided trip blank and temperature blank is included in every cooler that is shipped to TAL.

6.5.2 Replicate (Duplicate) Samples and Matrix Spikes

Water samples for replicate matrix spikes QC analyses will be collected sequentially, as described below. Sequential replicates (duplicate, triplicate, etc. samples) consist of samples collected separately but close in time and space. Note that not all sample types will be collected for matrix-spike analysis.

1. Assign a unique sample ID to the environmental and the duplicate sample, and the set of two bottles for matrix-spike analysis.
2. Collect the environmental sample first and collect the duplicate sample immediately after; next collect the two additional samples – indicated in the list below – for matrix-spike analysis.
3. Follow identical sample-collection procedures for the duplicate and matrix-spike samples as for the environmental sample, but ensure that the samples are properly labeled and coded for sample type (environmental, duplicate, or matrix spike).:
   - VOC/BTEX (no preservative)
   - TPH (GRO C6-C10) (no preservative) ➔ add matrix-spike samples (MS/MSD)
   - SVOC/PAH (no preservative) ➔ add matrix-spike samples (MS/MSD)
   - Total metals/trace elements
   - Nutrients (TKN and total P)
   - Oil & Grease (pre-preserved bottle) ➔ add matrix-spike samples (MS/MSD)
   - DOC (filtered, no preservative)

6.6 Sample Handling and Storage

Once all samples have been collected:

1. Tape caps and check labels on the sample vials/bottles (containers). Check that cap is secure.
2. Wipe any petroleum or mud off the outsides of the containers and place the full containers into bubble envelopes, double bag, place on ice, protect from ice-melt-water and place in the appropriate shipping coolers.
3. Record collection of sample on multiple ASR forms to manage the chain of custody in individual coolers to the appropriate laboratories (refer to Table D1-AppD). ASR forms should be sealed in doubled ziplock bags and taped to the inside lid of the respective cooler.
4. CHAIN OF CUSTODY: it is necessary to follow the detailed instructions given in Section 7.
   - Remember to record all pertinent data in the project logbook and on the appropriate field form(s) and sign them.
   - Be sure to attach custody seals to the cooler prior to shipment.

6.7 Addendum: Disposable-Bailer Sampling Method

The disposable-bailer method may serve as a suitable alternative to the peristaltic-pump methods, depending on site conditions. It requires repeated deployment of the disposable Teflon

bailer. In the case where the PVC tube has been deployed, 1.5-inch diameter disposable bailers may be used to collect water samples through the PVC instead of using the peristaltic-pump method.

Use bailers with sealable tops (pressurizable type) that allow the bailer to remain closed while being submerged to the depth of sample collection.

After completing field-measurement procedures for conditions with floating product, the bailer is deployed, with Sampler 1 collecting the water samples and Sampler 2 managing the sample containers/bottles before and after the each sample is collected in its appropriate container. Sample containers for organic-compound analyses and bottles that contain preservative are not field rinsed. For this method the RA sample-collection bottle is not necessary, as the sample is discharged directly from the bailer into the HNO_3-preserved container for metals analysis and into the H_2SO_4-preserved container for nutrients analysis.

1. *Sampler 1 and Sampler 2*: Remove outer and inner rubber gloves and collect samples wearing inner nitrile gloves. (Samplers each wear three pairs of inner nitrile gloves.)
2. *Sampler 2*: Remove the disposable bailer from its sealed bag and store the release valve in a safe, clean location for easy access. Sampler 2 puts a clean aluminum foil swatch over the upper pressure port on the bailer and adds a short "leash" with a loop to attach to the wrist of Sampler 1.
3. *Sampler 1*: Submerge the bailer to sampling depth with top pressure port covered, using the aluminum foil "cap" and hand pressure to ensure that only water only from the chosen sampling depth enters the bailer. At the chosen depth, open the pressure port to allow water to enter the bailer.
4. *Sampler 1*: Raise the bailer out of the water and present the lower water inlet/outlet port to Sampler 2, while keeping the upper pressure port sealed.
5. *Sampler 2:*
    a. Prepare to collect two VOC and two TPH-GRO samples. Attach or insert VOA sampling attachment to bailer outlet port (Sampler 1: keep upper pressure port sealed.
    b. *Sampler 2*: Uncap first VOA vial and place under outlet port.
    c. *Sampler 1:* Open pressure port to fill VOA vial and cap to overflowing, leaving each with a meniscus.
    d. *Sampler 2*: Empty water from cap into VOA vial while capping the vial, to prevent bubbles from forming. Cap VOA vial, and check for bubbles (invert and tap vial). If bubbles are observed, Sampler 2 will uncap vial, collect additional water from bailer in cap, and repeat step *5d* until no bubbles are observed.
    e. *Sampler 1 and 2*: Repeat steps *5a – d* until the 4 vials for VOC and TPH-GRO analyses have been collected successfully.
    f. *Sampler 2*: Clean and dry each container, ensure cap is on securely, place in foam or bubble sleeves, place in doubled Ziploc bags, and store on ice in the appropriate cooler.

Seal caps with Teflon tape when on shore and replace vials into protective sleeves, ziplock bags, and ice.

6. *Sampler 1*: Repeat steps 3 and 4 as needed for continuing to Step 7.
7. *Sampler 2*: Uncap, place under outlet port, and fill (leave headspace) and cap the following bottles to within 1 inch of the top while *Sampler 1* opens the pressure port:
   a. 2 x 1-L baked amber glass for TPH-DRO
   b. 2 x 1-L baked glass for SVOC and PAH
   c. 1-L certified glass for Isomeric Fingerprint (Eganhouse)
8. *Sampler 2*: Clean and dry each container, ensure cap is on securely, wrap in bubble or foam sleeve, place in doubled Ziploc bags, and store on ice in the appropriate cooler.
9. *Sampler 1:* Hand *Sampler 2* the first of two 1-L Teflon bottles for the Surfactant sample (Furlong – NWQL).
   a. *Sampler 2:* Uncap and place under outlet port while *Sampler 1* opens the pressure port.
   b. Fill the bottle to two-thirds of capacity to leave room for expansion of the sample when frozen. Recap the bottle securely, place in foam or bubble sleeve and place on ice.
   c. *Sampler 1 and 2*, repeat steps *a* and *b* with second Teflon bottle.
10. *Sampler 1*: Hand *Sampler 2* the 250-mL HNO3-preserved poly for Total Metals/Trace Elements (TAL)
   a. *Sampler 2*: Uncap, place under outlet port,
   b. *Sampler 1*: Open the pressure port. Fill container carefully, leaving headspace and avoiding loss of preservative. Recap and hand to Sampler 2.
   c. *Sampler 2*: Dry the container, check that container is labeled to indicate HNO_3 preservative and check that cap is securely tightened. Invert 3 times to mix, place into doubled ziplock bags and store on ice.
11. *Sampler 1:* Hand *Sampler 2* the 250-mL H_2SO_4 -preserved poly container for Nutrients (TAL). *Sampler 1 and 2* follow the same procedures as described in Step 10.
12. *Samplers 1 and 2:* Prepare to collect the 125-mL baked glass DOC sample by installing the AquaPrep filter onto the bailer outlet. Field-rinse the filter (but not the bottle) by passing about 50 mL of sample through the filter. Then, fill the DOC bottle to the shoulder with sample filtrate, cap securely, place bottle into bubble or foam sleeve and then into doubled ziplock bags, and store on ice.
13. Remove and discard bailer in dedicated waste receptacle.
14. **Oil and Grease is collected by Direct Dip** (no container field rinse):
   a. *Sampler 1 and 2*: Don long rubber gloves over nitrile gloves.
   b. *Sampler 2*: uncap and hand a 1-L HCl-preserved Oil and Grease sample container to *Sampler 1*.

c. *Sampler 1:* Skim or scoop sample from the water surface into the HCl-preserved container carefully, capturing surface oil but taking care not to lose the HCl preservative (if possible), and leaving about 1-inch of headspace. Hand container to *Sampler 2*.
d. *Sampler 2:* Recap and wipe the container clean to remove oily product. Check that the lid is secured tightly and that the container is marked with the type of preservative to ensure proper labeling. Invert 3 times to mix. Place into bubble or foam sleeve and then into doubled ziplock bags. Store on ice,
e. *Sampler 1, 2, or 3:* Once on shore, if you suspect that preservative was lost, check the sample pH — decant a small amount of sample, check pH with a pH strip; if pH is greater than 2, add a vial of 6 *N* HCl and record this information in the logbook. Rewrap the O&G container, tape the lid, and place on ice.

14. Remove the wooden (or metal) stake and PVC tube and return to decontamination area. Discard the stake and PVC tube into appropriate receptacles for hazardous waste.
15. Secure all samples, returning to shore. Decontaminate sample coolers and equipment to bring the samples to shore.
16. Pack bottles in appropriate shipping coolers, in dry ice or wet ice, as instructed by the laboratory, and ship for priority overnight delivery to the respective laboratories.

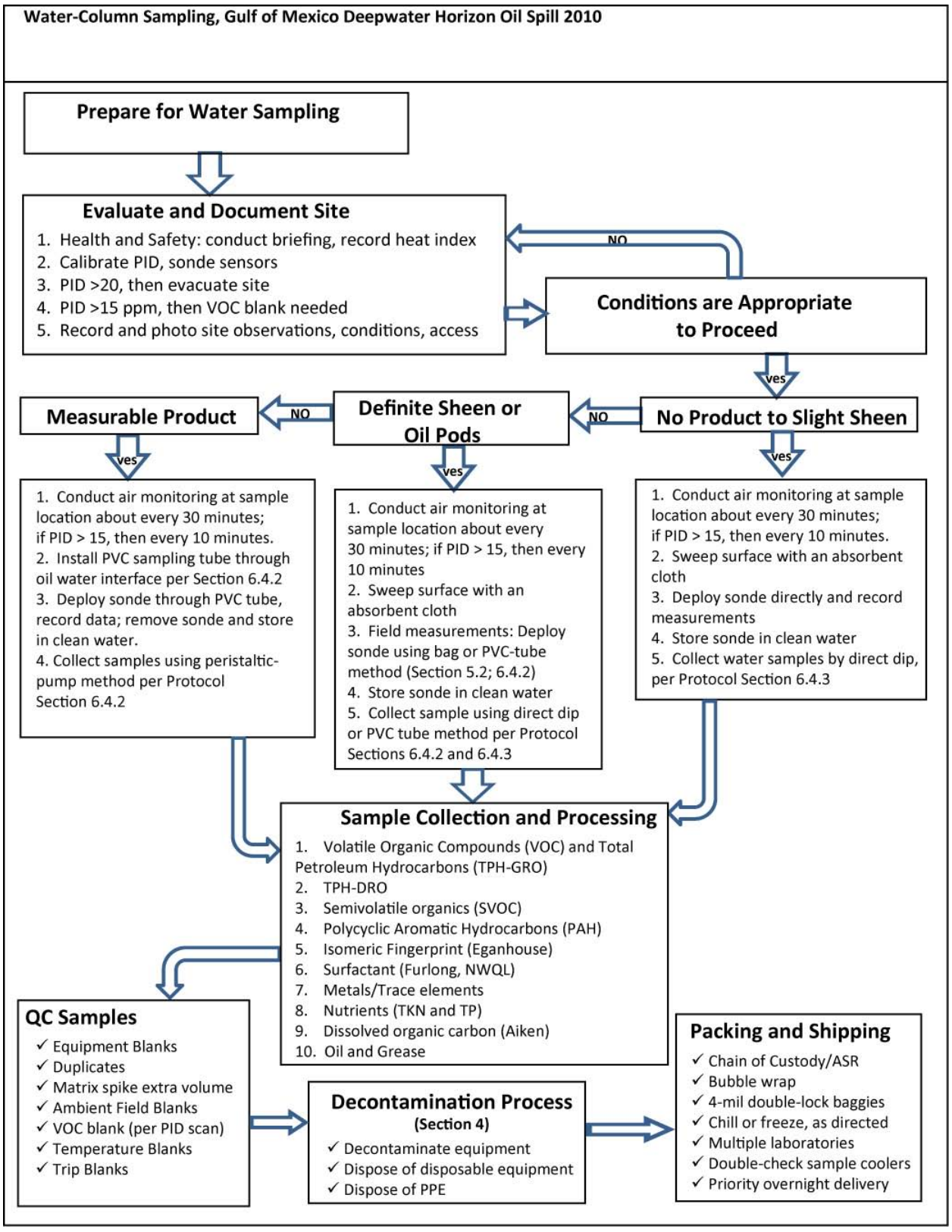

Figure 4. Water-column Sampling, Gulf of Mexico Deepwater Horizon Oil Spill, 2010.

7.0 Sediment Samples

Standard and project-specific procedures are described in this section that will be used for collecting samples of sediment or other solids in an oil-impacted marine shoreline environment. These procedures are intended for use as an addendum to the standard USGS protocols described in NFM Chapter A8.

Analyses of the sediments to be collected will be used to evaluate chemical and biological changes that occurred in a bulk sample, compared to the sediment samples collected at the same location before on-shore arrival of crude product from failure of the Deepwater Horizon well. The sediment is to be analyzed for metal and trace elements; organic compounds such as PAH, TPH, SVOC, and Oil and Grease; benthic invertebrates; microorganisms such as hydrocarbon-degrading microorganisms, and will undergo "fingerprinting" analyses to determine the unique characteristics of non-ambient organic and inorganic components. Chain of Custody (COC) requirements will be followed strictly in the collection, processing, transport, handling, and storage of these samples.

7.1 Method Overview and Considerations

For the purpose of this study, wet sediment samples will be collected from a 3.28 ft^2 (1 $meter^2$) area at the land/water interface (swash zone) on beaches and from bottom materials of streams that dissect wetland or marsh areas. Swash-zone sediments are to be collected from the surface to a depth of from 4 to 6 inches, and either cored or homogenized and in accordance with best scientific practices. Submerged wetland or marsh sediments will be collected from the bed surface to a depth of about 4 inches and homogenized. Similar collection and homogenization procedures will be employed as those used to collect pre-landfall sediments or as directed by specific analytical or laboratory requirements. Tar balls also will be collected for analysis of weathered characteristics. Samples will be collected at the same locations at which the pre-landfall samples were collected, determined by GPS coordinates.

Various types of sediment deposits that are characteristic of a given sampling location can greatly influence analytical results. For example, contaminants are more likely to be concentrated in sediments typified by fine particle size and high organic content. This type of deposit is more typical of marsh or wetland areas, in contrast to typically coarser sediments found on beaches and in other erosional zones. Since the particle size and organic content of the sediments are related directly to water velocity and flow characteristics of a body of water, a description of the sedimentary deposits observed at the sampling site should be described in the project logbook with respect to relative particle size; sorting; and native, apparent oil-spill related, anthropogenic, or undifferentiated organic-matter content. Differences in sediment types result in different interferences and matrix effects on the laboratory analysis; therefore, collection of an additional volume of sediment samples that represent end-member sediment types for matrix spike analysis is recommended.

7.2 Equipment and Supplies

Sample integrity is dependent on proper selection and use of sampling equipment, laboratory containers, preservatives, and decontamination of any material that makes contact with the collected sample**.** All equipment and supplies for sample collection and handling shall meet the specifications of the required analysis, and are listed in Appendix B (and at the end of this section). **The intent of this standard operation procedure is to use certifiable pre-cleaned sampling or single-use disposable equipment at each sampling site; for this reason equipment rinsate blanks will not be part of the QC protocol for this project.** Reagents will be required for cleaning of reused equipment. Decontamination solutions (Appendix B) and the proper disposal of these and other chemical reagents and solid wastes are specified at the end of Section 4.0, which discussed sampling equipment decontamination.

7.3 Preparation, General Process, and Order of Sample Collection

A key objective in collecting post-landfall sediment samples will be to examine the analytical results for chemical and biological characteristics compared with those of the pre-landfall samples. Therefore, samples should be collected from an area at which oil is present, in addition to being at or near the pre-landfall location of sampling.

The extent of oil penetration into the beach sands or marsh sediments also should be documented. If the field site is heavily oiled, field personnel should collect a 6 to 12-inch core using a transparent polycarbonate tube to capture a depth profile, describe and measure any pattern of oil infiltration, and photograph the core; alternatively they might dig a trench to expose a profile and document observations in the logbook and with photographs.

7.3.1 Preparation

Sediment sampling occurs after water samples have been collected and packed. The third team member can begin and facilitate sediment-sampling preparations.

1. Plan sampling with consideration of weather and tidal conditions, if possible. The variability of tidal range may affect the viability of sample locations at mid to high tides. In addition, sediments in the land/water interface may differ substantially at different stages of tide. If possible, sample collection should be conducted at comparable tidal stages as that for the same location during the pre-impact effort.
2. Perform a general site survey prior to site entry, in accordance with the HASP.
3. Prepare dedicated sets of equipment for each site and as required per analysis (see Appendix-D table 2 for sediment sampling).
    - Pre-cleaned or pre-certified clean sample containers

- Pre-cleaned and quality-assured Teflon bags (these will have been first quality-controlled by collecting and analyzing blank-water samples of the appropriate grade for a full suite of the same organic and inorganic constituents for which samples will be analyzed to ensure that they are not a source of free organic or inorganic analytes of interest)
- Sterile coring devices, Teflon scoops, spoons, spatulas, purchased as certified sterile and clean of target analytes or cleaned and autoclaved in the laboratory and wrapped for clean transport prior to use.
- Scoops/spades/spoons/spatulas either are disposable or will be sheathed for use in Teflon bags that are disposed after use. Reusable equipment will be cleaned of surface contamination in the Contamination Reduction Zone (CRZ), stored in ziplock bags for transport to the office laboratory where they will be cleaned using the chemical agents appropriate for the equipment type and degree of contamination, per routine USGS decontamination protocols. Rinsate blanks will be collected periodically to verify the efficacy of the cleaning procedure.
- Pre-cleaned, Teflon-lined, 2-gallon bucket to composite a bulk sediment sample.

4. Install stakes or flags to identify and mark boundary of the sampling location. If necessary, the proposed sampling location may be adjusted based on site access, property boundaries, and surface obstructions.
   a. Record GPS data for the sampling locations (sample markers are temporary).
   b. Document specific site and sediment characteristics, including the extent and description of any observed contaminant.
   c. Photograph the location and a depth profile at which samples are collected, before and after collection: take the pictures facing north, south, east, and west, close-ups, and a view looking directly downward. Photos should be date-and-time stamped, and labeled with site ID.

7.3.2 General Process

Sampling requirements for each type of sample analysis are shown on Figure 5 and in Appendix D, Table 2, in addition to being described in greater detail in the sections that follow. For sediment sampling, in general:

- With the exception of the sample for analysis of benthic invertebrates and tar balls, a bulk sample will be collected from a 3.28 ft^2 (1 $meter^2$) area and homogenized in a 2-gallon Teflon-lined bucket, from which the rest of the sediment will be subsampled.
- Before collecting sediment into the Teflon-lined bucket:
  - Wearing nitrile gloves, remove product (liquid or mousse) from the beach surface by blotting it up with an absorbent cloth to expose sand. Change gloves.
  - Remove large rocks, sticks, shells, and tar balls (greater than 2 mm).Change gloves.
- Using the Teflon scoop (recommended), work systematically to collect the top 4 to 6 inches of wet sediment so as that the bulk sample represents the 3.28 ft^2 (1 $meter^2$) sampling area

until the bucket is about three-quarters full, mixing periodically to homogenize the sample. (The tool selected depends on the type and condition of the sediment at the sampling location; a Teflon sample bottle that has been modified as a scoop seems especially useful for collecting marsh sediments).

- When closing sample jars, make sure the container threads and lid are free of any sediment before sealing the container to avoid possible leaks and loss of sample.
- After collecting each sample, use a Kimwipe or cloth to clean off the outside of the container, tape the lid as instructed below, place container into foam or bubble sleeve and into doubled ziplock bags.
- Store all samples on dry or wet ice, as directed, immediately.
- Follow COC instructions to the letter (refer to Section 8).

7.3.3 Order of Sample Collection and Containerization

1. **Tar balls** – 125 or 250 mL certified glass jar – Chill (Rosenbauer)
2. **Benthic invertebrates** (Demopoulous) – 3 x 500 mL polypropylene jars – Preserve with 10-percent formalin supersaturated with sodium borate – Chill
3. Collect bulk sample for:
   a. **Microoganisms** (Lisle) – 400-mL double Whirl-Pak—Freeze
   b. **Toxicity** (Carr/Biedenbach) – 2 x 1-L wide-mouth glass jar – Chill, do not freeze
   c. **Oil Fingerprint** (Rosenbauer) – 2 x 500-mL wide-mouth jar, fired – Freeze
   d. **Isomeric Fingerprint** (Eganhouse) – 8-oz wide-mouth jar – Freeze
   e. **Metals/Trace Elements and Nutrients** (Horowitz) – 1 kg beach sand; 500 g fine-grained sediments, in (1 or 2) 500-mL double Whirl-Paks – Chill, do not freeze
   f. Samples for TestAmerica Laboratory (TAL) analysis – use TAL sample containers:
      - **SVOC TCL** – 8 oz wide-mouth jar – Chill
      - **PAH/Alkylated PAH**– 4 oz wide-mouth jar – Chill
      - **Oil and Grease/SVOC/percent moisture –** 8 oz wide-mouth clear glass – Chill.

NOTE: To protect samples from ice-melt-water while being transported to the office, shipper, or laboratory, seal the ice in doubled bags and place each sample into a doubled ziplock bag.

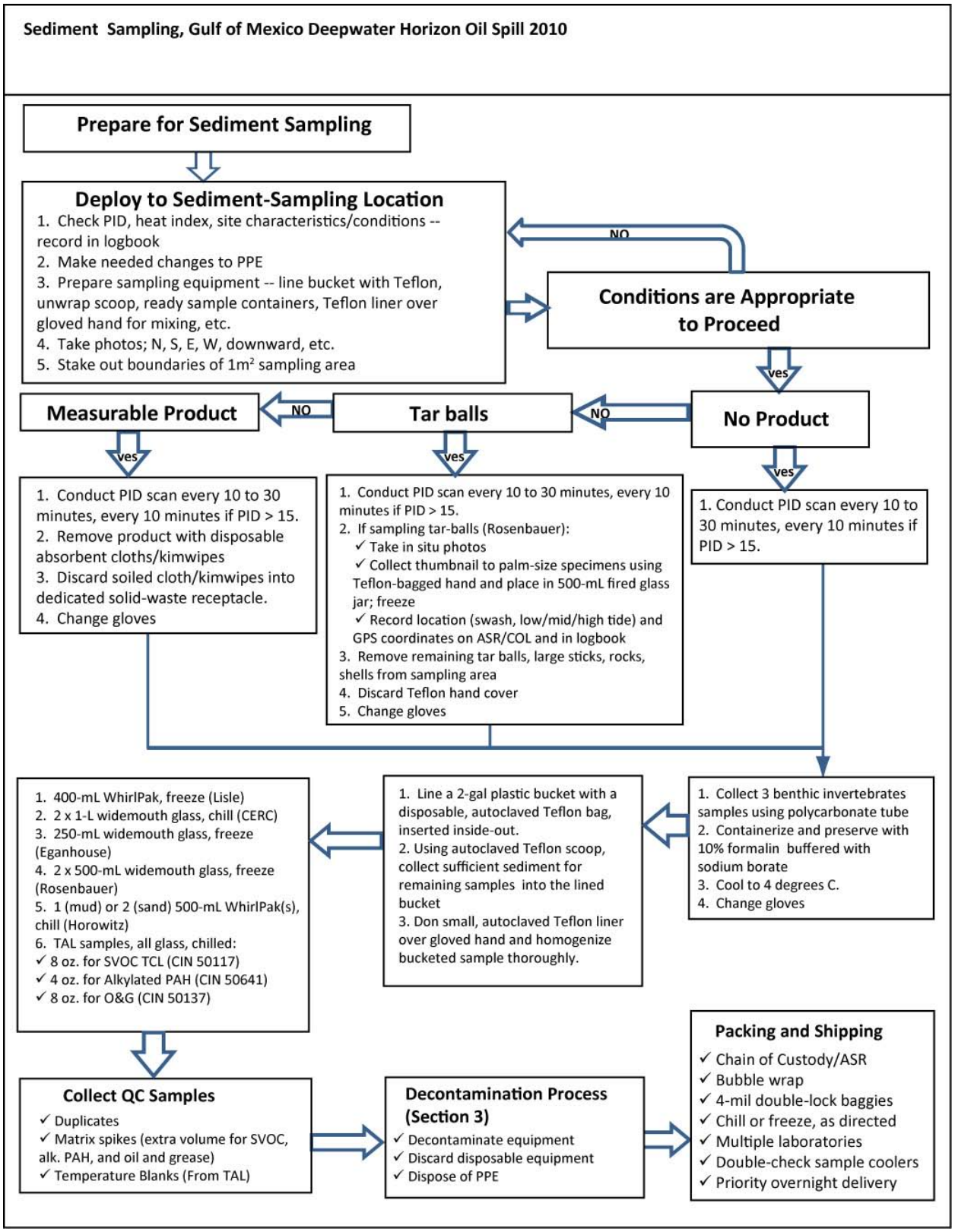

Figure 5. Sediment Sampling, Gulf of Mexico Deepwater Horizon Oil Spill, 2010.

7.4 Step-By-Step Procedures

7.4.1 Tar-Ball Sample Collection

a. Specimens should be thumbnail to palm-size. These can be collected from anywhere at the beach or marsh site. Photograph in situ, before collecting.
b. Retrieve by gloved hand, covered with a small Teflon bag.
c. Place specimens into a 125 or 250-mL lab-certified glass jar
d. Store and ship frozen
e. Record a description of the collection location; e.g., swash, low/mid/high tide, GPS coordinates, and photographs.

7.4.2 Benthic Invertebrate Sample Collection

Sampling for benthic invertebrates requires collection of three samples at each site, collected approximately 3.28 ft (1 meter) apart from the 3.28 ft^2 (1-m^2)area at which a bulk sample will be collected afterwards that will be subsampled for other analyses. To obtain the sample for benthic invertebrates, a 2.5-inch (about 6.4-cm) (inner diameter), 12-inch (about 30.5-cm) long polycarbonate tube (core) is used to collect the top . The core of sediment is then extruded into a laboratory container, labeled, and preserved. The specific steps for collected these samples is as follows.

1. Don sterile disposable nitrile gloves, layering up to three pair as needed or determined by field conditions.
2. Remove the coring device from the protective packaging (precleaned by sterilization (autoclave) or received certified clean from a laboratory or manufacturer).
3. Push the pre-cleaned disposable polycarbonate coring device exactly 2 inches (about 5 cm) into the sediment (to the set-mark on the side of the core tube).
4. Carefully slide a pre-cleaned spatula (without slots) under the coring device to enclose the sample. Be careful not to disturb the sediment inside the coring device.
5. Carefully remove excess sediment and any oil from the outside of the coring device with a clean Kimwipe.
6. Extrude the sediment sample contained inside the core tube into a 500-mL plastic jar by gently shaking or tapping the coring device.
7. Inspect the inside of the coring device and spatula surface containing the sample and use forceps to place any remaining organisms into the container.
8. Add the 10-percent formalin supersaturated with sodium borate preservative, cap the jar securely (clear threads of sediment), and tape and double-bag the jar. (Note: if preservative is unavailable, double-bag the sample container and immediately freeze or chill and place in freezer upon return to the office.).
9. Invert the jar several times to evenly disperse the preservative.

10. Repeat steps 1 through 9 to collect and preserve two more samples. Select sampling locations within the 3.28 ft^2 (1 $meter^2$) sediment collection area that are about 3.28 ft (one meter) apart from each other and from the first sample
11. Label each sample jar with the sampling date, name of collector, and sampling location. If sample was preserved with sodium borate-saturated formalin solution, write "10% buffered formalin" on the label. Record the collection of the sample in the field log book and on the chain of custody and appropriate field forms.
12. Replace outer pair of gloves with clean pair and set up for the next sample.

7.4.3 Bulk Sample Collection

A bulk sample will be collected and homogenized as a composite, and subsampled for the remaining chemical and microoganism analyses, as described below. Remember to blot up oil that is pooled on the surface of the sampling quadrangle with an absorbent cloth. Extensive use will be made of Teflon bags in the sampling procedures, and should be used in a manner to ensure that contact with the sample is restricted to the inside, quality-controlled (QC'ed) portion of the bag. The step-by-step procedures recommended below should be customized as fits the needs of the field team; however, whatever procedure works best should be determined, documented in the logbook, and the same routine repeated at sites sampled by that team, to the degree possible.

7.4.3.1 Collecting a Bulk Sample

1. Deploy the equipment needed to the location in the swash or wetland area from which samples will be collected (or to the boat).
2. Line a clean 2-gallon bucket with precleaned and sterile Teflon bags (doubled), wearing pre-cleaned gloves and inverting the bag to ensure that the outside of the bag lines the bucket and the quality-controlled interior will contain the sediments.
3. Using the Teflon scoop (recommended), work systematically to collect the top 4 to 6 inches of swash or submerged sediment into the bucket, so that the bulk sample represents the 3.28-ft^2 (1-m^2) sampling area.
4. Decant excess water from the Teflon scoop (or other sampling tool) carefully before emptying sediment into the bucket so as to avoid fine sediments from being decanted with the excess water.
5. After emptying about three scoops of sediment into the bucket, homogenize the sample using the scoop or gloved hands sheathed with a Teflon bag. Continue this procedure until the bucket is about three-quarters full.

7.4.3.2 Sample Containerization and Storage

1. Move inland from the swash zone to a dry, plastic-lined area appropriate for sample containerization. If the sampling site was accessed by boat, the sampling team must determine how much of this phase of the sampling operation can be carried out on the boat (preferred), or if it must be carried out onshore.

2. Wipe off the composite container before setting it down on top of clean plastic sheeting. Change gloves.
3. *Samper 1*: Remix the bulk sample thoroughly, so as to be completely homogenized. Mix for about 5 minutes.
4. *Sampler 2*: Select the tool for subsampling and the sample container, as appropriate for the sample analysis. Sheath the tool in a clean Teflon bag. Check if QC samples are to be collected and ask Sampler 3 to set up additional containers, if needed. Hand the subsampling tool to Sampler 1 and uncap and hold the container for *Sampler 1* to fill with sediment.
5. *Sampler 1*: Fill the sample container, leaving headspace as described below for the analysis of interest (refer also to Table 2 in Appendix D).
6. *Sampler 2*: Hand the container and cap to *Sampler 3*.
7. *Samper 3*: Remove any sediment, mud, or oily substance from the outside of the container, paying attention to the threads on cap and container; securely cap and tape to seal cap to the container, wipe container off; affix, fill out, and check label; place container in bubble or foam sleeve, double bag in ziplock, and put the sample into the appropriate shipping cooler.
8. *Samplers 1, 2 and 3*: Continue steps 3 through 7 until all samples have been collected and stored on ice. Each analysis requires specific containers and volumes of sediment as described in the steps that follow. Fill all required sample containers with homogenized sample volumes as specified:
    a. Microoganisms (Lisle lab): Use sterile equipment to fill a 400-mL double Whirl-Pak – Freeze sample.
    b. Toxicity in Pore Water (Carr/Biedenbach lab): 2 x 1-L wide-mouth clear glass jars – Fill jars to bottom of threads. Wrap lids round top with electrical tape. Chill, do not freeze.
    c. Oil Fingerprint (Rosenbauer lab): 2 x 500-mL amber glass, lab-certified wide-mouth jars, **filled to about two-thirds of capacity** – Freeze samples.
    d. Isomeric Fingerprint (Eganhouse lab): one 8-oz amber glass lab-certified wide mouth jar, **filled to about two-thirds of capacity** – Freeze sample.
    e. Metals/Trace Elements and Nutrients (TP, TN, TS) (Horowitz lab): collect 1 kg for sand-sized sample in 2 x 500-mL WhirlPaks; collect 500 g for mud and fine-grained sediments in 1 or 2 500-mL double WhirlPaks – Chill, do not freeze.
    f. SVOC TCL (TestAmericaLab (TAL)): 8 oz wide-mouth TAL glass jar; tape lid – Chill.
    g. PAH /Alkylated PAH (TAL): 4 oz fired wide-mouth TAL jar; tape lid – Chill.
    h. Oil and Grease (TAL): 8 oz, fired wide-mouth TAL jar; tape lid – Chill.

7.4.4 Wrap-Up Procedures

1. Record the collection of sample in the field log book. Multiple ASR field forms are needed to manage the chain of custody (COC) in individual coolers to the appropriate laboratory. The ASR/COC forms needed for each laboratory can be found in Appendix F. Refer to Table 2

in Appendix D for a list of laboratory addresses and contacts, and container and shipping requirements.

2. Return excess soil from the composite (bulk) container to the point of collection. Rinse sediment and debris from the bulk container.
3. Remove and dispose all disposable PPE; used Teflon bags and other sampling gear; the ground sheeting, and decontamination liquid and solid materials, in designated and properly labeled receptacles. Complete the decontamination process on land or by boat as described in Section 4.0. If site access was by boat, complete as much of the decontamination process as possible on board.

7.5 Quality Control

One set of equipment blanks shall be collected and analyzed for concentration of SVOCs, PAHs, Oil and Grease, metals and nutrients to test the suitability of using Teflon bags for collecting, homogenizing, and subsampling sediments. A fresh 250-mL volume of VPBW will be used to rinse a Teflon bag three times, followed by filling the bag with the volume of VPBW necessary to fill sample bottles for the organic-compound analyses listed above. This procedure will be repeated using inorganic-grade (certified) blank water (IBW) to fill sample bottles for the metals and nutrients analyses. This set of equipment blanks will be collected once and only by one WSC sampling team, who will report to all the other WSC teams and to the Office of Water Quality the analytical results.

For TestAmerica Laboratory analyses, each Water Science Center should select one site at which to collect:

- Duplicate samples (Split replicate) for the Oil/Grease plus SVOC/PAH sample, the alkylated PAH sample, and the SVOC TCL sample:

    1. Collect at least twice as much material as is required.
    2. Homogenize the material and containerize as described above into two individual sample containers. Assign each container a unique sample identifier, complete the label, and record the original and duplicate on the COC/ASR as separate samples.

- Matrix-spike samples – the Oil/Grease plus SVOC/PAH sample, the alkylated PAH sample, and the SVOC TCL sample

    1. Collect a replicate set of samples, identified as matrix-spike samples MS/MSD) in separate containers. The spiking will be done by the laboratory. Ideally, samples for matrix-spike analysis should be collected when a notable difference in sediment matrix is observed, such as sand versus organic-rich mud or fines.
    2. Assign each container a unique sample identifier, complete the label, and record the original and duplicate on the COC/ASR as separate samples.

7.6 Analyses, Materials, and Supplies for Sediment Sampling

Table 3. Containers and Supplies Specific to Sediment Sampling

[oz, ounce; CIN, laboratory's analytical identification number; SVOC, semivolatile organic compounds; %, percent; HEM, N-hexane extractable material; PAH, polycyclic aromatic hydrocarbons; TCL, target compound list; mL, milliliter; BGC, baked glass container; L, liter; g, gram; Poly, polypropylene; NFSS, USGS National Field Supplies Service; NWQL, National Water Quality Laboratory]

Sample Container, Chemical Preservative	Laboratory, Analysis	Source
1 x 8 oz wide-mouth jar, Unpreserved	TestAmerica, Pensacola FL (TAL) CIN 50137 - Oil & Grease, SVOC, % moisture (Method HEM)	TAL
1 x 4 oz wide-mouth clear glass, Unpreserved	TestAmerica, Pensacola FL CIN 50641 - PAH and Alkylated PAH (Method 8270C)	TAL
1 x 8 oz clear glass	TestAmerica, Pensacola FL CIN 50117 - SVOC TCL (Method – 8270)	TAL
3 x 500 mL sterile poly 10% sodium-borate buffered formalin	A. Demopoulos, USGS, Gainesville FL Benthic invertebrates	One Stop, NFSS
2 x 1L BGC Unpreserved	R. Carr/J. Biedenbach, USGS, Corpus Christi TX – Pore-water toxicity	One Stop, NFSS
2 x 500g WhirlPak Unpreserved	A. Horowitz, USGS, Norcross GA Trace metals[10] and nutrients	Open Market (check with NFSS)
2 x 1L BGC, certified Unpreserved	R. Rosenbauer, USGS, Menlo Park CA Oil fingerprint	NWQL to provide I-Chem or equivalent
1 x 500 mL BGC, certified Unpreserved	R. Rosenbauer, USGS, Menlo Park CA Tar ball degradation	NWQL to provide I-Chem or equivalent
1 x 250 BGC, certified Unpreserved	R. Eganhouse, USGS, Reston VA Isomeric fingerprint	NWQL to provide I-Chem or equivalent
1 x 400 mL WhirlPak, sterile, unpreserved	J. Lisle, USGS, St. Petersburg, FL Microoganisms	Open Market

[10] Analysis includes: Sb, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Li, Mn, Hg, Mo, Ni, P, Se, Ag, Sr, Tl, Sn, U, V, Zn, Al, C (inorganic + organic), Organic C, Fe, N, S, Ti

Sample Container, Chemical Preservative	**Laboratory Analysis**	**Source**
1 x 8 oz wide-mouth jar, Unpreserved	TestAmerica, Pensacola FL (TAL) CIN 50137 - Oil & Grease, SVOC, % moisture (Method HEM)	TAL
1 x 4 oz wide-mouth clear glass, Unpreserved	TestAmerica, Pensacola FL CIN 50641 - PAH and Alkylated PAH (Method 8270C)	TAL
1 x 8 oz clear glass	TestAmerica, Pensacola FL CIN 50117 - SVOC TCL (Method – 8270)	TAL
1x 500 mL sterile BGC 10% sodium borate buffered formalin	A. Demopoulos, USGS Benthic invertebrates	One Stop
2 x 1L BGC Unpreserved	R. Carr / J. Biedenbach, USGS, Pore water toxicity	One Stop
2 x 500g WhirlPak Unpreserved	A. Horowitz, USGS, Trace metals and nutrients	Open Market
2 x 1L BGC, certified Unpreserved	R. Rosenbauer, USGS, Menlo Park CA Oil fingerprint	NWQL to provide I-Chem or equivalent
1 x 125 or 250 mL BGC, certified Unpreserved	R. Rosenbauer, USGS, Menlo Park CA Tar ball weathering	NWQL to provide I-Chem or equivalent
1 x 250 BGC, certified Unpreserved	R. Eganhouse, USGS, Reston VA Isomeric fingerprint	NWQL to provide I-Chem or equivalent
1 x 400 mL WhirlPak, sterile, unpreserved	J. Lisle, USGS, Microoganisms	Open Market

Equipment and Supplies for Sediment Sampling

- Maps/plot plan
- Compass, GPS
- Tape measure
- Survey stakes or flags
- Barricade tape for Exclusion and Contamination Reduction Zones
- Digital camera
- Polycarbonate tube, 2.5-inch (6.5 cm) inside diameter, 6 to 12-inch (about 15 to 30.5 cm) long
- Disposable or Teflon, white, or uncolored transparent plastic sampling spoons, spades, or spatulas
- Sterile sampling spoon/spatula
- Laboratory forceps
- 2-gallon homogenization bucket
- 3-gallon certified clean Teflon bucket liners
- Small Teflon bags (used with bag sampler) (to sheath gloves for hand mixing; alternatively, use a portable drill with a specially designed Teflon coated mixing tool
- 4-oz, 8-oz, and one-quart, wide-mouth jars w/Teflon-lined lids
- 10-percent formalin solution saturated with sodium borate -- benthic invertebrate sample preservation
- Ziploc plastic bags
- Cooler(s)
- Ice, wet ice and dry ice
- Plastic sheeting for homogenization and containerization area

8.0 Chain of Custody and Documentation Requirements: Labeling, Packaging, and Shipping

8.1 Method Summary

Samples collected for the post-impact oil spill require legally defensible data. The following protocols for field documentation, sample labeling, packaging, and shipping incorporate the use of standard chain-of-custody (COC) procedure as applied to environmental samples. The instructions and procedures provided in this section comprise a summary of *Standard Operating Procedure for Chain of Custody Samples*, Office of Environmental Measurement and Evaluation, USEPA New England - Region 1 (U.S. Environmental Protection Agency, 2002a). However, chain-of-custody requirements for a given operation can change; field teams should verify COC protocols with their NRDA or other appropriate contact before sampling.

8.2 Field Procedures

The field sampler is legally responsible for the care and custody of the samples collected in this project until the samples are transferred (for example, to a laboratory) or otherwise properly dispatched.

- As few people as possible should handle the samples.
- Each sample container will be labeled with a sample number, date and time of collection, sampler name, and sampling location.
- Sample labels are to be completed for each sample using indelible ink (such as non-erasable black or blue “rite-in-the-rain” ballpoint pen). If weather conditions prohibit use of ballpoint pen and a pencil is used instead, this must be noted in the field log book. **Sharpies or other similar pens that emit fumes are prohibited from use.**

8.2.1 Field Logbooks and Other Documentation

The field logbook (logbook) will provide a means of recording field observations and the data-collection activities performed. The logbooks obtained are to be bound, paginated field survey books or notebooks, preferably with “rite in the rain” properties.

Logbook entries should be as detailed as needed in order for persons going to the site at a later date to be able to reconstruct a particular situation without reliance on memory.

- At the beginning of each day, record the date, start time, weather, names of all sampling team members present, level of personal protection being used, and the signature of the person making the entry.
- Include a record of the names of visitors to the site and additional field-sampling or investigation team personnel, and the purpose of their visit.

- Record measurements made and samples collected, along with a detailed description of the location of data collection.
- All entries will be made in ink as described above, and no erasures will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark and the entry will be initialed and dated.
- Logbook entries and field record sheets with sample identification (ID) locations, date, time, and names or initials of all persons handling the sample in the field will be completed.

Field forms (Appendix F) have been customized for this project that can be used to supplement logbook entries, although their use will not substitute for recording the major onsite activities and data entries, according to COC protocol. The equipment used to collect samples will be noted on these field forms, along with the time of sampling, sample description/purpose, depth at which the sample was collected, sample volume, and number of containers and sample-preservation procedures. A sample identification number will be assigned after sample collection and recorded in the logbook and on field forms. Field duplicate samples, which will receive separate and unique sample identification (ID) numbers, will be noted under the sample description. Equipment employed to make field measurements will be identified by make, model, and serial or unique ID number along with the date and time of calibration or calibration checks.

Photographs will be taken from multiple perspectives to document the general condition and characteristics of the site and of the specific sampling locations of sample collection. It is recommended that the photographs be accompanied by photographs of the coordinate information displayed on the GPS for the specific location of the site and locations of sample collection.

8.2.2 Labeling Sample Containers

Sample labels shall be completed for each sample collected for analysis, using waterproof ink, as described above. When working under the jurisdiction of NRDA labeling conventions and sample nomenclature may differ from those routinely used within the USGS; ensure that correct nomenclature protocols are in place. Figure 6 provides an example of a sample label. The information to be recorded on the sample tag or label includes:

- Station Number - a number assigned by the project coordinator
- Date - a six digit number indicating the year, month, day of collection
- Time - a four digit number indicating the local standard or daylight time datum (EST, EDT, CST, CDT) time of collection using the military or 24-hour time convention; e.g. 0954
- Station Name - sampling station description
- Sampler personnel - each sampler is identified by their full name

- Sample Number - a unique sample number established from the Sampling Plan for each set of samples collected at one time and place
- Parameter (analyte) and sample preservation - the sample analysis to be conducted and how the sample is preserved using physical and/or chemical means.
- Comments - pertinent observations of site conditions that might affect the quality of the analysis, if any.

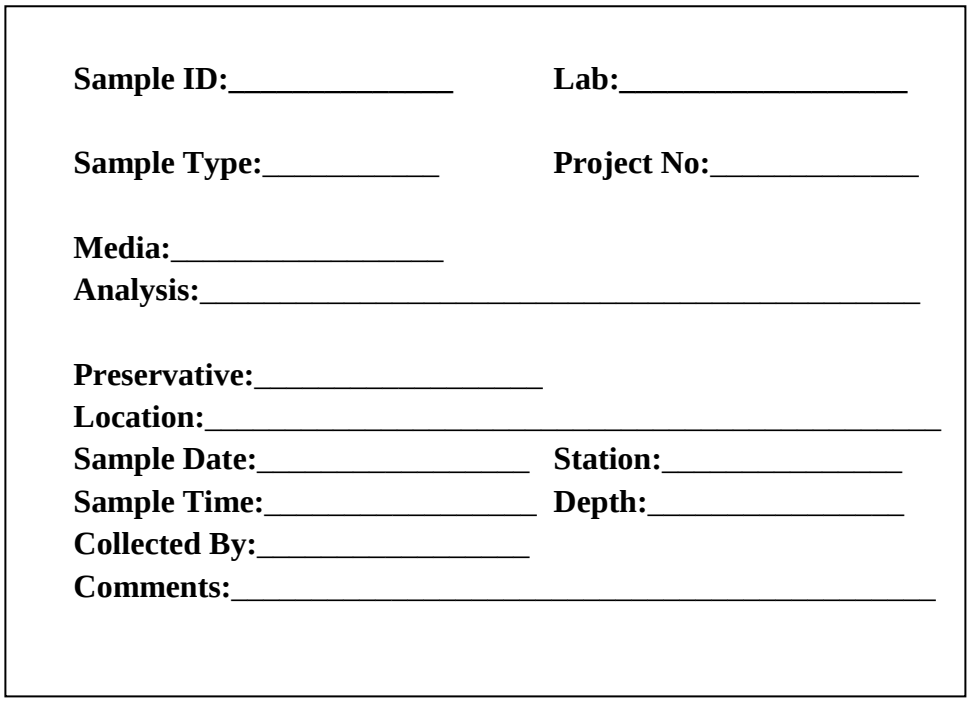

Figure 6. Example of a Sample Label

Due to the evidentiary nature of samples collected during environmental investigations, possession of the sample must be traceable from the time the samples are collected until they are introduced as evidence in legal proceedings. This chain of custody (COC) will be documented using the Analytical Services Request (ASR) form to inform the laboratory of the analyses being requested for each sample and to document sample possession and custody. One signed copy of the ASR form should remain with the sampler and two copies should be transported with the sample aliquots to each laboratory.

It is the intent of this protocol to follow USEPA policy regarding sample custody and COC protocols, as described in *NEIC Policies and Procedures*, EPA-330/9-78DDI-R, Revised June 1985. This custody procedure is in three parts: sample collection, laboratory analysis, and final evidence files. Final evidence files, including originals of laboratory reports and electronic files, are maintained under document control in a secure area. A sample or evidence file is under your custody when:

- It is in your possession, or
- It is in your view, after being in your possession, or
- It was in your possession and then locked up to prevent tampering, or
- It is in a designated and documented secure area.

To maintain a record of sample collection, a COC/ASR record will be filled out for each sample destined for laboratory analysis and for the transfer of samples among sample custodians, shipping courier, and the laboratory. Copies of standard COC/ASR forms for water and sediment samples that go to TestAmerica Laboratory - Pensacola are provided in Appendix F.

Sample COC/ASR procedures require that the possession and handling of the sample from the moment of its collection through analysis be documented by written record. The record must clearly reflect the movement of the sample through the COC/ASR to ensure the sample has been positively controlled and has not been tampered with in any way. Each time the samples are transferred, the signatures of the person relinquishing and receiving the samples, as well as the date and time of transfer, will be documented.

8.2.3 Transfer of Custody and Shipment

Samples will be properly packaged for shipment (Section 6 and Section 7) to be dispatched to the appropriate laboratory for analysis. Samples must be accompanied by a properly completed COC/ASR form at all times. The COC/ASR form will be **signed and dated with the time of transfer by a member of the field team** who has verified that those samples indicated on the COC/ASR form are indeed being shipped. The sample numbers and locations will be listed on the COC/ASR form. A separate signed custody record will be enclosed in each sample box or cooler. After packaging has been completed, the shipping containers will be secured with strapping tape and custody seals for shipment to the laboratory. The **custody seals must be signed and dated by a member of the field team**, and placed over the lid edge for fixed-base laboratory samples. The preferred procedure also includes using a custody seal attached to the front right and back left of the cooler.

All samples will be shipped by an appropriate courier (e.g., Federal Express). Samples will be transported daily or the next day from the sampling or storage location to the courier location for subsequent shipment to the laboratory. A designated member of the field team should track the time of shipment and progress to its destination until its arrival is confirmed by the laboratory. Upon receipt of the samples at the laboratory, the receiver will complete the transfer by dating and signing the COC/ASR form. If shipped by commercial courier, the air bill number and shipping data will be transcribed to the COC/ASR form in the appropriate signature/date block. A copy of the air bill is to be kept with the field copy of the COC/ASR form to reflect specific shipping information.

The custodian of the evidence file will maintain the contents of evidence files for each investigation, including all relevant records, reports, logs, field notebooks, pictures,

subcontractor reports, correspondence, laboratory logbooks, and COC forms.

- Each project evidence file will be stored in a secure, limited-access area and under custody. A copy of the COC/ASR shall be kept by the sample team.
- Analytical laboratories will retain all original raw analytical data information (both hard copy and electronic) in a secure, limited-access area and under custody of the laboratory-designated project manager.
- Sample collection points, depth increments, and sampling devices documented in the field logbooks will be verified with the information written on the sample label and COC/ASR form.

8.3 Packaging Samples

Equipment and material requirements to properly handle, ship, and maintain custody of samples as described in the preceding sections include the following:

- Teflon, Duct, and Electrical tape for sealing lids on sample containers and vials (as directed)
- Chain-of-Custody Forms
- Properly Labeled Sample Containers
- Indelible Black Ink marker
- Custody Seals, moisture-proof; can adhere to wet coolers
- Approved, Undamaged Coolers of Various Sizes with Drains Sealed
- Temperature Check Sample
- Ziplock Bags (assorted sizes for samples and ice)
- Plastic Trash Bags
- Bubble Wrap or Foam Sleeves
- Ice – Wet and Dry
- Courier Airbills
- Laboratory Contact Information
- Nylon Reinforced Strapping Tape
- Any Special Requirement Courier Labels (Hazardous Materials, Caustic, etc.)
- Lockable Storage Areas (to maintain sample custody, may be locked vehicle, office, etc.)
- Coolers for shipping samples: clean, leak-proof. To avoid loss of shipping labels from "sweating" coolers, it is recommended that sender and recipient address be written in indelible marker on the outside of the cooler.

Lids or caps on sample containers are to be taped with Teflon, electrical, or duct tape, as directed by the receiving laboratory to help ensure against leakage. Glass sample containers will be wrapped with plastic insulating material (bubble wrap) to prevent contact with other sample containers or the inner walls of the cooler. Each sample container, in addition, will be sealed in

doubled ziplock bags. Similar containers for the same location may be sealed in the same set of ziplock bags.

Sample identification from each container shall be compared to the entries on the COC/ASR form to ensure bottle labels and COC entries match. Once this is confirmed, the samples can be packed as described. Wet ice is required to be bagged in doubled bags and sealed to ensure no leakage during melting.

Samples will be packaged in thermally insulated, rigid coolers, according to DOT specifications, 173 Subparts A and B and 172 Subparts B, C, and D. Environmental samples and field quality-control blanks to be submitted to the analytical laboratory will be placed in a sample cooler along with ice and coolant blanks. After a cooler is filled, the appropriate COC/ASR form will be placed inside a resealable plastic bag and taped to the inside lid of the cooler, and the outer surface of the cooler will be cleaned. Any leaking cooler will be held by the courier and sample holding times could be missed.

The cooler shall be secured with COC tape and custody seals, followed by using a minimum of three complete wraps of nylon-reinforced strapping tape on each end of the cooler and over the COC tape and seals. Signed custody seals must be applied to a minimum of the front and back of the cooler such that the seal will be broken if the top is opened or removed. An example of a custody seal is shown in Figure 7.

Figure 7. Example of a Custody Seal.

8.4 Shipping Samples

Whenever possible, ship samples to the laboratory overnight on the day of collection. Pay strict attention to holding-time limitations for a given sample type. For example, the holding time of the VOC and TPH samples, collected in VOA vials, is 7 days from collection to analysis. Check laboratory hours of operation—keep in mind that the laboratory might not receive samples on Saturdays, Sundays, or holidays. The integrity of chilled samples sent late on a Thursday or on a Friday could be compromised if not received by the laboratory in time to be unpacked and refrigerated.

- Check planned arrival time before selecting the carrier service.

- No carrier service will accept or deliver leaky boxes or coolers. Securely tape the outside of shipping containers to prevent leaking and to maintain container integrity.
- Do not exceed maximum weight and size restrictions set by the carrier service.
- Comply with the carrier service's requirements for meeting U.S. Department of Transportation regulations for transporting hazardous substances.
  - Identify samples that require special shipping procedures.
  - Send chilled samples to the laboratory by the fastest means possible.
  - Some samples require special handling and shipping (such as radon and CFC samples). Contact the laboratory for specific instructions. Obtain authorization from the laboratory before sending any highly contaminated or potentially hazardous samples to the laboratory for analysis.
- Shipping of sediment samples for this project must conform to Federal regulations and procedures. **Do not ship sediment samples in coolers containing samples of water, tissue, or media other than sediments.**

NOTE – Avoid overfilling sample containers. Over filling can cause containers to break, especially when containing frozen samples and dry ice.

9.0 Quality Assurance and Quality Control for Field Sampling

The purpose of this section is to address the topic of Quality Assurance (QA) as it applies, in general, to post-impact Deepwater Horizon sampling and to describe the actions and sampling protocols to be implemented for collection of Quality-Control (QC) samples. The standard operating procedures described in this section follow those given in the USGS *National Field Manual for the Collection of Water-Quality Data* and may need to be modified according to circumstances encountered in the field or because of changes or redefinition of data-quality objectives defined for the sampling effort. Any deviations must be thoroughly justified and documented in field logbooks.

9.1 Quality-Assurance Requirements

The USGS defines quality assurance (QA) as those procedures used to control the non-quantifiable components of a project, including development and use of this Project Sampling Plan. Examples of key QA components of this Sampling Plan required to fulfill the objectives of this project are listed below:

- Documented use of standard, scientifically valid and appropriate methods and protocols for the collection of in situ environmental field measurements and water and sediment data. Such data must be produced in such a manner so as to ensure that site conditions are represented accurately at a time and location that fulfill project and data-quality objectives.

- Adherence to strict protocols for documenting site conditions and field activities, including implementation of those requirements for maintaining a legal record of chain-of-custody for all samples that are collected; for example, properly entering data in bound, paginated site-dedicated logbooks and on field data sheets.
- The surfaces of equipment that could contact the sample must be constructed of materials that cannot themselves become a source of sample contamination. In other words, the equipment used must not be capable of releasing measurable concentrations of the same analytes that are targeted for study. In this regard, it is recommended that all sample containers are provided with a certification of laboratory-grade cleanliness.
- Rigorous use of equipment cleaning and decontamination procedures is required that are known to be appropriate and effective for work in crude-oil contaminated land and aqueous environments.
  - Protocols for removal of the cleaning and decontamination agents used on equipment must be strictly followed so that the cleaning process itself does not become a source of contamination to the sample. For example: methanol must be allowed to completely evaporate from all equipment surfaces, nooks, and crannies; only non-phosphate detergents will be used and subsequently these and any acid solutions must be rinsed thoroughly from all equipment surfaces, nooks, and crannies.
  - Standard hazardous-waste handling and disposal procedures (described in Section 4), involve the proper containment and disposal of contaminated materials, including the waste fluids and materials from equipment decontamination. Such procedures are meant to ensure that cross contamination of samples does not occur among and between sites and that contamination is not transferred offsite to public or private areas.
- Disposable equipment will be used wherever possible in order to minimize the number of steps need for sampling under potentially hazardous conditions and to avoid the need for equipment decontamination and consequent quality-control actions required to document proper decontamination.
- Awareness of the natural and anthropogenic effects on the environment in which sampling will occur. For example,
  - When boats are used, boat motors and bilge pumps must be turned off during the sampling operation and retrieval and decontamination of sampling equipment to avoid an additional source of contamination.
  - Storage – permanent and transient – of gasoline or other petroleum-based products and methanol and methanol-infused rags or clothing must be kept in a secure area that is separate and downwind of the sample-collection and sample-preservation and packaging area.
- Collection and analysis of quality-control (QC) samples, such as blanks, duplicates, and matrix spikes, whose purpose is to assess the quality of environmental data by generating a

set of data that will be used to estimate the magnitude of the bias and variability resulting from the procedures used for obtaining the samples.

  - For blank samples: Laboratory-certified blank water of the appropriate grade will be obtained, stored, transported, and used in accordance with standard USGS procedures: inorganic-grade blank water (IBW) for metals/trace-element and nutrient analyses; nitrogen gas-purged volatile/pesticide-grade blank water (VPBW) for each of the organic-compound analyses.
  - Matrix spikes will be treated by laboratory personnel at the laboratory.

- Mandating the training of all field personnel to ensure that health and safety regulations are understood and appropriately implemented.

9.2 Quality-Control Sampling

QC samples will be collected and analyzed along with environmental samples to assist in identifying the occurrence, source, and magnitude of sample contamination (field and laboratory) and as a measure of variability in the analytical composition of samples collected. In order to provide useful information, QC samples must be collected, prepared, and analyzed in the same manner and using the same materials as the environmental samples. Failure to do so is likely to result in invalid or indeterminate interpretations of the QC data and can compromise the scientific defensibility of the data.

9.2.1 Frequency and Distribution

QC samples for routine analyses of water and sediment samples will be collected at a frequency of not less than one (1) in 10 samples per Water Science Center during the initial phase of post-impact sampling, or as otherwise described below for the QC Sample Type. QC samples collected for special (non-routine) analyses will be collected as directed by the chief scientist for the respective analysis.

Additional (extra) QC samples should be collected according to the best professional judgment of the field team leader or as needed to account for the bias and variability of unanticipated onsite conditions. For example: (1) matrix interferences may be much different in a lagunal mud than in a coarse sand matrix, suggesting the advisability to collect an additional set of matrix-spike samples; (2) the potential for cross contamination of the samples from the environment may be much greater at sites with more visible presence of oil, alerting the sampler to the need to collect a precautionary blank sample; (3) a PID scan may signal heightened concern for bias to VOC samples, resulting in collection of an ambient-condition blank.

The specific sites at which various types of QC samples will be collected and the frequency of visiting these sites is to be determined at a time closer to when post-landfall sampling will begin and will be addressed in the final Deepwater Horizon Response Post-Landfall Sampling and Analysis Plan.

9.2.2 Quality-Control Samples

Quality-control samples will be collected for water and sediment, as specified in Section 6.0 for Water Sampling and Section 7.0 for Sediment Sampling, respectively. In general:

- Quality control for sediment samples will rely primarily on collection of duplicate samples and a sample set for matrix spikes at the rate of one (1) every tenth (10^{th}) sample (i.e., at least one per Water Science Center team). Spiking of sediment is to be performed at the laboratory. Blank sediment samples (certified-clean soil or sediment) will not be collected for this project. In lieu of certified blank sediments, the unimpaired sediments collected during the pre-impact phase of this project will serve as background samples against which to compare the post-impact sediment samples.
- For sediment or water media, the need for field blanks mostly is obviated by the use of dedicated and disposable sets of equipment. One exception is collection of a set of field blanks to document the suitability of Teflon bags as liners and equipment covers, as these will be in contact with sediment samples.
- Quality control for water sampling includes collection of one or more of the following QC sample types:
  - Replicate samples, collected one after the other.
  - Matrix spikes; the sample is fortified by the laboratory analyzing the samples.
  - Field blanks; for this project an emphasis will be including:
  - Ambient field blanks, to determine the potential for sample contamination from ambient field conditions occurring during the time of sample exposure to the atmosphere.
  - Blank samples that are collected or prepared in a protected environment within an office or laboratory; for example: equipment blank, bottle or preservative blank, refrigerator blank, source-solution blank, temperature blank, trip blank, etc.

9.2.2.1 Field Replicates

Field replicates are used to assess the variability associated with sample heterogeneity, sample methodology, and analytical procedures. Two or more field samples are obtained from one location, either concurrently or sequentially (one after the other). Following collection, they are treated as separate samples throughout the remaining sample handling and analytical processes.

- Split Replicates consist of a composite or homogenized sample that is split into equal volumes using appropriate, quality-assured methods, and placed into the appropriate containers. For this project, no water samples will be prepared as split replicates.
- Sequential Replicates consist of samples collected separately but close in time (one after another). Spatial distance among sequential replicates can depend on the media and the intended analysis.

- For sediment to be analyzed for VOCs, for example, it is advised that distinct and non-homogenized samples be collected from 1 to 3 feet apart.
- For water sampling, sequential replicates are to be collected as close in time and space as possible. For this project, sequential replicates will be collected for water samples only.
- Each container will be assigned a unique sample identifier, and labeled and recorded on the COC/ASR as separate samples.

9.2.2.2 Matrix Spikes

Matrix-spike samples are used to evaluate interference from the environmental matrix on the performance of the analytical method. A replicate set of sample containers should be collected for sediment and/or water and identified as spike samples for each analysis for which a matrix spike is to be requested. The spiking will be done in the laboratory. Each container will be assigned a unique sample identifier, and labeled and recorded on the COC/ASR as separate samples. TestAmerica Laboratory will automatically perform matrix-spike analysis for any sample for which sufficient sample is received (an extra two containers, appropriately labeled). For this project, six (6) matrix-spike samples will be collected for every ten (10) sites that are sampled; these include SVOC, alkylated PAH, and oil and grease in sediment and SVOC, TPH-GRO, and oil and grease/PAH in water.

9.2.2.3 Field Blanks

A field blank is a category of QC sample that is prepared in the field to assess cross contamination caused (a) by inadequate decontamination procedures or contamination of a sample from a source not associated with the sample matrix, such as sampling equipment or sample-handling and transport procedures, or (b) ambient atmospheric conditions at the time of sampling (ambient blank). Since samples for this project will be collected primarily using precleaned dedicated, disposable equipment few, if any, equipment-specific field blanks will need to be collected. Blank samples, therefore, will focus on collection of ambient field blanks to determine the potential for sample contamination from ambient field conditions occurring during the time of sample exposure to the atmosphere.

- **Field blanks should be collected at a rate of one (1) in every 20 samples for a given analyte, or at a greater frequency**, depending on ambient field conditions or decontamination-related requirements.
- Ambient field blanks will be collected for VOCs, depending on the presence of organic vapors exceeding 15 ppmv (determined by PID scan).
- Field blanks are to be collected before collecting environmental samples while at the sampling location.
- A rinsate blank will be collected for equipment that is reused after it has been decontaminated. Any equipment to be reused must be decontaminated and rinsed on site as instructed in Section 3.0 of this protocol.

- Field blanks and equipment blanks (Section 9.2.2.4 below) will be assigned a unique ID, labeled, and recorded on the ASR/COC form as are environmental samples. Blank samples are treated in a manner identical to the environmental samples collected that day.

9.2.2.4 Equipment Blanks and other Office or Laboratory-Produced Blanks

Equipment blanks are collected in a controlled environment protected from ambient (such as air-borne) contaminants in the office or laboratory. Equipment blanks (in some cases these are the same as rinsate blanks) are obtained by collecting blank water of the appropriate type from or through sampling equipment after having gone through an established cleaning procedure and before its first use in the field. The purpose of the equipment blank is to ensure that the equipment itself and the presampling cleaning procedure are not potential sources of contamination to the samples the equipment will contact. The protocols and procedures related to collection of equipment blanks for this project are the same as those used routinely for USGS water-quality projects and as documented in Chapter 4, Section 4.3 of the USGS National Field Manual.

- Equipment blanks will be required to test the suitability of new, disposable (single-use), and reusable equipment. A one-time equipment blank per type of equipment will be collected by each WSC before sampling begins. This applies specifically to the peristaltic pump tubing, bailer[11], DOC filtration unit, direct-dip sample-collection container for metals and nutrients, Teflon-bag bucket liner, and Teflon scoop. (This protocol does not apply to laboratory-supplied sample containers that are certified clean for the chemical constituents of interest.)
- A source-solution blank is to be collected for VOC analysis, to document if the composition of the blank water, as received and stored before transport to the field, was free of measurable concentrations of the VOCs to be analyzed (an ambient blank, collected in the field, could serve the combined purpose of a source-solution and ambient-field condition blank, with transport of the blank water being among the possible pathways of contamination).
- Temperature blanks will be included in coolers and checked by the receiving laboratory to ensure that sample-preservation requirements with respect to temperature have been met.
- Trip blanks (for VOC and SVOC analyses) will be supplied by TestAmerica and analyzed to determine if the integrity of these samples could have been comprised by the sample-transport process.

[11] Collection of an equipment blank for the bailer is not necessary unless the bailer method for sampled collection is used.

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11.0 Acronyms, Abbreviations, and Chemical Symbols

Ag:	Silver
Al:	Aluminum
App:	Appendix
As:	Arsenic
ASR:	Analytical Services Request
ASTM:	ASTM International. (An organization for standardization of technical scientific and industrial methods)
atm:	Atmospheric unit
B:	Boron
Ba:	Barium
Be:	Beryllium
BGC:	Baked glass container
BP:	British Petroleum Global Company
C:	Carbon
Cd:	Cadmium
CDT:	Central Daylight Time
CFR:	Code of Federal Regulations
Co:	Cobalt
COC:	Chain of custody
CPR:	Cardiopulmonary Resuscitation
Cr:	Chromium
CRD:	Contamination Reduction Corridor
CRZ:	Contamination Reduction Zone
CST:	Central Standard Time
Cu:	Copper
Decon:	Decontamination
DI water:	Distilled/Deionized Water
DO:	Dissolved oxygen
DOC:	Dissolve Organic Carbon
DOI:	Department of the Interior
DOT:	Department of Transportation
DRO:	Diesel-range organics
DWH:	Deepwater Horizon

EDT: Eastern Daylight Time
USEPA: U.S. Environmental Protection Agency
EST: Eastern Standard Time
EZ: Exclusion zone or Hot zone

Fe: Iron
FWS: Fish and Wildlife Service

Gal: Gallon
GCC: Glass combusted container
GOM: Gulf of Mexico
GPS: Global Positioning System
GRO: Gasoline-range organics

HASP: Health and Safety Plan
HazWOper: Hazardous Waste Operations and Emergency Response
HCl: Hydrochloric acid
Hg: Mercury
HI: Heat Index
HNO_3: Nitric acid
H_2SO_4: Sulfuric acid

IBW: Inorganic-grade blank water
IC: Incident Command

JHA: Job Hazards Analysis

LEL: Lower Explosive Limit
Li: Lithium

MeOH: Methanol
Mn: Manganese
Mo: Molybdenum
MOCC: Motorboat Operator Certification Course
MS/MSD: Matrix-spike samples

N: Nitrogen
N: Normal (normality of a chemical reagent)
NFM: *National Field Manual for the Collection of Water-Quality Data* (USGS)
Ni: Nickel

NIST: National Institute of Standards and Technology
NOAA: National Oceanic and Atmospheric Administration
NRDA: Natural Resource Damage Assessment and Restoration Program
NWQL: National Water Quality Laboratory (USGS)

O&G: Oil and Grease
OC: Organic carbon
OSHA: Occupational Safety and Health Administration
OWQ: Office of Water Quality (USGS)
Oz: Ounce

P: Phosphorus
PAH: Polycyclic Aromatic Hydrocarbons
Pb: Lead
PEL: Personnel Evacuation Limit
PFD: Personal Floatation Device
PID: photoionization detector
POC: Point(s) of Contact
PPE: Personal Protective Equipment
ppm: parts per million
ppmv: parts per million by volume
PVC: Polyvinyl Chloride

QA: Quality assurance
QC: Quality control
QW: Quality of water

RA: Raw, acid-rinsed (sample container)
ROX: Reliable Oxygen Sensor (YSI Company)

S: Sulfur
Sb: Antimony
SC: Specific Electrical Conductance
Se: Selenium
SI: International System of Units (Système international d'unités)
SMIS: Safety Management Information System
Sn: Tin
Sr: Strontium
SVOC: Semivolatile organic compounds
SZ: Support Zone

TAL:	TestAmerica Laboratory
Ti:	Titanium
TKN:	Total Kjeldahl Nitrogen
Tl:	Thallium
TP:	Total Phosphorus
TPH:	Total Petroleum Hydrocarbons
U:	Uranium
UEL:	Upper Explosive Limit
UC:	Unified Command
USCG:	U.S. Coast Guard
USGS:	U.S. Geological Survey
V:	Vanadium
VOC:	Volatile Organic Compounds
VOA:	Vial for VOC
VOO:	Vessels of Opportunity
VPBW:	VOC- and Pesticide-grade Blank Water (laboratory certified)
WSC:	Water Science Center (USGS)
Zn:	Zinc

Appendix A. Pre-Impact Sampling Sites

Attachment 1. Table of Gulf of Mexico USGS Pre-Oil Spill Sampling Sites (6.18.2010)

Attachment 2. Location Map of USGS Sampling Sites (7.14.2010)

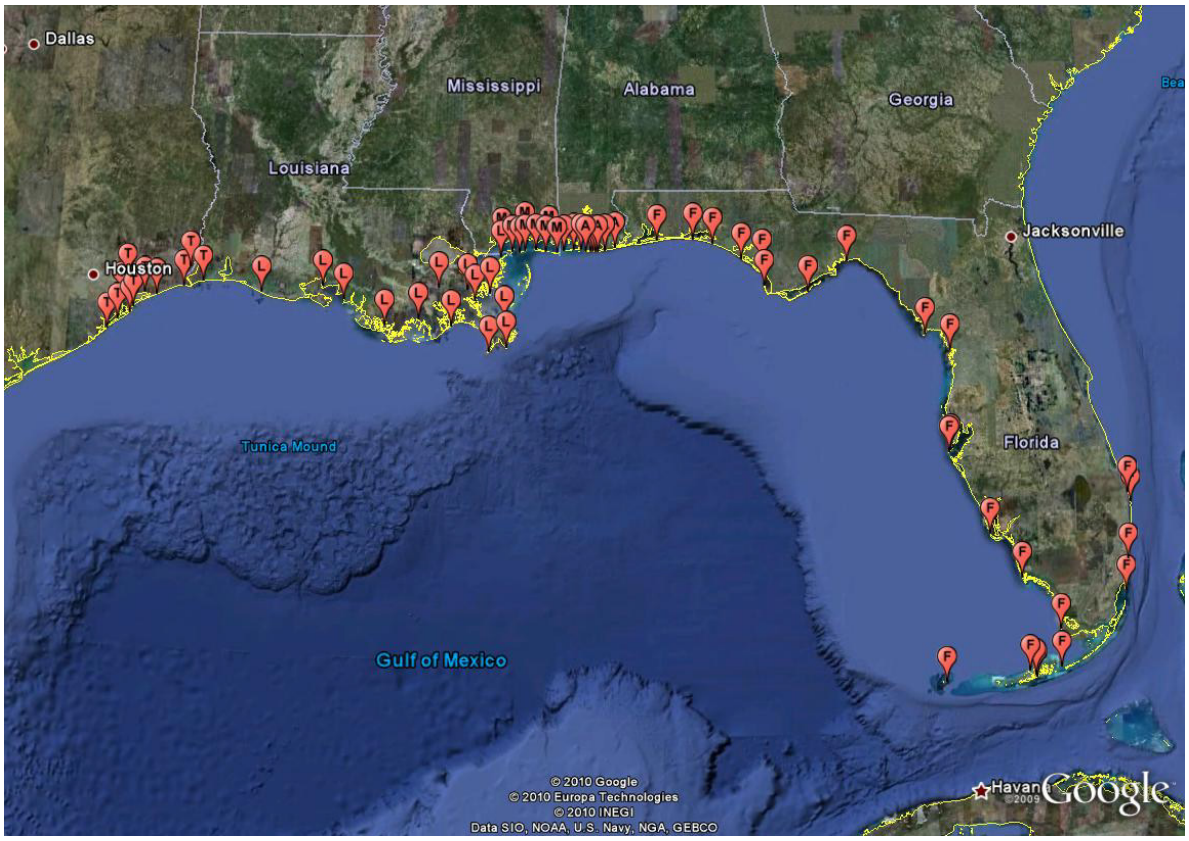
Attachment 1. Gulf of Mexico USGS Pre-Oil Spill Sampling Sites (6.18.2010)

Map no.	ID	Name	Lat-dd	Long-dd	Sample date	County or code
		FLORIDA				
FL-1	302144086581200	DWH GOM Oil Spill-Gulf IS NS nr Navarre, FL	30.362389	-86.970167	5/11/10	Santa Rosa
FL-2	302258086263400	DWH GOM Oil Spill-Henderson Bch SP nr Destin, FL	30.382944	-86.442778	5/11/10	Okaloosa
FL-3	301926086091800	DWH GOM Oil Spill-Grayton Bch SP nr Seaside, FL	30.324056	-86.155056	5/12/10	Walton
FL-4	300729085440900	DWH GOM Oil Spill-St. Andrews SP nr Panama City,FL	30.124722	-85.736028	5/12/10	Bay
FL-5	294645085243000	DWH GOM Oil Spill-St. Joe P SP nr Port St. Joe, FL	29.779167	-85.408528	5/13/10	Gulf
FL-6	294152084460300	DWH GOM Oil Spill-St George IS SP nr E Point, FL	29.697861	-84.767750	5/13/10	Franklin
FL-7	300427084105000	DWH GOM Oil Spill-St. Marks NWR nr St. Marks, FL	30.074194	-84.180444	5/18/10	Wakulla
FL-8	290740083031200	DWH GOM Oil Spill-Piney Pt Bch at Cedar Key, FL	29.127750	-83.053361	5/18/10	Levy
FL-9	285425082412600	DWH GOM Oil Spill-Fort IS Gulf Bch nr Chassah., FL	28.907194	-82.690778	5/19/10	Citrus
FL-10	273728082441800	DWH GOM Oil Spill-Fort DeSoto Pk nr St Pete, FL	27.624444	-82.738333	5/17/10	Pinellas
FL-11	263132082114000	DWH GOM Oil Spill-Captiva IS Bch nr Captiva, FL	26.525639	-82.194222	5/20/10	Lee
FL-12	255610081440500	DWH GOM Oil Spill-Tiger Tail Bch at Marco IS, FL	25.936139	-81.734583	5/21/10	Collier
FL-13	251329081101100	DWH GOM Oil Spill-NW Cape Sable Bch nr Flamingo,FL	25.224806	-81.169972	5/22/10	Monroe
FL-14	243737082522500	DWH GOM Oil Spill-Dry Tortugas National Park, FL	24.627139	-82.873639	5/20/10	Monroe
FL-15	254003080092000	DWH GOM Oil Spill-B Baggs Cape nr Key Biscayne, FL	25.667417	-80.155528	6/1/10	Miami-Dade
FL-16	260454080063400	DWH GOM Oil Spill-Lloyd Bch at Ft Lauderdale, FL	26.081694	-80.109444	5/26/10	Broward
FL-17	264921080021700	DWH GOM Oil Spill-MacArthur Bch at W Palm Bch, FL	26.822583	-80.038056	5/27/10	Palm Beach
FL-18	244345081000600	DWH GOM Oil Spill-Coco Plum Bch nr Marathon, FL	24.729250	-81.169972	5/24/10	Monroe
FL-19	265722080045400	DWH GOM Oil Spill-BLM Tract1 nr Jupiter Inlet, FL	26.956111	-80.081667	6/16/10	Palm Beach
FL-20	265722080045500	DWH GOM Oil Spill-BLM Tract2 nr Jupiter Inlet, FL	26.956111	-80.081944	6/16/10	Palm Beach
FL-21	243902081332700	DWH GOM Oil Spill-BLM Tract1 nr Park Key, FL	24.650556	-81.557500	6/9/10	Monroe
FL-22	243703081323700	DWH GOM Oil Spill-BLM Tract2 nr Sugarloaf Key, FL	24.617500	-81.543611	6/9/10	Monroe
FL-23	243700081322300	DWH GOM Oil Spill-BLM Tract3 nr Sugarloaf Key, FL	24.616667	-81.539722	6/9/10	Monroe
FL-24	273605082454900	DWH GOM Oil Spill-BLM Tract at Egmont Key, FL	27.601389	-82.763611	6/14/10	Hillsborough
FL-25	300227085255800	DWH GOM Oil Spill-BLM Lathrop Bayou nr Panama City, FL	30.040833	-85.432778	6/10/10	Bay
FL-26	244325081351500	DWH GOM Oil Spill-Marvin Key at GWH NWR, FL	24.709806	-81.644639	7/7/10	Monroe

		ALABAMA				
AL-1	301338088193500	DWH GOM Oil Spill West Dauphin Island	30.227425	-88.326394	5/8/10	Mobile
AL-2	301455088110300	DWH GOM Oil Spill Dauphin Is. AL-2	30.24881454	-88.1841677	5/9/10	Mobile
AL-3	301448088044000	DWH GOM Oil Spill Dauphin Is. AL-3	30.24687027	-88.0777765	5/9/10	Mobile
AL-4	301329088003000	DWH GOM Oil Spill Fort Morgan AL-4	30.22492629	-88.0083304	5/8/10	Baldwin
AL-5	301349087541600	DWH GOM Oil Spill Fort Morgan AL-5	30.23048145	-87.9044377	5/8/10	Baldwin
AL-6	301428087434900	DWH GOM Oil Spill Gulf Shores AL-6	30.24131404	-87.7302646	5/8/10	Baldwin
AL-7	301608087345400	DWH GOM Oil Spill Orange Beach AL-7	30.26909103	-87.5816491	5/8/10	Baldwin
AL-8	301353087561600	DHW GOM Oil Spill BLM-1	30.23159265	-87.9377724	5/24/10	Baldwin
AL-9	301343087520200	DWH GOM Oil Spill BLM-2	30.2288147	-87.867214	5/24/10	Baldwin
AL-10	301341087495200	DWH GOM Oil Spill Fort Morgan BLM-3	30.22825903	-87.8311016	5/24/10	Baldwin
		LOUISIANA				
LA-22	294432090083100	DWH GOM Oil Spill-Jean Lafitte National Park, LA	29.7422222	-90.1419444	5/14/10	Jefferson
LA-23	294406091511300	DWH GOM Oil Spill-Cypremort Point, LA	29.735	-91.8536111	5/13/10	St. Mary
LA-24	292046090254500	DWH GOM Oil Spill-Lake Felicity, LA	29.3461111	-90.4291667	5/18/10	St. Mary
LA-25	293808092460200	DWH GOM Oil Spill-Rockefeller Refuge Beach, LA	29.63555556	-92.7672222	5/13/10	Cameron
LA-26	291507090551800	DWH GOM Oil Spill-Sister Lake, LA	29.25194444	-90.9216667	5/17/10	Terrebonne
LA-28	293424091321600	DWH GOM Oil Spill-Point Chevreuil, LA	29.57333333	-91.5377778	5/13/10	St. Mary
LA-29	294324089432500	DWH GOM Oil Spill-Crooked Bayou, LA	29.72333333	-89.7236111	5/18/10	Plaquemines
LA-30	294108089234500	DWH GOM Oil Spill-Mississippi R. Gulf Outlet, LA	29.68555556	-89.3958333	5/7/10	St. Bernard
LA-31	291537089570100	DWH GOM Oil Spill-Grand Isle Bch at State Park, LA	29.26027778	-89.9502778	5/10/10	Jefferson
LA-32	291914089105500	DWH GOM Oil Spill-Mississippi R. at Main Pass, LA	29.32055556	-89.1819444	5/7/10	Plaquemines
LA-33	293518089364300	DWH GOM Oil Spill-Breton Sound, LA	29.58833333	-89.6119444	5/7/10	Plaquemines
LA-34	300907089144500	DWH GOM Oil Spill-Miss. Sound at Grand Pass, LA	30.15194444	-89.2458333	5/7/10	St. Bernard
LA-35	285951089085600	DWH GOM Oil Spill-Mississippi R. at South Pass, LA	28.9975	-89.1488889	5/7/10	Plaquemines
LA-36	285615089235600	DWH GOM Oil Spill-Mississippi R. at SW Pass, LA	28.9375	-89.3988889	5/7/10	Plaquemines
		MISSISSIPPI				
MS-37	301309089044700	DWH GOM OIL SPILL-South Cat Island Beach, MS	30.21916667	-89.0797222	5/7/10	
MS-38	301227088582000	DWH GOM OIL SPILL-West Ship Island Beach, MS	30.2075	-88.9722222	5/7/10	
MS-39	301358088533300	DWH GOM OIL SPILL-East Ship Island Beach, MS	30.23277778	-88.8925	5/7/10	
MS-40	301425088440600	DWH GOM OIL SPILL-West Horn Island Beach, MS	30.24027778	-88.735	5/8/10	
MS-41	301321088353300	DWH GOM OIL SPILL-East Horn Island Beach, MS	30.2225	-88.5925	5/8/10	

MS-42	301208088253600	DWH GOM OIL SPILL-Petit Bois Island Beach, MS	30.2022222	-88.4266667	5/8/10
MS-43	301858089141000	DWH GOM OIL SPILL-Pass Christian Beach, MS	30.3161111	-89.2361111	5/8/10
MS-44	302336088535800	DWH GOM OIL SPILL-BIloxi Beach, MS	30.39333333	-88.8994444	5/8/10
MS-45	302034088325200	DWH GOM OIL SPILL-Pascagoula Beach, MS	30.34277778	-88.5477778	5/8/10
		TEXAS			
TX-46	294456093394801	East Sabine, LA Oil Spill Sample Site	29.74888889	-93.6633333	5/10/10
TX-47	294057093572301	Texas Point, TX Oil Spill Sample Site	29.6825	-93.9563889	5/10/10
TX-48	295542093521701	Sabine Lake, TX Oil Spill Sample Site	29.92833333	-93.8713889	5/10/10
TX-49	293324094220601	High Island, TX Oil Spill Sample Site	29.55666667	-94.3683333	5/10/10
TX-50	293429094332101	East Bay nr Anahuac, TX Oil Spill Sample Site	29.5747222	-94.5558333	5/10/10
TX-51	291815094461001	Galveston Island, TX Oil Spill Sample Site	29.30416667	-94.7694444	5/10/10
TX-52	294408094501101	Trinity Bay nr Beach City,TX Oil Spill Sample Site	29.73555556	-94.8363889	5/11/10
TX-53	292318094430901	Bolivar Peninsula Oil Spill Sample Site	29.38833333	-94.7191667	5/11/10
TX-54	292937094544001	Galveston Bay nr Eagle Pt,TX Oil Spill Sample Site	29.4936111	-94.9111111	5/11/10
TX-55	291251094571401	West Bay, Galveston Is SPk, Oil Spill Sample Site	29.21416667	-94.9538889	5/11/10
TX-56	290512095063101	San Luis Pass, TX Oil Spill Sample Site	29.08666667	-95.1086111	5/11/10

Attachment 2. Location Map of USGS Sampling Sites (7.14.2010)



Appendix B. Field Supplies

This list continues to develop – Users should check the OWQ_Deep_Oil wiki at my.usgs.gov[12]

GOM Equipment and Supplies for USGS Response to the Deepwater Horizon Oil Spill: Post Landfall				
General Field Equipment/Supplies	**Catalog Number**	**Description**	**Source**	**Source Website**
PPE				
PID			Rental or purchase:	http://www.trs-environmental.com/SubCategory/Photoionization_Detectors.aspx?source=google&wm_crID=2933477&wm_lpID=17068927&wm_ctID=355&wm_kwID=10967404&wm_mtID=1&wm_content=0&wm_g_crID=4749194529&wm_g_kw=photo+ionization+detectors&wm_g_pcmt=&wm_g_cnt=0&gclid=CPn0n4K1jqICFYd-5QodT3chZg&wm_kw=photo+ionization+detectors
Calibration Gasses				awaiting guidance from Safety officer
Field Logbook	**550**	Environmental bound Book, Poly Cover	write in the rain	http://www.riteintherain.com/ItemForm.aspx?item=550&Category=6fd10376-a439-4797-95f0-349a58e602ea
Field Form			Website	OWQ_Deep_Oil wiki (my.usgs.gov)
Safety Glasses/Goggles			GSA/open market	
Elbow/shoulder length rubber-coated gloves	**2056**	**Ansell Low-Cost Shoulder-Length Rubber Gloves**	lab safety	http://www.labsafety.com/search/rubber+shoulder/24543486/2056/?GoButton=Go&isredirect=true
Disposable nitrile gloves			one-stop	
Tyvek coveralls			lab safety	http://www.labsafety.com/search/tyvek+pants/24532559/
Tyvek boot covers	**7064P**	**BOOT COVERS TYVEK UNVSL W**	**lab safety**	http://www.labsafety.com/search/tyvek+boot+covers/24532545/7064P/?isredirect=true
Duct, electrical, and Teflon tape			open market	
PFD (Cleanable)		Revere Model 280 Work Vest, Type V, nylon buckle closure, modified as described in Section 3.3	open market (for example, West Marine/Port Supply Model#10967776	http://www.portsupply.com/webapp/wcs/stores/servlet/TopCategoriesDisplay?langId=-1&storeId=50005&catalogId=10001

[12] If access is denied, e-mail or call fwilde@usgs.gov (703-648-6866) or sski@usgs.gov (703-648-6902)

PFD (Standard USGS issue)		Type 3		
General Field Equipment/Supplies	**Catalog Number**	**Description**	**Source**	**Source Website**
Waders/ hip boots (Rubberized)			open market	
Sterile Latex Surgical Gloves	19-014-641	Fisher Scientific		
Cleaning Supplies				
Non-phosphate detergent (Liqui-Nox, Dawn, Simple Green)			Open market	
Spray bottles				
Carboys				
Buckets, three 5-gallon				
Long handled brushes				
Short handled brushes				
Bottle brushes				
Plastic sheeting				
Kimwipes, WypAll X70 cloths				
Roll of police-barrier tape				
Buckets with lids and hanldles				
Teflon bucket liners				
pressurized sprayers				
solvent sprayers				
aluminum foil			open market	
trash bags				
trash containers				
DOT certified metal/plastic containers (liquid waste)				
Kimwipes				
Replacement brushes and wipers				
Detergent/degreaser		Dawn, Liqui-Nox, Simple Green		
Soft brushes				
Cotton swabs				
Waste containers				

General Field Equipment/Supplies	Catalog Number	Description	Source	Source Website
Sample Collection/Processing/Preservation				
Multiparameter QW instrument (Turbidity, DO, pH, Temperature, SC)				
YSI C-spray coating				
Plastic bags, ziplock and trash			Open market	
Rubber bands				
Aluminum foil				
Field Forms				
ASR/COC Forms				
GPS				
Compass				
Tape measure (0.01 ft graduations)				
Survey stakes, flags				
Digital camera				
Logbook				
Ballpoing pen or indelible marker (extra fine tip)				
Sledge hammer				
Wood or metal stake				
Bucket, 2-gallon, for compositing				
Teflon bucket liners				
Teflon bags (small to wear over gloves)				
Polycarbonate tubing 2.5 in. (~6.4 cm) inside diameter, marked at 0.5-in. intervals				US Plastic Corp
Sterile gloves				
Peristaltic pump				
C-flex tubing, clean, (~8ft)				
Sample bottles/containers (App. D)				
Preservation chamber				
Preservation chamber bag				
Hydrochloric acid				
Sulfuric acid, Nitric acid				

Spade or shovel				
General Field Equipment/Supplies	**Catalog Number**	**Description**	**Source**	**Source Website**
Teflon sampling scoop				
Clean spatula (not slotted) or chop knife				
Teflon bucket liner				
10-percent formalin, saturated with sodium borate				
Sample-collection bottles		500-mL fired amber 1-L RA poly	One-stop	
Shipping				
Labels (sample container, shipping)				
FedEx Airbills				
Coolers				
Ice (label field form “ice”)				
Liners for cooler, plastic bags for ice				
Foam/bubble sleeves	S-5990	Bubble Bag 6' X 8"	Uline	
Dry-Ice stickers				
Nylon reinforced tape				
Dry Ice (label field form “dry ice”)				
COC tape	Q150FLD			

Appendix C. Activity Flow Charts

- Preparation for Post-Landfall Sampling, Gulf of Mexico (Figure 2 in text)
- Site setup for Sampling and Equipment Decontamination (Figure 3 in text)
- Water-Column Sampling, Gulf of Mexico Deepwater Horizon Oil Spill 2010 (Figure 4 in text)
- Sediment Sampling, Gulf of Mexico Deepwater Horizon Oil Spill 2010 (Figure 5 in text)

Preparation for Post-Landfall Sampling, Gulf of Mexico

[VOO, Vessels of Opportunity; IC, Incident Command; App, Appendix; PID, Photoiorization detector; COC, Chain of Custody; HASP, Health and Safety Plan; NWQL, National Water Quality Laboratory; HCl, hydrochloric Acid, RA, raw acidified; QC, quality control; WSC, Water Science Center]

Prepare for Sampling

- ✓ Check in with Incident Command
- ✓ Arrange for boat decon or VOO with Incident Command or Unified Command

Health and Safety

- ✓ Record Heat Index (HI)
- ✓ HAZWOper and BP training
- ✓ Check emergency routes, and contacts
- ✓ PID scan
- ✓ Review HASP
- ✓ Setup decontamination zone (EZ, CRZ)

Equipment Purchase and Preparation

- ✓ Review App. B--Equipment list
- ✓ Ensure adequate supplies for field event
- ✓ Prepare field kits
- ✓ Extra batteries, backup equipment, and sample containers
- ✓ Test, fix equipment for proper operation
- ✓ Pre-label bottles when possible
- ✓ Purchase, cut, clean PVC sampling tube and C-Flex/Teflon tubing
- ✓ Check sources of ice and dry ice
- ✓ Peristaltic pump, portable; coolers; Teflon bags
- ✓ Sensor/sonde calibrate, test

Review Work Plan and Site History

- ✓ Print and review App D, Tables 1 and 2
- ✓ PID operation, calibration
- ✓ Review protocols: Decon set up, Sonde prep; sampling (water, Sediment, COC)
- ✓ Check routes for site access, evaluation, emergencies
- ✓ Prepare field logbook
- ✓ Prepare and print: ASR/COC, field forms, labels

Clean and collect equipment-blanks

- ✓ Prepare and obtain appropriate blanking and decon solutions and supplies
- ✓ NWQL 1-L RA and 500 mL glass bottle
- ✓ Teflon homog. bag (QC'd by one WSC)
- ✓ Pump tubing
- ✓ AquaPrep® filter
- ✓ Bailers (optional)
- ✓ Nitrile gloves (rinse thoroughly but no blank) needed
- ✓ Teflon scoop

Autoclave, if necessary:

- ✓ Polycarbonate sampling tubes (do not blank)
- ✓ Small and large Teflon bags
- ✓ Cleaned Teflon scoop or sampling spoons

Check List of Supplies and Reusable Equipment for Decon (See App. B)

For example:

- ✓ Buckets, brushes, kimwipes, absorbent cloths, low-pressure hose/power source, rinse bottles, etc.
- ✓ Methanol, 5 percent HCl solution, detergent (e.g., Dawn, LiquiNox, Simple Green)
- ✓ Deionized water of known chemical composition
- ✓ Source of potable tap water
- ✓ PVC pipe sections (clean or disposable)
- ✓ Metal stakes, Sledge hammer, tools
- ✓ Rubber waders, rubber-coated and nitrile gloves
- ✓ Teflon scoop
- ✓ RA bottle (1L)
- ✓ 500 mL fired glass bottle

Site Set-Up for Sampling and Equipment Decontamination

Mobilize to the Site
Boat access required? Plan decontamination.

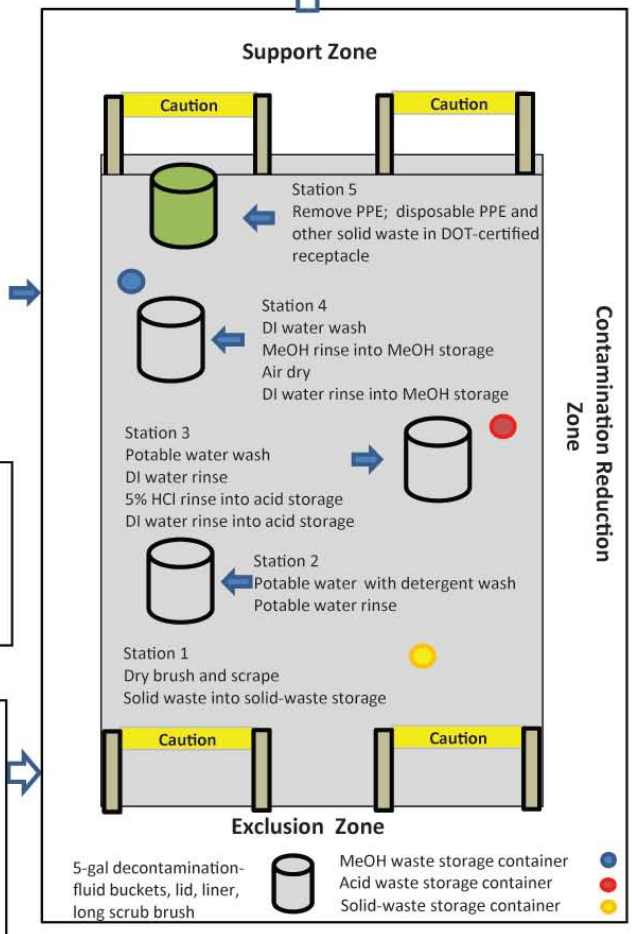
Set up Work Zones (See Diagram)
- **Exclusion Zone (EZ) (Hot Zone)**
Contaminated area or area where samples are to be collected. Enter only in appropriate PPE and with air-monitoring surveillance
- **Contamination Reduction Zone (CRZ)**
Decontamination and removal of PPE
- **Support Zone (SZ)**
Where clean PPE is donned and equipment is prepared prior to sampling and after decontamination

Collect Samples
- ✓ Section 5 and 6: Field Measurements
- ✓ Section 6, Water Samples
- ✓ Section 7, Sediment Samples
- ✓ See App-D - Table 1 Water Samples
- ✓ See App-D - Table 2 Sediment Samples

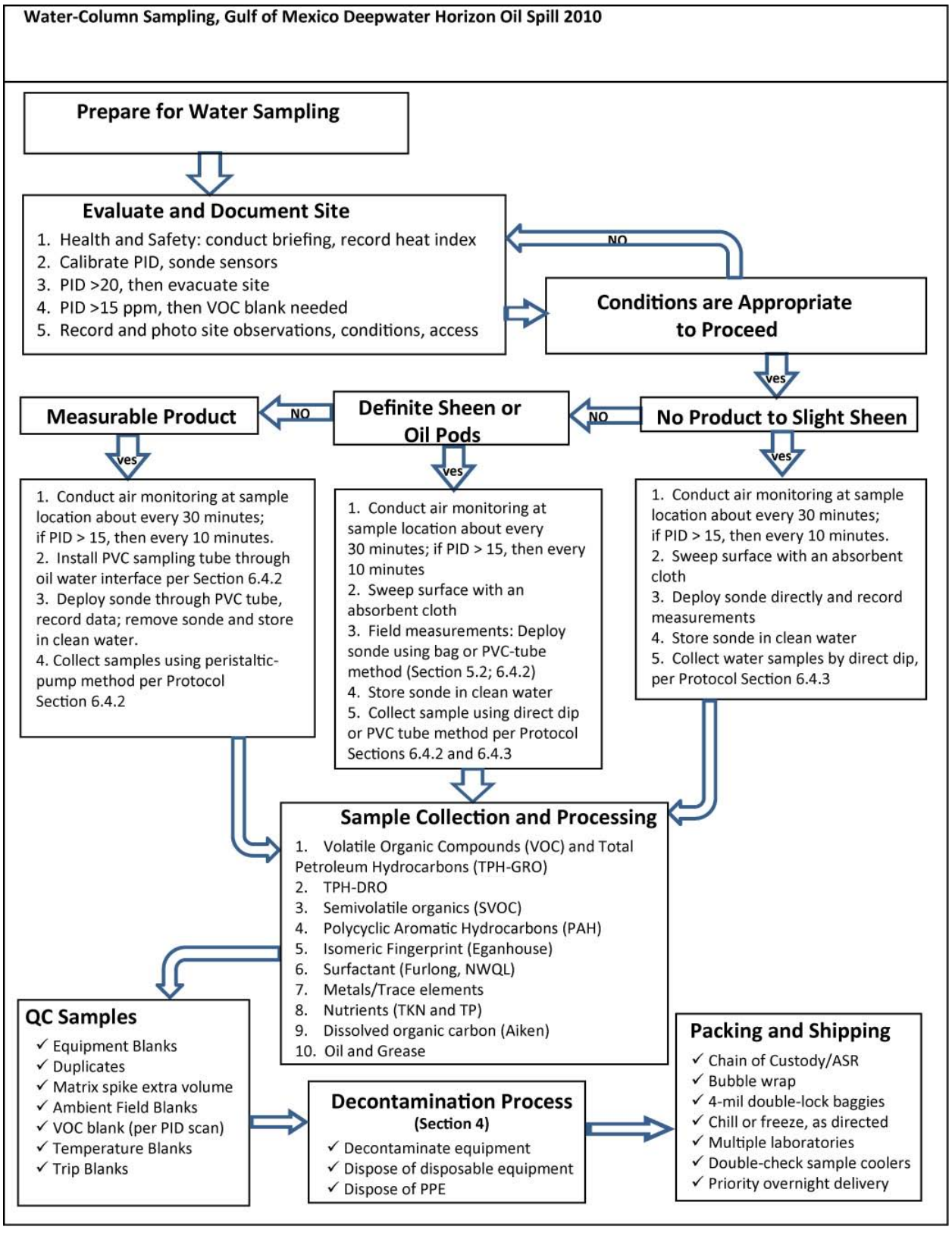
Decontamination Process
- ✓ Decontaminate small equipment, as appropriate to its type and use
- ✓ Clean sonde at Station 2, adding the steps needed per Section 4 procedures
- ✓ Dispose* of disposable equipment
- ✓ Clean or dispose* of PPE, as appropriate, at the end of sampling

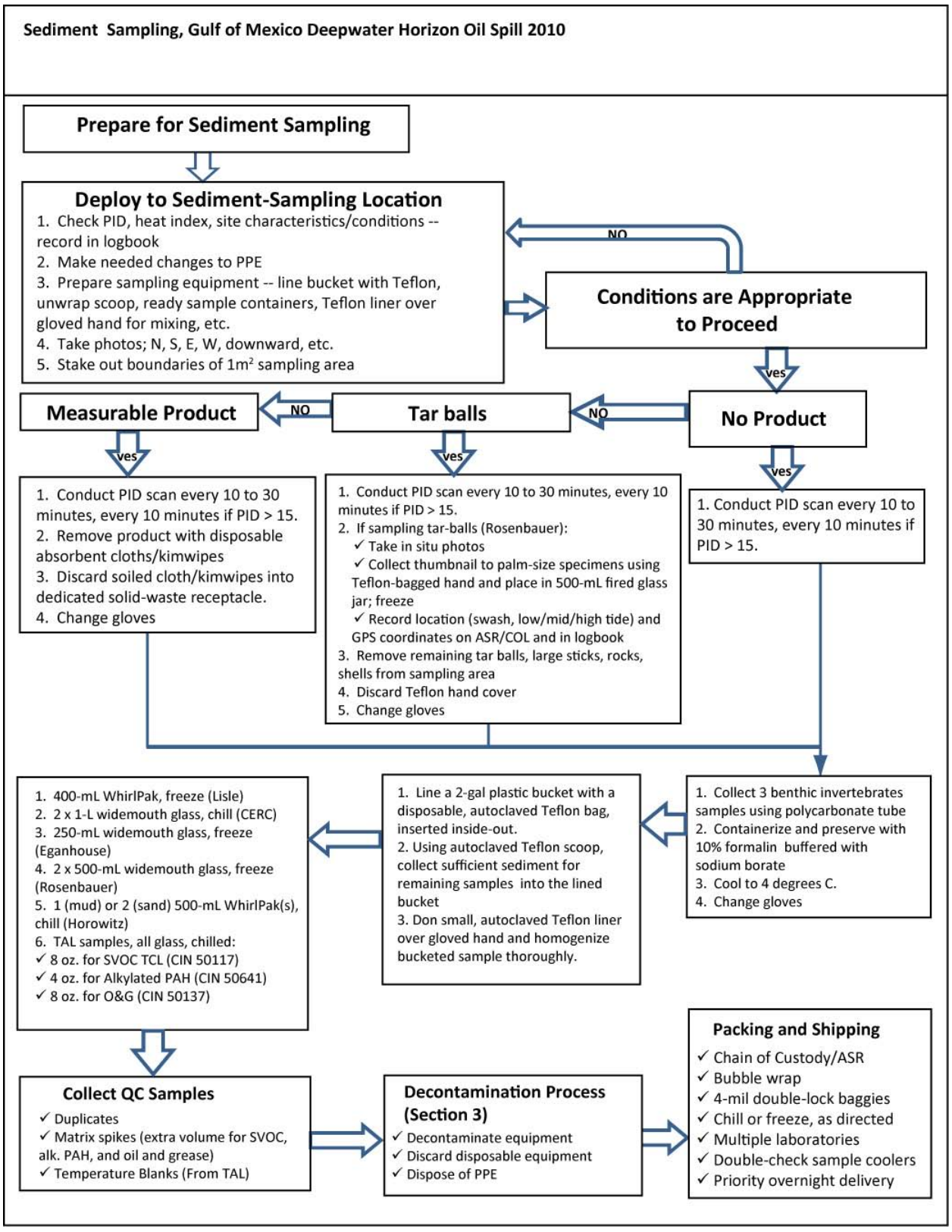
* Use appropriate disposal containers for liquid and solid waste.

Package and Ship Samples
- ✓ Water: See App-D - Table 1
- ✓ Sediment: See App-D - Table 2



Note: Depending on project requirements, soiled equipment may be bagged for transport after completing Station 2 decon procedures and brought to an office facility or laboratory where the acid rinse (Station 3) and methanol rinse (Station 4), may be carried out under controlled conditions.


Water-Column Sampling, Gulf of Mexico Deepwater Horizon Oil Spill 2010
Prepare for Water Sampling
Evaluate and Document Site
1. Health and Safety: conduct briefing, record heat index
2. Calibrate PID, sonde sensors
3. PID >20, then evacuate site
4. PID >15 ppm, then VOC blank needed
5. Record and photo site observations, conditions, access
NO
Conditions are Appropriate to Proceed
yes
No Product to Slight Sheen
NO
Definite Sheen or Oil Pods
NO
Measurable Product
yes
yes
yes
1. Conduct air monitoring at sample location about every 30 minutes; if PID > 15, then every 10 minutes.
2. Install PVC sampling tube through oil water interface per Section 6.4.2
3. Deploy sonde through PVC tube, record data; remove sonde and store in clean water.
4. Collect samples using peristaltic-pump method per Protocol Section 6.4.2
1. Conduct air monitoring at sample location about every 30 minutes; if PID > 15, then every 10 minutes
2. Sweep surface with an absorbent cloth
3. Field measurements: Deploy sonde using bag or PVC-tube method (Section 5.2; 6.4.2)
4. Store sonde in clean water
5. Collect sample using direct dip or PVC tube method per Protocol Sections 6.4.2 and 6.4.3
1. Conduct air monitoring at sample location about every 30 minutes; if PID > 15, then every 10 minutes.
2. Sweep surface with an absorbent cloth
3. Deploy sonde directly and record measurements
4. Store sonde in clean water
5. Collect water samples by direct dip, per Protocol Section 6.4.3
Sample Collection and Processing
1. Volatile Organic Compounds (VOC) and Total Petroleum Hydrocarbons (TPH-GRO)
2. TPH-DRO
3. Semivolatile organics (SVOC)
4. Polycyclic Aromatic Hydrocarbons (PAH)
5. Isomeric Fingerprint (Eganhouse)
6. Surfactant (Furlong, NWQL)
7. Metals/Trace elements
8. Nutrients (TKN and TP)
9. Dissolved organic carbon (Aiken)
10. Oil and Grease
QC Samples
✓ Equipment Blanks
✓ Duplicates
✓ Matrix spike extra volume
✓ Ambient Field Blanks
✓ VOC blank (per PID scan)
✓ Temperature Blanks
✓ Trip Blanks
Decontamination Process
(Section 4)
✓ Decontaminate equipment
✓ Dispose of disposable equipment
✓ Dispose of PPE
Packing and Shipping
✓ Chain of Custody/ASR
✓ Bubble wrap
✓ 4-mil double-lock baggies
✓ Chill or freeze, as directed
✓ Multiple laboratories
✓ Double-check sample coolers
✓ Priority overnight delivery


Sediment Sampling, Gulf of Mexico Deepwater Horizon Oil Spill 2010
Prepare for Sediment Sampling
Deploy to Sediment-Sampling Location
1. Check PID, heat index, site characteristics/conditions -- record in logbook
2. Make needed changes to PPE
3. Prepare sampling equipment -- line bucket with Teflon, unwrap scoop, ready sample containers, Teflon liner over gloved hand for mixing, etc.
4. Take photos; N, S, E, W, downward, etc.
5. Stake out boundaries of 1m² sampling area
NO
Conditions are Appropriate to Proceed
yes
Measurable Product
NO
Tar balls
NO
No Product
yes
yes
yes
1. Conduct PID scan every 10 to 30 minutes, every 10 minutes if PID > 15.
2. Remove product with disposable absorbent cloths/kimwipes
3. Discard soiled cloth/kimwipes into dedicated solid-waste receptacle.
4. Change gloves
1. Conduct PID scan every 10 to 30 minutes, every 10 minutes if PID > 15.
2. If sampling tar-balls (Rosenbauer):
✓ Take in situ photos
✓ Collect thumbnail to palm-size specimens using Teflon-bagged hand and place in 500-mL fired glass jar; freeze
✓ Record location (swash, low/mid/high tide) and GPS coordinates on ASR/COL and in logbook
3. Remove remaining tar balls, large sticks, rocks, shells from sampling area
4. Discard Teflon hand cover
5. Change gloves
1. Conduct PID scan every 10 to 30 minutes, every 10 minutes if PID > 15.
1. Collect 3 benthic invertebrates samples using polycarbonate tube
2. Containerize and preserve with 10% formalin buffered with sodium borate
3. Cool to 4 degrees C.
4. Change gloves
1. Line a 2-gal plastic bucket with a disposable, autoclaved Teflon bag, inserted inside-out.
2. Using autoclaved Teflon scoop, collect sufficient sediment for remaining samples into the lined bucket
3. Don small, autoclaved Teflon liner over gloved hand and homogenize bucketed sample thoroughly.
1. 400-mL WhirlPak, freeze (Lisle)
2. 2 x 1-L widemouth glass, chill (CERC)
3. 250-mL widemouth glass, freeze (Eganhouse)
4. 2 x 500-mL widemouth glass, freeze (Rosenbauer)
5. 1 (mud) or 2 (sand) 500-mL WhirlPak(s), chill (Horowitz)
6. TAL samples, all glass, chilled:
✓ 8 oz. for SVOC TCL (CIN 50117)
✓ 4 oz. for Alkylated PAH (CIN 50641)
✓ 8 oz. for O&G (CIN 50137)
Collect QC Samples
✓ Duplicates
✓ Matrix spikes (extra volume for SVOC, alk. PAH, and oil and grease)
✓ Temperature Blanks (From TAL)
Decontamination Process (Section 3)
✓ Decontaminate equipment
✓ Discard disposable equipment
✓ Dispose of PPE
Packing and Shipping
✓ Chain of Custody/ASR
✓ Bubble wrap
✓ 4-mil double-lock baggies
✓ Chill or freeze, as directed
✓ Multiple laboratories
✓ Double-check sample coolers
✓ Priority overnight delivery

Appendix D. Water and Sediment: Requirements for Sample Containers, Collection/Preservation, Shipping, and Laboratory Locations

Table D1. Water Samples: Containers, Collection/Preservation, Shipping, and Laboratory Locations

Table D2. Sediment Samples: Containers, Collection/Preservation, Shipping , and Laboratory Locations

Table D1. Water Samples: Containers, Collection/Preservation, Shipping, and Laboratory Locations

LABORATORY	**CONTAINER VOLUME AND TYPE -- ANALYSIS**	**COLLECTION and PRESERVATION Wipe all containers clean and dry, check label, before packing.**	**SHIPPING -- Priority Overnight PROTECT SAMPLES FROM CONTACT WITH ICE MELTWATER: Double-bag and seal each sample using heavy-duty ziplock bags and double-bag the ice (total of 4-bag layer between ice and containers). ENSURE THAT COOLERS ARE LEAK-PROOF.**	**SHIPPING ADDRESS**	**TELEPHONE**
Dr. Ed Furlong, NWQL, Denver	2 x 1-L Teflon Bottles (from NWQL) -- Surfactant	Leave sufficient headspace for freezing sample. Wipe bottles free of oil and water. Wrap in clean aluminum foil. **KEEP BOTTLE UPRIGHT.**	Keep sample bottles UPRIGHT. **FREEZE** or ship same day on ice. Include return address label and account number. Include Return-FedEx airbill with COC paperwork.	Dr. E. Furlong, National Water Quality Laboratory, USGS, Bldg 95, Entrance E3, Denver Federal Center, Denver Co, 80225-0046	303 236 3941 fax 303 239 3499
Dr. George Aiken, Boulder, CO (DOC)	125 ml DOC. Analysis: Dissolved Organic Carbon	Collect raw sample in 500ml baked amber glass. Rinse AquaPrep filter with 50 mls of DI water and 50 mls sample, then fill 125-ml DOC bottle; leave headspace. Chill and maintain at or less than 4C without freezing. Ship overnight.	**CHILL to 4C. Place sample bottle in foam or bubble sleeve and seal in zip-locks.** DO NOT FREEZE. Ship chilled at 4C. Include Return-FedEx airbill with COC paperwork.	USGS, Attn: Kenna Butler Suite E127, 3215 Marine St, Boulder, CO 80303	303 541 3009
Dr. Robert Eganhouse, Reston, VA (Isomeric Fingerprinting)	1-L I-Chem or equivalent fired amber glass with lab certification (equivalent to GCC). Analysis: Isomeric Fingerprint	Leave headspace. Close cap tightly and secure with electrical tape. Place sample bottle in protective sleeve. KEEP BOTTLE UPRIGHT. Chill and maintain at or less than 4C without freezing.	**CHILL to 4C.** Place sample bottle in foam or bubble sleeve and Place sample bottle in foam or bubble sleeve and seal in zip-locks. **KEEP BOTTLE UPRIGHT**. **Do not freeze**. Include Return FedEx airbill with COC paperwork	Robert P. Eganhouse, USGS, 12201 Sunrise Valley Drive, MS 432, Reston, VA 20192	703 648 5879

Table D1. Water Samples: Containers, Collection/Preservation, Shipping, and Laboratory Locations.—Continued.

LABORATORY	CONTAINER VOLUME AND TYPE -- ANALYSIS	COLLECTION and PRESERVATION Wipe all containers clean and dry, check label, before packing.	SHIPPING -- Priority Overnight PROTECT SAMPLES FROM CONTACT WITH ICE MELTWATER: Double-bag and seal each sample using heavy-duty ziplock bags and double-bag the ice (total of 4-bag layer between ice and containers). ENSURE THAT COOLERS ARE LEAK-PROOF.	SHIPPING ADDRESS	TELEPHONE
TAL (Test America Laboratories), Pensacola, FL ALL CONTAINERS (EXCEPT "RA") ARE SUPPLIED BY TAL, PLUS ONE VOC TRIP BLANK AND ONE TEMPERATURE BLANK	2 x 40 ml VOA vials w/ septum. Analysis: TCL VOCs (Method 8260B)	See Protocol Section 6 for collection methods. Ensure absence of bubbles in sample. **Unpreserved.** Chill to 4C without freezing.	**CHILL to 4C.** Place sample bottle in foam or bubble sleeve and in sealed zip-locks. **Ship priority overnight,** protected from meltwater and in a leakproof cooler.	Marty Edwards, 3355 Mclemore Drive Pensacola, FL 32514	850 471 6227
	2 x 40 ml VOA vials w/ septum. Analysis: TPH GRO (C6-C10) (Method 8015B)	See Protocol Section 6 for collection methods. Ensure absence of bubbles in sample. **Unpreserved.** Chill to 4C.	**CHILL to 4C.** Place sample bottle in foam or bubble sleeve and in sealed zip-locks. Ship with VOCs, priority overnight, protected from meltwater and in a leakproof cooler.		
	1 x 1L fired amber glass. Analysis: TPH Diesel and Oil-range organics (DRO/ORO) w/ chromatograms (Method 8015B).	Unpreserved. Fill, leaving headspace. Chill to 4C without freezing.	**CHILL to 4C.** Bubble wrap, place in zip-locks and seal. Ship priority overnight, protected from meltwater and in a leakproof cooler.		

Table D1. Water Samples: Containers, Collection/Preservation, Shipping, and Laboratory Locations.—Continued.

LABORATORY	CONTAINER VOLUME AND TYPE -- ANALYSIS	COLLECTION and PRESERVATION Wipe all containers clean and dry, check label, before packing.	SHIPPING -- Priority Overnight PROTECT SAMPLES FROM CONTACT WITH ICE MELTWATER: Double-bag and seal each sample using heavy-duty ziplock bags and double-bag the ice (total of 4-bag layer between ice and containers). ENSURE THAT COOLERS ARE LEAK-PROOF.	SHIPPING ADDRESS	TELEPHONE
TAL (Test America Laboratories), Pensacola, FL ALL CONTAINERS (EXCEPT "RA") ARE SUPPLIED BY TAL, PLUS ONE VOC TRIP BLANK AND ONE TEMPERATURE BLANK	2 x 1L fired amber glass. Analysis: Semivolatile Organic Compounds (SVOC TCL) (Method 8270D)	Unpreserved. Fill, leaving headspace. Chill to 4C without freezing.	**CHILL to 4C.** Bubble wrap, place in sealed zip-locks. Ship priority overnight, protected from meltwater and in a leakproof cooler.	Marty Edwards, 3355 Mclemore Drive Pensacola, FL 32514	850 471 6227
	1 x 1L (32 oz) clear wide mouth glass. Analysis: Oil and Grease HEM (Method 1664A)	Preserved with HCl. Fill, leaving headspace. Check pH and add addition **HCl to pH < 2, if needed. Chill to** 4C without freezing.	**CHILL to 4C.** Bubble wrap, place in zip-locks and seal. Ship priority overnight, protected from meltwater and in a leakproof cooler.		
	250 ml poly, pre-preserved with HNO3 for Metals/Trace Elements analysis. 1 x 1L RA ("raw, acidified") poly bottle from NWQL for sample collection.	Use precleaned, blanked 1-L RA bottle to collect dip sample and fill acid-preserved 250-ml poly bottle. Leave headspace. Check pH and add HNO3 to pH < 2, if needed. Chill to 4C without freezing.	**CHILL to 4C.** Place in sealed plastic bag. Ship priority overnight, protected from meltwater and in a leakproof cooler.		

Table D1. Water Samples: Containers, Collection/Preservation, Shipping, and Laboratory Locations.—Continued.

LABORATORY	CONTAINER VOLUME AND TYPE -- ANALYSIS	COLLECTION and PRESERVATION Wipe all containers clean and dry, check label, before packing.	SHIPPING -- Priority Overnight PROTECT SAMPLES FROM CONTACT WITH ICE MELTWATER: Double-bag and seal each sample using heavy-duty ziplock bags and double-bag the ice (total of 4-bag layer between ice and containers). ENSURE THAT COOLERS ARE LEAK-PROOF.	SHIPPING ADDRESS	TELEPHONE
TAL (Test America Laboratories), Pensacola, FL ALL CONTAINERS (EXCEPT "RA") ARE SUPPLIED BY TAL, PLUS ONE VOC TRIP BLANK AND ONE TEMPERATURE BLANK	250 ml poly, preserved with H2SO4 for Nutrients (TKN and TP)	Use precleaned, blanked 1-L RA bottle to collect dip sample and fill acid-preserved 250-ml brown poly bottle. Leave headspace. Check pH and add additional H2SO4 to pH < 2, if needed. Chill to 4C without freezing.	**CHILL to 4C.** Place in sealed plastic bag. Ship priority overnight, protected from meltwater and in a leakproof cooler.	Marty Edwards, 3355 Mclemore Drive Pensacola, FL 32514	850 471 6227

Table D2. Sediment Samples: Containers, Collection/Preservation, Shipping, and Laboratory Locations.

LABORATORY	CONTAINER VOLUME AND TYPE -- ANALYSIS	COLLECTION and PRESERVATION **Wipe all containers clean and dry, remove sediment from container and cap threads, check label, before packing.**	SHIPPING -- Priority Overnight **PROTECT SAMPLES FROM CONTACT WITH ICE MELTWATER: Double-bag and seal each sample using heavy-duty ziplock bags and double-bag the ice (total of 4-bag layer between ice and containers). ENSURE THAT COOLERS ARE LEAK-PROOF.**	SHIPPING ADDRESS	TELEPHONE
Dr. Amanda Demopoulos, Gainesville, FL (Benthic Invertebrates)	Sediment core in 500 ml plastic jar	Collect sediment core (6.5-cm diameter) from surface to 5 cm depth and preserve onsite with 10% formalin supersaturated with sodium borate. Extrude core into 500-ml jar. Seal lid with duct or electrical tape; label jar "10% buffered formalin." Chill to 4C without freezing.	CHILL to 4C. Wrap sample jar in absorbent paper, put into double ziplocks and seal. Ship within 1 day of collection.	Dr. A. Demopoulos, USGS, Southeast Ecological Science Center, 7920 NW 71st St., Gainesville, FL 32653	352 264 3490
Dr Robert Rosenbauer, Menlo Park, CA	2 x 500-mL I-Chem or equivalent certified fired glass widemouth fired bottle (BGC) -- Analysis: Oil Fingerprint	Freeze samples; no holding time as long as frozen. Fill no more than 80% to allow room for expansion when frozen. Use a kimwipe to dry jars and remove any particles from threads and lid and cap tightly. Secure cap with electrical tape. KEEP JARS UPRIGHT. Double Bag. Freeze if possible	FREEZE. Ship frozen on dry ice if possible. Place sample jars in foam or bubble sleeves and seal in zip-locks. KEEP JARS UPRIGHT. If storing on wet ice freeze sample before shipping.	Dr. R. Rosenbauer, USGS, MS 999, 345 Middlefield Rd, Menlo Park, CA 94025	650 329 4198

Table D2. Sediment Samples: Containers, Collection/Preservation, Shipping, and Laboratory Locations.—Continued.

LABORATORY	CONTAINER VOLUME AND TYPE -- ANALYSIS	COLLECTION and PRESERVATION Wipe all containers clean and dry, remove sediment from container and cap threads, check label, before packing.	SHIPPING -- Priority Overnight PROTECT SAMPLES FROM CONTACT WITH ICE MELTWATER: Double-bag and seal each sample using heavy-duty ziplock bags and double-bag the ice (total of 4-bag layer between ice and containers). ENSURE THAT COOLERS ARE LEAK-PROOF.	SHIPPING ADDRESS	TELEPHONE
Dr Robert Rosenbauer, Menlo Park, CA	1 x 125 (or 250) mL I-Chem or equivalent certified fired glass widemouth fired bottle (BGC) -- Analysis: Tar balls -- weathering characteristics	Collect tar balls wearing Teflon gloves, sized from thumbnails to palm-sized into 500 wide-mouth jar. Chill to 4C.	CHILL to 4C. Place sample jar in foam or bubble sleeves and seal in ziplocks. KEEP JARS UPRIGHT.	Dr. R. Rosenbauer, USGS, MS 999, 345 Middlefield Rd, Menlo Park, CA 94025	650 329 4198
Dr. Art Horowitz, Norcross, GA	1 x 500-mL or 2 x 500-mL WhirlPak (see Collection) -- Analysis: Metals and trace elements; nutrients	Fill WhirlPak(s) from the bulk sample composite. Collect 1-kg in two 500g WhirlPaks if sediment is sand-sized. If dominant grain-size consists of fines or mud, fill one 500g WhirlPak. Keep in dark and chilled. DO NOT FREEZE.	CHILL, DO NOT FREEZE. Keep in dark and chilled at 4C. Double-bag. Ship overnight asap no later than Wednesday. For samples collected on Thursday, keep samples chilled and in the dark until they can be shipped on Monday.	Dr. A. Horowitz, Georgia Water Science Center, Peachtree Business Center, Suite 130, 3093 Amwiler Rd, Atlanta, GA 30360	770 903 9153
Dr. John Lisle, St. Petersburg, FL	400 ml in double WhirlPak -- Analysis: Microorganisms	Use sterile equipment. Fill WhilPak from the bulk sample composite. FREEZE sample to -20C.	FREEZE. Ship double-bagged sample overnight on dry ice, maintain sample at -20C until delivered to lab. Isolate samples from meltwater.	Dr. J. Lisle, USGS, Center for Coastal Watershed Studies, 600 4th Street-South, St. Petersburg, FL 33701	727 803 8747 x3140 Office, x3094 Lab,

Table D2. Sediment Samples: Containers, Collection/Preservation, Shipping, and Laboratory Locations.—Continued.

LABORATORY	CONTAINER VOLUME AND TYPE -- ANALYSIS	COLLECTION and PRESERVATION **Wipe all containers clean and dry, remove sediment from container and cap threads, check label, before packing.**	SHIPPING -- Priority Overnight **PROTECT SAMPLES FROM CONTACT WITH ICE MELTWATER: Double-bag and seal each sample using heavy-duty ziplock bags and double-bag the ice (total of 4-bag layer between ice and containers). ENSURE THAT COOLERS ARE LEAK-PROOF.**	SHIPPING ADDRESS	TELEPHONE
Dr. Robert Eganhouse, Reston, VA	1 X 250 mL (8 oz) I-Chem or equivalent certified fired glass wide-mouthed fired jar(BGC) -- Analysis: Isomeric Fingerprint	Fill jar 1/2 to 2/3 full Fill from the bulk sample composite. Use a kimwipe to remove any particles from threads and lip, tightly seal cap, secure cap with electrical tape. FREEZE. KEEP JARS UPRIGHT, Freeze samples or chill on regular ice and protect from meltwater	FREEZE or ship chilled at 4C if shipping within 1 day of collection. Place sample jar in foam sleeve, double bag with heavy zip-lock bag and seal. Protect from meltwater.	Robert P. Eganhouse, USGS, 12201 Sunrise Valley Drive, MS 432, Reston, VA 20192	703-648-5879
USGS Marine Ecotoxicology Research Station TAMU-Corpus Christi Center for Coastal Studies	2 x 1-L clear or amber wide-mouth glass bottle (BGC) -- Analysis: Pore-water toxicity	Fill bottles to jar threads from the bulk composite. Use a kimwipe to remove any particles from threads and lip, tightly seal cap, secure cap with electrical tape, place sample jar in foam sleeve, double bag with heavy zip-lock bag. KEEP JARS UPRIGHT. DO NOT FREEZE. Keep samples at 4C.	CHILL at 4C. DO NOT FREEZE. Pack jars with bubble wrap, place into double-bagged ziplocks, and seal.	Dr. Robert Carr or Dr. James Biedenbach USGS/BRD Marine Ecotoxicology Research Center 6300 Ocean Dr. NRC Suite 3200, Unit 5867 Corpus Christi, TX 78412	361 825-3217 or 361-825-3216 Fax (361) 825-3270

Table D2. Sediment Samples: Containers, Collection/Preservation, Shipping, and Laboratory Locations.—Continued.

LABORATORY	CONTAINER VOLUME AND TYPE -- ANALYSIS	COLLECTION and PRESERVATION **Wipe all containers clean and dry, remove sediment from container and cap threads, check label, before packing.**	SHIPPING -- Priority Overnight **PROTECT SAMPLES FROM CONTACT WITH ICE MELTWATER: Double-bag and seal each sample using heavy-duty ziplock bags and double-bag the ice (total of 4-bag layer between ice and containers). ENSURE THAT COOLERS ARE LEAK-PROOF.**	SHIPPING ADDRESS	TELEPHONE
Test America, Pensacola, FL	1 x 8 oz wide mouth jar -- Analysis: Oil & Grease HEM (Method 1664A, CIN 50137)	Fill from bulk sample composite. Use a kimwipe to remove any particles from threads and lip, tightly seal cap. Double bag, chill to 4C.	CHILL at 4C. Wrap jar in bubble wrap, place into double-bagged ziplocks, and seal. Ship overnight.	Marty Edwards, 3355 Mclemore Drive Pensacola, FL 32514	850-471-6227
	1 x 4 oz wide mouth jar -- Analysis: Alkylated PAH and PAH (Method 8270C SIM;CIN 50641)	Fill from bulk sample composite. Use a kimwipe to remove any particles from threads and lip, tightly seal cap. Double bag, chill to 4C.	CHILL at 4C. Wrap jar in bubble wrap, place into double-bagged ziplocks, and seal. Ship overnight.		
	1 x 8 oz clear wide mouth jar -- Analysis: SVOC TCL (Method 8270D; CIN 50117)	Fill from bulk sample composite. Use a kimwipe to remove any particles from threads and lip, tightly seal cap. Double bag, chill to 4C.	CHILL at 4C. Wrap jar in bubble wrap, place into double-bagged ziplocks, and seal. Ship overnight.		

Appendix E. Health and Safety

Appendix E-1. Health and Safety Plan Package

Appendix E-2. Job Hazard Analysis

Appendix E-3. USGS Safety Bulletin (7/21/2010): Personal Flotation Device Selection and Use

Appendix E-4. Contacts for Deepwater Horizon Incident Response (current as of 8/6/2010)

Appendix E-5. Instructions for British Petroleum (BP) Site-Specific Training

Appendix E-6. Example of Incident-Command Decontamination Locations for July 13, 2010

Appendix E-1: Health and Safety Plan Package

USGS personnel working under the direction of the Incident Command or other Federal Agency are to follow that organization's HASP.

USGS HASP requirements for response to the Gulf of Mexico Deepwater Horizon oil spill are fulfilled by assembling a USGS DWH GOM HASP package, which should be kept on hand when deploying to the field site. This package includes the following documents (the following HASP elements also can be accessed through a www.my.usgs.gov wiki[13]):

1. **Agency HASPs.** A HASP provided by the Incident Command (IC) or Agency under whose jurisdiction the work will be conducted is required. In this case, the HASP provided by the Fish and Wildlife Service (FWS) will suffice, unless directed otherwise.

    i. U.S. Coast Guard (http://www.uscg.mil/forms/ics/ICS_208_CG.pdf),

    ii. Fish and Wildlife Service (http://internal.usgs.gov/ops/safetynet/FWS%20WIldlife%20Branch%20HASP%20(MC%20252%20Oil%20Spill).pdf)

2. **The Daily Operational and Safety Situational Report (the "shift" or operations plan).** The Shift Plan – which usually covers a 48-hour time period – is obtained from the designated IC safety or Industrial Hygiene staff on or for the day(s) of field deployment. Arrangements can be made to receive the Shift Plan via e-mail for the time period of planned field deployment to avoid delay of field work by contacting the USGS Bureau Industrial Hygienist (Anthony Zepeda, 703-648-7551), or by contacting:

    i. **Houma LA Incident Command** - 1697 Highway 311, Houma LA 70395, Main 985-493-7600; Operations 985-493-3343; mc252decon@gmail.com

    ii. **Mobile AL Incident Command** - One South Water Street Mobile AL 36602, 251-442-1938.

3. **Evacuation Plan.** The Evacuation Plan generally is separate from the Shift Plan. Evacuation plans are specific to and provided either by the Huoma, LA or Mobile, AL Incident Command Sectors, as appropriate. The field team should request the latest Evacuation Plan when requesting the Shift Plan and include it in their HASP package. Eamples are linked to the HASP Package of the my.usgs.gov wiki (see footnote #12).

4. Job Hazard Analysis (JHA). A draft JHA for Houma GOM-DWH is included in this appendix (E-2) and is linked on the HASP Package section of the wiki (footnote #12).

5. Section 3.0 of this Sampling Protocol. A copy of this section is linked on the HASP Package section of the my.usgs.wiki (see footnote #12).

[13] This wiki is readily accessible by USGS personnel; non-USGS personnel should contact the Office of Water Quality (703-648-6862 or 703-648-6866 or 703-648-6902 for access privileges): https://my.usgs.gov/josso/signon/login.do?josso_back_to=https://my.usgs.gov/OWQ_Deep_OilWiki/josso_security_check

Consideration should be given to supplementing the HASP with additional topical information to cover health, safety, and hazards conditions that may be unique to USGS sampling sites. For this purpose, the USGS Template HASP for Oil Impacted Areas can be used and amended: http://internal.usgs.gov/ops/safetynet/HASP%20for%20Oil%20Spill%20Impacted%20Areas.doc Supplemental information can be found at http://1stop.usgs.gov/safety/topic/jha/index.html .

Appendix E-2: Job Hazard Analysis

Job Hazard Analysis

- Check or highlight the numbered box(s) for all significant safety concerns this project should address. Significant safety concerns are commonly those that require training, purchase of safety equipment, or specialized preparation to address potentially hazardous conditions.

- Identify any unlisted safety concerns at bottom of the page.
- Provide details on the back of this page.

Project Title (Short)_____

Field Team / Supervisor_____

Site ID and Date_____

√	Safety Concerns
1.	Wading, bridge, boat, or cableway measurements or sampling
2.	Working on ice covered rivers or lakes
3.	Measuring or sampling during floods
4.	Well drilling; borehole logging
5.	Electrical hazards in the work area
6.	Construction
7.	Working in remote areas, communication, office call in procedures
8.	Ergonomics, carpal tunnel syndrome
9.	Field Vehicles appropriate for task?- Safety screens, equipment restraints.
10.	All terrain vehicles, snowmobiles
11.	Helicopter or fixed wing aircraft usage
12.	Site access
13.	Hypothermia or heat stroke
14.	Hantavirus, Lyme Disease, Histoplasmosis, Pfiesteria, Others?
15.	Contaminated water with sanitary, biological, or chemical concerns
16.	Immunizations
17.	Laboratory or mobile laboratory. Chemical hygiene plan.
18.	Hazardous waste disposal
19.	Hazardous waste site operations
20.	Confined space
21.	Radioactivity

22.	Respiratory protection
23.	Scuba Diving
24.	Electrofishing
25.	Use and disposal of chemical reagents
26.	
27.	
28.	

(Job Hazard Analysis continued on next page.)

Box no.	For each numbered box checked on the previous page, briefly: A. Describe the safety concern as it relates to this project. B. Describe how this safety concern will be addressed. Include training, safety equipment and other actions that will be required. C. Estimate costs.
1.	Wading in Gulf of Mexico surf zone to 3 feet of water. 2 to 3-person team working at sampling location, each with USGS-approved PFD, waders, and PPE, as described in the USGS Gulf of Mexico Deepwater Horizon (GOM DWH) Sampling Protocol.
7.	Remote sites may not have 911 access; precautions are taken to have on hand cell phones or radios and emergency contact numbers.
9.	Field vehicles, including motorcraft, comply with DOI/USGS regulations and standards, include proper http://1stop.usgs.gov/safety/topic/jha/index.htmlsafety equipment, chemical spill kits, and MSDS sheets.
12.	Access to hot zones is verified daily with the Coast Guard Incident Command.
13.	Summer conditions and PPE requirements could aggravate potential for hypothermia or heat stroke; HASP is on hand that details personnel behavior and work constraints when working under these conditions, including rest periods, liquid intake, and emergency procedures.
15.	Potential exposure to crude oil products. HASP and GOM DWH Sampling Protocol dictate the PPE and safe sample-handling procedures. Minimum of 24 hours of HazWOper training is current and completed.
17.	Mobile laboratory contains and conforms to the WSC chemical hygiene plan.
18.	Oil-soiled disposable equipment and garments and cleaning solutions will be disposed in accordance with the OSHE and USGS protocols, as described in the USGS GOM DWH Sampling Protocol and in accordance with State and local regulations.
19.	Training has been completed for setting up and working in Hot (Exclusion) zones, Contamination Reduction Zones, Safety Zones, and a Contaminant Corridor and is detailed in the USGS GOM DWH Sampling Protocol. Sampling and decontamination activities will be carried out using these procedures.
22.	Potential exists for volatile hydrocarbon exposure to the respiratory system. The field team will follow the exposure-detection protocol, monitoring exposure levels using a PID while on site as directed in the USGS GOM DWH Sampling Protocol, evacuating the site at a PID measurement of 20 ppmv and 5 ppm for Benzene, and executing the evacuation procedures provided by Incident Command and informing the Industrial Hygienist (IH) on duty of the evacuation. Field personnel will not return to the site until it is cleared by the IH and will not be working under conditions that require use of a respirator.

25.	Potential contact with chemical sample preservatives: Formalin, sulfuric acid, nitric acid, and hydrochloric acid. The specific JHAs for these substances are included in this HASP and field personnel have been briefed regarding the hazards and proper use and handling of these chemical substances.

Discussed job hazard analysis (JHA) with Water Science Center's

Collateral Duty Safety Officer and/or copy of JHA given to **Yes____ No____**

Collateral Duty Safety Officer **Yes____ No____**

Science Center Director/Supervisor _____ Date _____

Regional Program Officer _____ Date _____

(Job Hazard Analysis continued on next page.)

Appendix E-2, Continued

JOB HAZARD ANALYSIS PLAN FOR (PROJECT TITLE):

INSTRUCTIONS FOR EMPLOYEES:
Each employee shall comply with occupational safety and health standards and all rules, regulations, and orders issued pursuant to this project, which are applicable to his or her own actions and conduct. Management is responsible to ensure that all safety policies are implemented and monitored at the field level. Supervisors must ensure that employees are informed of safety policies; that the policies are integrated into field operations; and that they are carried out in a proper and consistent manner. However, once you have received training and have been assigned an activity, most of the responsibility for personal safety and that of others is yours. Your first responsibility is to think for yourself. Both supervisors and employees will be held accountable if safety policies are not followed.

PREPARING FOR THE FIELD

In preparing yourself, consider the following elements. Many of the tasks assigned to USGS employees require strenuous exercise, sometimes under adverse weather conditions.

Adequate planning for field assignments includes: Discussing the assignment thoroughly with your supervisor to ensure that you understand what is expected, why it needs to be done, and how it should be accomplished. Know where the nearest emergency medical facilities are located; make plans on how to contact these facilities if you are alone and severely injured (cellular phone). Reviewing maps, property descriptions, and notes made by yourself and others on previous visits to ensure that you are aware of site conditions and potential hazards that may exist. Contacting landowners and public officials to inform them of your plans and receive permission for access. Appropriate personal gear may include: Adequate clothing for weather conditions. Proper footgear that you will need for fieldwork, including hiking boots, steel-toed safety shoes, hip boots, hardhats, and waders. A PFD is required when working on boats and or while wading into the surf zone and wetland or marsh areas (see PFD Safety Bulletin dated 7/21/2010).

A list of required tools, instruments, and supplies should be made when planning your trip and these items should be checked to ensure they are in good operating condition before you start your trip (these are listed in Appendix B of the USGS GOM-DWH Sampling Protocol (https://my.usgs.gov/OWQ_Deep_OilWiki/). An office Call-in policy will be in effect for all field activities. **Field personnel engaged in response to the Deepwater Horizon oil spill must obtain the daily or 48-hour Operational Plan (Shift Plan) before deploying to the field site, either from the USGS Bureau or Eastern Region Industrial Hygienist**

(A. Zepeda, 703-648-7551; B. Demith, 703-648-4636) or from the Houma Sector Unified Command FWS Safety Officer (Jack Morrow, 404-408-7226, john_morrow@fws.gov).

We cannot eliminate all the hazards associated with our jobs. We can, however, reduce these hazards to reasonable risks. The intent of Job Hazard Analyses (JHAs) is to identify the hazards associated with our jobs and then develop realistic actions that can be used to reduce these hazards to reasonable workplace risks.

Additional JHA information for task-specific work is available on the WRD Safety Homepage http://1stop.usgs.gov/safety/topic/jha/index.html.

SAMPLING IN THE GULF OF MEXICO

Detailed instructions are provided in the USGS *Sampling Protocol for Post-Landfall Deepwater Horizon Oil Release, Gulf of Mexico, 2010: Addendum to Standard USGS Methods for the Collection of Water, Sediment, Benthic Invertebrates, and Microorganisms* (Sampling Protocol) and in the updated information posted in the OWQ_Deep_Oil Wiki, previously referenced. Field personnel must become familiar with the contents of the Sampling Protocol and abide by all the health and safety requires described, including the mandatory HazWOper and other training, PPE, and air-monitoring requirements, and are to check the wiki for bulletins and updates that affect personnel health, safety, and ability to perform their duties.

SAMPLING AND MEASUREMENTS BY WADING

Personal Flotation Devices (PFD's) are required in all operations near, in, or over water except in those cases where an approved site-specific Job Hazard Analysis (JHA) defines the conditions for an exemption (refer to the ***U.S. GEOLOGICAL SURVEY (USGS)***
SAFETY BULLETIN: *Personal Flotation Device (PFD) Selection/Use*, issued 7/21/2010*)*. In areas of potential contamination appropriate PPE must be worn, as described in the Sampling Protocol referenced above. Prevent water from contacting your skin.

FLOODS

Rain can fall at a rate of several inches per hour and rapidly create dangerous conditions in the area where you are working. Weather forecasts, evacuation plans, and the daily briefing provided by the local Incident Command are necessary in planning activities to ensure your safety. Maintain an updated copy of your floodplan. Maintain regular office and IC contact during emergency conditions. Have the proper rescue equipment on hand and use it according to your plan. Make sure you have emergency communication capability in case of an accident. Raingear must meet color requirements of the state and reflective requirements of ANSI Class III garments.

REMOTE AREAS, COMMUNICATIONS

Mobile telephones provide a minimum precaution. Satellite communication services might be available for remote areas where cellular service is not available. Make an itinerary for every

field trip and leave a copy at the office and with the IC in addition to family or colleagues. Schedule times to check in at work and with family or colleagues when field trips require overnight stays. Follow the established schedule. Notify all concerned parties if your schedule changes. Obtain or reserve communication equipment, such as a cellular phone or two-way radio. It's a good idea for all field crews to be aware of any potential medical conditions or treatments for existing medical conditions of the field-team members. Examples of these conditions would include severe allergic reactions, Diabetes, coronary problems, heat stress, etc.

ERGONOMICS

Work-related musculoskeletal disorders (MSD) result when there is a mismatch between the physical capacity of workers and the demands of the job. Many of these are caused or aggravated by work related stressors such as such as lifting, reaching, pulling, pushing, and bending. Get assistance in moving heavy or large items to reduce back injuries.

FIELD VEHICLES

It is required that the installation of barriers behind the front seats of all vehicles that are used to carry heavy equipment is enforced. Defensive driver training will be given to all employees who are expected to operate motor vehicles on the job. All weights, compressed gas cylinders, and all other heavy or large items shall be appropriately secured in the vehicle. Gasoline, methanol, and other hazardous materials should be transported in leak proof containers (safety can) and secured to prevent movement and transported to prevent release of fumes. For all vehicles used in field situations, an appropriate fire extinguisher shall be securely mounted and easily accessible. Vehicle maintenance and condition are the responsibility of the users.

Field Vehicles Must Have The Following Safety Equipment:

Fire extinguisher, First Aid kit, PFD's, PID, ANSI Traffic vests, Hardhat, Safety Glasses, Gloves (leather, cloth, chemical resistant), Traffic control lights, cones, emergency signs.

SITE ACCESS

Working in and around the surf zone and wetlands or marshes will subject you to conditions that can cause slips, falls, contact with contaminated water and sediments, impede mobility, and that could result in serious injury to you and your coworkers. You can't avoid all potential dangers, but you can minimize the risk of accidents by considering the following guidelines.

- Avoid steep slopes and navigate slippery conditions with care, using the buddy system.
- Do not enter the surf zone under rough surf conditions.
- When navigating through deep marsh muds, keep moving to avoid sinking into the muck and becoming immobilized.
- Adhere to PFD, PPE, and all other safety requirements.
- Be alert to significant wildlife threats, such as the potential to encounter alligators, snakes, or other domestic and wild animals and be prepared to take appropriate preventive and defensive action (*National Field Manual for the Collection of Water-Quality Data,* Chapter

9). Biting insects, such as mosquitoes, chiggers, ticks, and various flies, are generally of less immediate hazard than stinging insects, but they may be carriers of disease.

DEALING WITH HOSTILE PERSONS

Be aware of radical or strong political groups operating in the area. Familiarize yourself with any controversial issues or illegal activities in the area you will be working. Be able to briefly explain the necessity for the data collection you are charged with. Formulate a plan for dealing with hostile people that includes avoidance or calm, deliberate departure from their presence.

HYPERTHERMIA

Hyperthermia is a condition of increased body temperature caused by exposure to excessive heat. Contributing factors are physical exertion, clothing, humidity, lack of air movement, and temperature, but the most important factor is body hydration. The normal body requirement for fluids in temperate regions is 2 1/2 quarts per day; GOM conditions will require more fluid. Early warning symptoms of Hyperthermia are chilling, a throbbing pressure in the head, unsteadiness, dizziness, nausea, dry skin (either hot and red or cool and pale), rapid pulse, and muscle pains and spasms.

VIRAL AND BACTERIAL ISSUES

USGS policy on respiratory protection and provides generic guidelines to assist centers in development of a safety program for employees who work in an environment with potential exposure to respiratory hazards. Respirators may not be used without appropriate medical surveillance and clearance.

USGS personnel should assume that any water they sample, measure or gage may be contaminated with pathogenic organisms. It should be a regular practice after sampling to thoroughly disinfect with a biocidal agent (for example, germicidal soap or alcohol based cleaners) any exposed skin that has come in contact with the water.

CONTAMINATED WATER AND SOIL - SAMPLING WASTEWATER DISPOSAL

Wear appropriate gloves and eye protection. Prevent water from contacting your skin. Appropriate immunizations are made available on a voluntary basis. Carry appropriate disinfecting solutions for cleaning of hands, equipment and materials. Calibration standards, decontamination and other cleaning solutions, and chemical preservatives must be handled and disposed of with respect to local environmental policies. Process samples with care. Always use appropriate gloves and safety glasses when handling samples and preservatives. Biohazards must be appropriately labeled, stored and disposed according to local regulations.

LABS AND MOBILE LABS

Each USGS vehicle performing water quality work is considered a mobile lab. Mobile labs must meet the requirements of chemical transportation regulations of the DOT. Each vehicle will be supplied with a copy of the district chemical hygiene plan, Material Data Safety Sheets (MSDS) for any chemical carried and supplied with appropriate personal protective equipment. Any

USGS personnel using chemicals shall be appropriately trained through lab safety, hazard communications training. Normally it is not necessary for USGS vehicles to be placarded. Mobile labs, including water-quality vehicles will meet the same standards of facility labs. Each vehicle will be supplied with chemical hygiene plans, MSDS's, PPE, emergency eye wash, JHA's appropriate to job tasks.

FORMALIN AND FORMALDEHYDE, DRY ICE, H_2SO_4, HCl, HNO_3

Formalin is a teratogen, which can cause adverse birth and reproductive effects. It is also a mutagen, which can cause DNA damage. If exposure exceeds 0.75 ppm for 8 hours (TWA) and greater than 2.0 ppm for and 15 minute period; all provisions listed in 29 CFR 1910.1048 shall apply. Wear appropriate gloves or clothing to prevent exposure. Wear safety goggles. Keep formalin from contact with alkalis, acids, and phenols. Formalin or formalin-preserved samples will not be transported in the passenger compartments of vehicles. Wash thoroughly after handling formalin. http://1stop.usgs.gov/safety/topic/jha/formalin.html

DRY ICE

Dry ice will be used to preserve specific samples for the GOM-DWH project and must be handled in accordance with the dry-ice JHA: http://1stop.usgs.gov/safety/topic/jha/DryIce.pdf

ACID SAMPLE PRESERVATIVES

Some samples will be preserved with nitric (HNO_3), hydrochloric (HCl), or sulfuric (H_2SO_4) acid, which must be handled as stipulated in the following JHAs:

HNO_3 and HCL: http://1stop.usgs.gov/safety/topic/jha/acid_hcl_hno3.html

H_2SO_4: http://1stop.usgs.gov/safety/topic/jha/acid_h2s04_amps.html

DECONTAMINATION AGENTS

Chemical substances used for equipment cleaning and decontamination may include methanol (MeOH) and nitric or hydrochloric acids. The ASR referenced above for nitric and hydrochloric acid applies to the use of these chemicals as cleaning agents.

MeOH: http://1stop.usgs.gov/safety/topic/jha/methanol.htm

SAMPLING IN WEATHER EXTREMES

Fieldwork often is necessary under adverse atmospheric and other environmental conditions. Prepare for extreme conditions that might be experienced in your area of the country. Before leaving for the field, check the weather forecast using one or more of these options: the local television station, the national weather channel, the local land/marine weather band channel that constantly repeats current and future weather conditions, or computer networks. Extremes of air temperature occur in all parts of the country. The ideal comfort range for humans is between 16 to 32ºC (60 to 90ºF). Hypothermia and Hyperthermia normally occur in temperatures outside this range.

Do nothing that will endanger the public. Use vehicle light bar (flashing lights), consult traffic control plan, and wear PFD or reflective vest. Do not park on bridge unless known to be safe. Don't attempt a wading measurement if there is any doubt that you will be able to safely cross the stream.

PERSONAL PROTECTIVE EQUIPMENT (PPE) AS REQUIRED AND APPLICABLE

FIELD WORK
- PERSONAL FLOTATION DEVICE (PFD)
- HARD HAT
- SAFETY GLASSES
- GLOVES (WORK AND CHEMICAL RESISTANT)
- HIP OR CHEST WADERS WITH OR WITHOUT STEELTOES & SHANKS
- STEEL TOED BOOTS
- CELL PHONE
- REFLECTIVE CLOTHING
- BRIDGE AND TRAFFIC SAFETY PLAN AND EQUIPMENT
- TRIP PLAN

BOATING
- PFD
- USCG REQUIRED EQUIPMENT
- TRIP/FLOAT PLAN

WATER QUALITY
- PFD
- ANTIBACTERIAL CLEANERS
- SAFETY GLASSES
- GLOVES (CHEMICAL)
- GROUND FAULT INTERUPTORS (GFI) FOR USE WITH AC PUMPS
- IMMUNIZATIONS

CONSTRUCTION
- PFD
- HARD HAT
- SAFETY GLASSES
- GLOVES
- HEARING PROTECTION
- CLIMBING HARNESS
- GROUND FAULT INTERUPTORS (GFI) FOR USE WITH POWER TOOLS

Appendix E-3. USGS Safety Bulletin (7/21/2010): Personal Flotation Device Selection and Use

U.S. GEOLOGICAL SURVEY (USGS) **SAFETY BULLETIN:** *Personal Flotation Device (PFD) Selection/Use*	**DATE ISSUED:** ***07/21/10***	**PAGE:** ***1 of 3***
AREA AFFECTED: ***Gulf of Mexico (GOM)*** ***Deepwater Horizon Oil Spill Response/Cleanup Areas***	**OPERATIONAL PERIOD:** ***Remains in effect for the duration of USGS GOM Deepwater Horizon Oil Spill Activities or until superseded by supplemental guidance issued after 7/21/2010.***	

This Safety Bulletin provides clarifying information regarding Personal Floatation Device (PFD) use by U. S. Geological Survey personnel working within the Gulf of Mexico (GOM) Deepwater Horizon Oil Spill affected areas. This message is provided to answer specific questions raised by USGS employees regarding Agency requirements for PFD's. It does not address aviation related PFD use requirements.

Agency personnel must comply with USGS PFD policy requirements [e.g. 445-2-H, Chapter 31, 31.4 (A) (6)] and adhere to any supplemental Agency requirements established in response to GOM Deepwater Oil Spill watercraft related activities. USGS employees responding to any affected GOM area involving watercraft will provide their own PFD according to USGS Policy and supplemental information contained herein. If you are responding to any GOM affected area and do not have a PFD, contact your immediate supervisor and make arrangements to acquire one PRIOR to assignment or mobilization. If USGS employees are assigned to a Vessel of Opportunity (VOO), you are required to wear your own PFD, meeting Agency PFD requirements unless the VOO Operator mandates otherwise. (An example of this would be during extreme weather conditions or working on open decks of larger vessels where the VOO Operator provides a higher level of PFD safety.)

Question 1: Are personnel required to wear a PFD while on-board USGS, Partner, Agency, BP VOO, or any other GOM spill assigned watercraft?

Yes. Although there are some exceptions provided in USCG, DOI and USGS policies, all personnel working aboard GOM Oil Spill assigned watercraft are required to wear a PFD. Such exceptions are typically based on vessel size/class and/or location of personnel on vessel (e.g., on the deck, in enclosed cabin areas, and at the discretion of the watercraft operator at other locations on the vessel. In regards to these exceptions, personnel must follow USGS Watercraft/PFD Policy requirements. USGS employees assigned to VOO Vessels are directed to provide and wear USGS approved PFD's while on-board. In the event of extenuating circumstances, (such as severe weather or working on open decks of larger vessels), VOO Operators may provide crew with higher levels of safety such as a Type I PFD. In that case, USGS employees are directed to adhere to the VOO Operator mandates.

Question 2: Are there any other specific times or activities when I need to wear a PFD?

Yes. Numerous water based activities may be conducted during our work on the GOM Oil Spill and USGS employees must mitigate the hazard of drowning by wearing a PFD while working AROUND THE WATER (e.g., conducting work along shorelines), ABOVE THE WATER (e.g., on watercraft, structures or bridges), and NEAR THE WATER (e.g., wading). You and your Spill Supervisor must evaluate the hazards of any proposed work to ensure that adequate hazard mitigation measures have been implemented. Assistance in evaluating hazards can be gained by contacting your respective spill safety officer, local collateral duty safety coordinator or Bureau Watercraft Safety Program Manager.

CAUTION: NO PFD SHALL BE WORN UNDER ANY TYPE OF OUTER CLOTHING. Wearing any PFD under a Tyvek suit or under other layers of clothing may compromise the floatation of the PFD as well as increase the element of heat stress.

Question 3: Is there a requirement for vessels to have a throwable device on-board a USGS Watercraft?

YES. Any vessel 16 feet and greater (except canoes and kayaks) working the GOM Oil Spill, must carry one throwable Type IV device, (e.g., throw rings, cushions) (* throw-rope bags alone are not a Type IV) ready for immediate deployment. USGS Watercraft Operators and VOO Operators must indicate the throwable device location during a safety briefing before initial vessel departure.

Question 4: Must a PFD be U. S. Coast Guard Approved?

Yes. Approved PFD's have an USCG approval number typically provided on the inside shell fabric or material. ALL PFD's used on watercraft for the GOM Oil Spill must have the USCG approval.

Question 5: What does "in good, serviceable condition" really mean?

According to USGS Policy, PFD's must be regularly inspected by the wearer to ensure the unit is in good, serviceable condition. All DOI-USGS PFD's shall be International Orange (or ANSI Hi-Vis Lime-Green) in color). All adjustment straps, buckles and/or zippers should be in good working order. All outer shell and inner shell fabric should be intact without compromise. Approved, retro reflective tape should be intact and securely attached. PFD's that are UV Damaged and faded in color should be immediately replaced. PFD's with frayed or broken straps, broken zippers or buckles should be immediately replaced. PFD's with cracked, faded or torn retro reflective tape should be immediately replaced. Any torn fabric (inner or outer shell) indicates a need for immediate replacement. All of the above inconsistent findings reference a PFD that is NOT in good, serviceable condition.

Question 6: Are there different types of PFD's?

Yes. There are five (5) types of PFD's which provide one of three forms of floatation. The five types include (1) Type I Off-Shore Life Jacket; (2) Type II Near-shore Buoyant Vest; (3) Type III Floatation Aid; (4) Type IV Throwable Device; and (6) Type V Special Use Device. BP requires VOO operators to furnish Type III PFD's to VOO passengers that do not have a PFD. In all cases, each USGS employee will provide their own individual PFD before embarking upon a VOO vessel. VOO Operators have the final authority to mandate wearing a VOO supplied PFD.

Question 7: Are there different sizes of PFD's and is it important to match the size to the wearer?

Yes. Many PFD types come in ranges of sizes from small to XXXL. Depending upon the manufacturer, (e.g., Stearns, Revere, Mustang Survival, etc.) the PFD may have side adjustments for dual sizing. Personnel who wear undersized PFD's tend not to wear the unit correctly (unzipped and/or unlatched) which could lead to displacement from the wearer when water entry is made. A PFD that is too large for the wearer may come off upon water entry. USGS employees required to wear Tyvek style suits should ensure that their PFD fits properly over this outerwear.

Question 8: Where and how do I get a PFD when I've been assigned GOM Oil Spill related tasks involving watercraft operation or water hazards?

If you are mobilized to a known area where there is NO OIL or NO OIL RESIDUE reported, you can use the standard USGS approved PFD that you have been supplied with. *note sizing requirements referenced in Question 7.

If you are mobilized to an area where OIL and/or OIL RESIDUE has been reported or is suspected, USGS employees should consider the following guidelines:

1. ***Oil and/or Oil residue, once attached to the fabric material of any standard PFD, likely cannot be removed from the fabric by conventional cleaning methods, thus rendering the PFD contaminated. Once the fabric is contaminated, the PFD will be deemed in "unserviceable condition" and must be disposed of properly. OIL and/or OIL residue contaminated PFD's shall not reused, if contamination takes place.***

2. ***USGS employees shall consider the following options for USGS Approved PFD's in areas of GOM OIL and/OIL Residue response:***

    a. ***West Marine/Port Supply is a common USGS vendor that offers a Type V PFD designed for the Oil Worker Profession. The floatation foam panels are dipped in a rubberized coating allowing it to be cleaned easily. This is a Revere Model 280 RT Work Vest with nylon straps and nylon buckles. Oil and/or Oil residue can easily be cleaned with mild soap and water or alcohol swabs.***

    b. ***West Marine/Port Supply Product number is Model # 10967776. Special USGS pricing for this Work Vest (single or multiple vest purchase) is $30.00 each.***

    c. ***The Revere Model 280 RT is manufactured with SOLAS Retro-Reflective Tape that DOES NOT meet the DOI Standards for necessary square inches of tape and MUST be modified in order to meet our Standards.***

i. ***Pre-Cut patches of SOLAS (adhesive backed) Reflective Tape will be available from the Bureau Watercraft Safety Program Manager along with a detailed drawing of where the wearer shall attach the tape in order for the PFD to meet compliance standards.***

ii. ***It shall be the responsibility of the USGS employee to immediately notify the USGS Spill Supervisor upon modification of this PFD and the USGS Spill Supervisor will maintain records indicating the employee's name and date of modification and Spill Supervisor's name.***

iii. ***Revere Work Vest Model 280 RT PFD's that are <u>not</u> modified accordingly <u>SHALL NOT</u> be used at any time for any water related USGS activities inside the GOM Oil Spill Area or during any watercraft activities outside the GOM Oil Spill area.***

iv. ***Revere Work Vest PFD's, <u>once modified</u>, may be used in other watercraft activities outside the GOM Oil Spill areas.***

INFLATABLE PFD's:
NOTE: According to USGS Policy, with any inflatable PFD, the wearer MUST conduct <u>minimal</u> semi-annual <u>oral</u> inflation tests, allowing the unit to stand, inflated, for a 24 hour period. Traditional, automatic inflatable PFD's (wafer style) <u>must be annually inflated by submerging in water</u>, leak testing, drying and re-arming. Newer MUSTANG HAMMER (hydrostatic) INFLATOR MECHANISMS are allowed to go 4 years before automatic inflation is required (new USGS Policy). <u>IN ALL CASES</u>, the periodic testing of inflatable PFD's are to be recorded in a "maintenance log" maintained by the wearer and a copy sent to the local CDSPC of the Cost Center. During any Center Safety Audit/Inspection, these maintenance records are to be made readily available to the person(s) conducting the audit/inspection. Failure to comply with this USGS maintenance requirement may result in the wearer forfeiting the continued use of the inflatable PFD.
USGS Policy further states that employees opting to wear any inflatable PFD must undergo documented training exercises before wearing this PFD as a primary device.

Prepared by: Gary L. Hill, USGS Watercraft Safety Program Manager, (727) 803-8747 ext 3004

Appendix E-4: Contacts for Deepwater Horizon Incident Response (current as of 8.06.2010)

Unified and/or Incident Command

- **Houma LA Incident Command** - 1697 Highway 311, Houma LA 70395,

Main 985-493-7600; Operations 985-493-3343; mc252decon@gmail.com

- **Mobile AL Incident Command** - One South Water Street Mobile AL 36602, 251-442-1938.
- **Houma Sector, Wildlife Branch Safety Officer -- BP persistent cell phone (985-665-7093)**
- **BP-provided persistent phone for Houma Safety Officer (Glen Stapleton) 985-709 5957**
- **St Petersburg FL Incident Command –** Fish and Wildlife Research Institute, 100 8th Avenue SE, St. Petersburg FL 33701, 904-755-8008
- **Fish and Wildlife Service (FWS) Safety Officer, Mobile, AL** - Gary Wilson, Gary_Wilson@fws.gov, 503-803-0888; or Brian_Hardison@fws.gov 404-376-3035
- **Fish and Wildlife Service Safety Officer, Houma, LA** - Jack Morrow 985-665-7093 (Unified Command) or 404-408-7226, John_Morrow@fws.gov
- **DOI Occupational Safety and Health Manager** - Barry Noll, barry_noll@ios.doi.gov, Cell: 202-288-6843

Safety Contacts

USGS personnel should contact the Safety point of contacts to obtain current guidance on safety and health issues such as known hazardous conditions. Your local and Regional USGS Safety and Health staff should be able to provide assistance if primary points of contact are not available. Jack Marrow, Fish and Wildlife Service (FWS) Safety Officer, Houma Sector, at 985-665-7093.

- Gary Wilson, Fish and Wildlife Service (FWS) Safety Officer, Mobile Sector, at 503-803-0888.
- Tim Radtke, DOI Industrial Hygienist, 303-638-2623
- Regional Safety Office, if the above are not available

PFD and other Watercraft Safety Issues

Gary L. Hill, Bureau Watercraft Safety Program Manager, USGS Center for Coastal and Wetland Studies, St. Petersburg FL: 727-803-8747 (land)/ 727-365-0070 (cell); garylhill@usgs.gov.

Online safety and health resources/information

- Joint Incident Command: http://www.deepwaterhorizonresponse.com/go/doctype/2931/53023
- DOI: http://www.doi.gov/deepwaterhorizon/, and https://www.smis.doi.gov/smisaux/OilSpillInfo.htm

- USGS: http://www.usgs.gov/deepwater_horizon/, and http://internalgov/ops/safetynet/oilspillworkers.html

Waste Disposal and Other Environmental Issues

Waste disposal and other environmental issues should be referred to the following DOI IC staff:

- Doug Mutter, PMB/OEPC - Douglas_Mutter@ios.doi.gov
- Stephen Spencer, PMB/OEPC - Stephen_Spencer@ios.doi.gov Cell: 505-249-2462

Watercraft Decontamination

USGS personnel should notify the IC regarding decontamination services for WSC vessels.
Mobile IC Decon Center:

- 985-493-3343, or
- mc252decon@gmail.com, or
- Mobile Decon Center 251-455-3010 (for locations of Mobile IC Regon Decon Centers, see www.bpdecon.com).

Use of Vessels of Opportunity (VOO)

- VOO coordination hotline: 866-279-7983 or 877-847-7470
- Vince Mitchell, VOO Program Coordinator for Houma, LA, 427-773-9983.

Air Monitoring

- Bob Garbe (DOI Occupational Health Program Manager): Robert_Garbe@ios.doi.gov, 303-810-9934 (cell)
- Tim Radtke (DI Industrial Hygienist: Tim_Radtke@ios.doi.gov, 303-638-2623 (cell)
- Houma, LA Incident Command Center (Main Office): 985-493-7600
- Anthony Zepeda USGS Bureau Industrial Hygienist: – azepeda@usgs.gov, 703-648-7551. E-mail or fax (703-648-7592) copies of field form with PID readings.
- Beth Demith, USGS Eastern Region Industrial Hygienist: bdemith@usgs.gov, 703-648-4636

Air–monitoring results can be found under the following URLs:

- USEPA http://www.epa.gov/bpspill/air.html
- Current Air Quality along the Gulf Coast http://gulfcoast.airnowtech.org/

Accident Reporting

All USGS accidents shall be reported within the DOI Safety Management Information System (SMIS) accessible at https://www.smis.doi.gov/ and clicking on "Accident Reporting" tab. Note that under the "Special (Disaster Response Related) Accident Report" selection, the department has added the following category "During the Response to the Gulf Oil Spill". Please mark this category when reporting accidents involving individuals who become ill or are injured during

natural disaster relief efforts. On the injury selection page there is an entry button that allows the reporting supervisor to categorize an injury due to the Department's response. This specialized entry page has specific questions on PPE and training. Questions related to SMIS may be directed to the DOI Occupational Safety and Health Manager, 202-288-5549/202-904-0008 or USGS HQ Safety and Health Specialist 703-648-7553.

Appendix. E-5: Instructions for British Petroleum (BP) Site-Specific Training

Directions to complete the BP Site Specific HAZWOPER Training (Post Emergency Spilled Oil Cleanup – HSEREH004) course for the Mississippi Canyon 252 Deepwater Horizon Oil Spill **May 20, 2010 edition**

Step 1	Log in to: https://www2.virtualtrainingassistant.com/BPPublic/wc.dll?learner~cmenu
Note: Before beginning this course, you may have to remove the Pop-up Blocker from your computer. If so, A. Go to "Tools" B. Select "Pop-up Blocker" C. At Pop-up Blocker Settings," select "Allow Pop-ups"	
Step 2	To Log In, click on: [I'm a New Student] (located to the right of the block for "User ID")
Step 3	You are now on the Edit Profile Screen. A. Enter your name into the "Name" section. B. At "I am a _____ [V]" click on the pull-down menu and select "Gov't Agency Representative." C. At "Wildlife Organization [V]," select/click on the pull-down menu and select the appropriate agency (e.g., **U.S. Fish and Wildlife Service**, USDA Wildlife Services, etc.). D. At "Rehab Location _____," skip this block – leave it blank. E. At "Phone," enter your phone number. F. At "Email Address," provide your email address. G. At" Learner User ID," enter a "**4-8 character unique ID**." Write down your "User ID." H. At "Password," enter a "**4-8 character unique password**" and "Please re-enter password, enter your "**4-8 character unique password.**" Write down your "Password." I. NOTE: If you have not done so: write down **both** your ID and your password. You may need to use them again. J. Select the [Submit Changes] button.

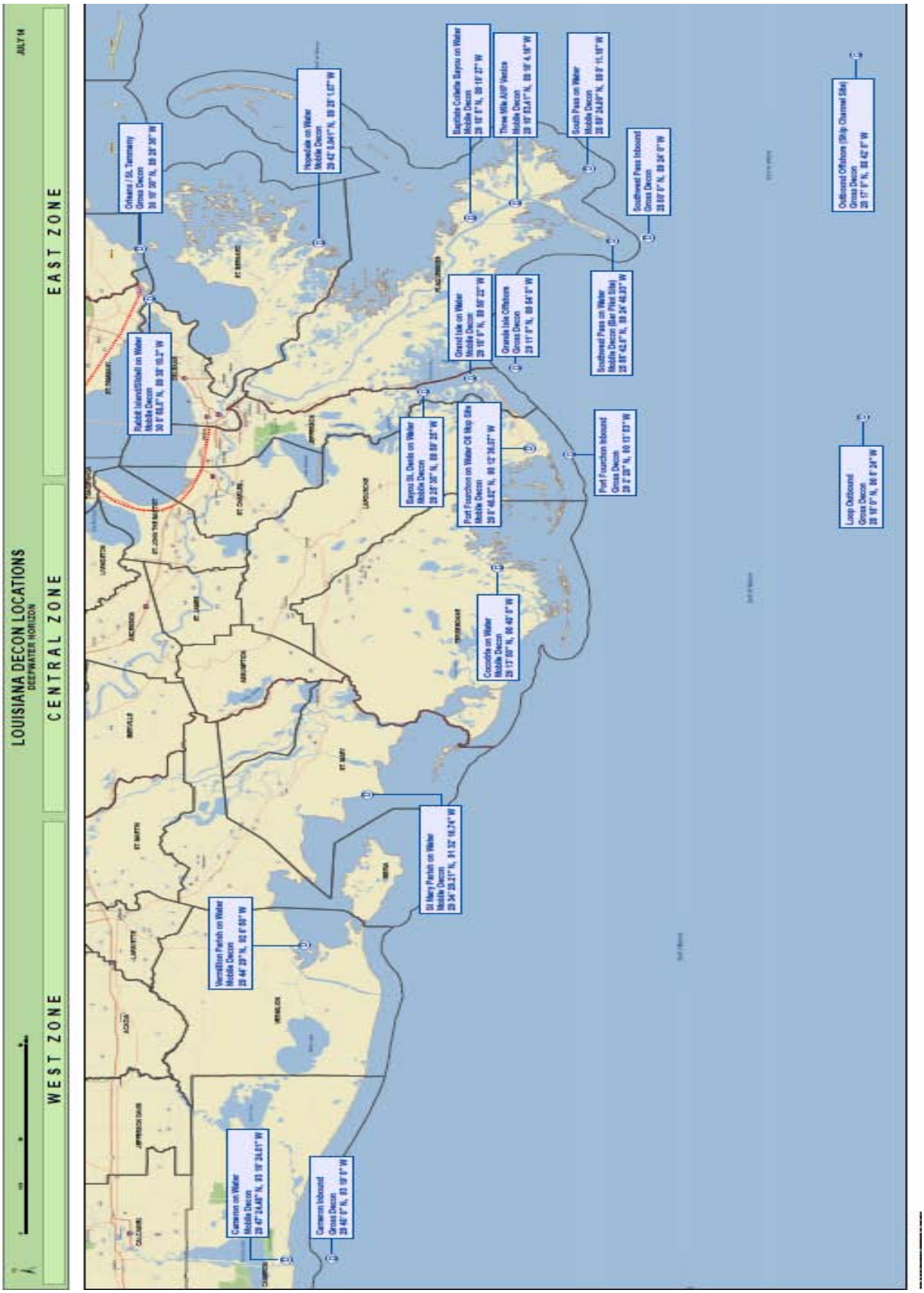
Step 4	You are on the "My Learner For: [your name] Learning Plan" screen. There is a green bar across the middle of the screen, titled "Course Title." Below that, the yellow bar contains the course title for "Post Emergency Spilled Oil Cleanup..[Start]." A. Select/click on the [Start] option.
Step 5	The next screen is the "My Learner For: [your name] Course Description" and contains a "Start" button located in the upper left side of the screen (under text: "Course Description"). A. Select/click on [Start].
Step 6	The next screen is the "My Learner For: [your name] Lessons for Class" and green and yellow bars are located across the middle of the screen. The yellow bar presents a selection for "Health & Safety CBT...[run]," under the "Action" column, A. Select/click on [Run].

Step 7	The next screen that appears will be: Training Launched"
	A. From this screen, the program will download a 10.55 MB file for course content
Step 8	A. Wait a few moments to allow the download. B. Maximize the screen to full page. C. Proceed through the 107 slides/pages.
	D. Upon completion, page/screen #107 will indicate that you should "Please continue to the next lesson, press run, and print completion certificate..."
	Note: In order to complete this action, you will have to close out of the 107 page presentation by selecting/clicking on the red boxed [X] in the upper right corner of the screen

Step 9	At this point, sometimes, the "Sign In" screen will re-appear. A. If it does not appear, proceed to step 10. B. If it does appear: i. Enter your "User ID" ii. Enter your "Password" iii. Select/click on [Enter]

BP Sponsored HAZWOPER – Specific to MS Canyon 252 Oil Spill Page 1

Appendix E-6: Example of Incident-Command Decontamination Locations for July 13, 2010.


LOUISIANA DECON LOCATIONS
DEEPWATER HORIZON
JULY '10
WEST ZONE
CENTRAL ZONE
EAST ZONE

Appendix F. Field Forms

Appendix F-1: Field-Notes Form for Oil-Release Incident Response

Appendix F-2: Analytical Services Request and Chain-of-Custody Forms

Appendix. F-1: Field-Notes Form for Oil-Release Incident Response

U. S. GEOLOGICAL SURVEY INCIDENT RESPONSE
WATER QUALITY and SEDIMENT COLLECTION FIELD NOTES NWIS Record No. _____

Station No. _____ Station Name _____ Field ID _____

Sample Date _____ Sample Start Time _____ End Time _____ Mean Time _____ Time Datum _____ (eg. EST, EDT, UTC)

Water Sample Medium: WS WSQ OAQ Sample Type: 9 (regular) 7 (replicate) 2 (blank) 1 (spike)

Sediment Sample Medium: SB SBQ Sample Purpose (71999): (200) Oil Spill Response Site Visit Purpose (50280): (1007) Oil Spill Response

QC Sample Associated with this Environmental Sample (99111) 1) None 10) Blank 30) Replicate 40) Spike
100) More than one type of QA 200)Other

Project No. _____ Project Name DEEPWATER HORIZON OIL SPILL RESPONSE

Photo Ionization Detector						
Time						

FIELD MEASUREMENTS

Property	Parm Code	Method Code	Result	Units	Remark Code	Value Qualifier	Null Value Qualifier	NWIS Result-Level Comments
Temperature, Air	00020	THM04 (thermistor) THM05 (thermometer)		°C				
Temperature, Water	00010	THM01 (thermistor)		°C				
Specific Conductance	00095	SC001 (contacting sensor)		µ S/cm				
Dissolved Oxygen	00300	LUMIN (luminescent)		mg/L				
Barometric Pressure	00025			mm Hg				
pH	00400	PROBE (electrode)		units				
Turbidity [see page 4 for codes]								
Other								

WATER SAMPLING INFORMATION

Parameter	Pcode	Value	Information
Sampler Type	84164	3070 Grab Sample (Dip) 8010 Other _____ 4080 peristaltic pump;	Depth of water (72199) _____ ft.
Sampling Method	82398	3070 Grab Sample (Dip) 8010 Other _____ 4033 peristaltic	Sampling Depth (00003) _____ ft.
Wave Height (feet)	70224		**Oil Products Present:**
Latitude (ddmmss)	91110	N: _____	Pancake(s) Mousse
Longitude (dddmmss)	91111	W: _____	Other
Oil Slick on Water	84176	1 Light Sheen 2 Heavy Sheen 3 Light Slick 4 Heavy Slick	
Observations (Severity Codes: 0=none; 1=mild; 2=moderate; 3=serious; 4=extreme)		Oil-Grease (01300) ___ Detergent Suds (01305) ___ Floating Garbage (01320) ___ Floating Algae Mats (01325) ___ Atm. Odor (01330) ___ Fish Kill (01340) ___ Floating Debris (01345) ___ Turbidity (01350) ___ Oil Slick Coverage on Shore within 25 Feet of Bed Sediment Sample Collection (84177) ___ Floating Vegetation (84178) ___	

SEDIMENT SAMPLING INFORMATION

Latitude (91110): N (ddmmss):

Longitude (91111): W (dddmmss):

SAMPLE ANALYSIS

Collection Apparatus:
STERILE SPOON SCOOP SPATULA
CORER
TEFLON METAL PLASTIC BAG

Composite Vessel:
STERILE GLASS METAL PLASTIC TEFLON
BOWL BAG LINER

COMPILED BY: _____ CHECKED BY: _____ LOGGED INTO NWIS BY: _____

Date _____ Date _____ Date _____

Station Number Station Name Date Time

SAMPLING CONDITIONS

Bottom: sand marl (shell bed) mud other _____

Weather: ***sky-*** clear partly cloudy cloudy ***precipitation-*** none light medium heavy rain mist _____

wind- calm light breeze gusty windy est. wind speed_____ mph ***temperature-*** very cold cool warm hot _____

Observations and Digital Photograph Records:

North File/image name_____ East File/Image name_____

South File /Image name_____ West File/Image name_____

Other File/Image name _____ Other File/Image name_____

Sample Comments (for NWIS; 300 characters max. note presence absence, oil or tarballs in/on water and sediment):Tarballs, size and approximate coverage in sample collection area, COLLECT ADDITIONAL IMAGES.

WATER QUALITY FIELD PARAMETERS

MAKE_____ MODEL_____ Barometric pressure = _____ mm Hg

Depth	Time	Temp °C (00010) (Method code THM01)	SC µS/cm (00095) (Method Code SC0001)	DO mg/L (00300) (Method Code LUMIN)	DO sat % (00301)	pH units (00400) (Method Code Probe)	Turbidity _____ (_____) _____ (Method Code)	NWIS Record No.

QUALITY-CONTROL INFORMATION

Filter Lot Number

NWIS LOT NUMBERS available at http://wwwnwql.cr.usgs.gov/qas.shtml?filters_home#Q460FLD

Filter Type	Filter Type Fixed-value Parameter Code (50276)	Pore Size (microns)	Manufacturer's Lot Number	NWIS Lot Number (Parameter Code 99206)
Aqua-Prep Disc	10	0.45		

NWIS PRESERVATIVE LOT NUMBERS

7.5N — 7.7N HNO_3 _____ Exp. Date: _____ (METALS&CATIONS)

6N HCl _____ Exp. Date _____ (Hg)

4.5N H_2SO_4 _____ Exp. Date: _____ (NUTRIENTS&DOC)

Conc. H_2SO_4 _____ Exp. Date: _____ (COD, PHENOL, O&G)

1:1 HCl _____ Exp. Date: _____ (VOC)

BLANK WATER LOT NUMBERS

Inorganic (99200) _____ 2nd Inorganic (99201) _____

Pesticide (99202) _____ 2nd Pesticide (99203) _____

QC SAMPLES

Sample Type	NWIS Record No.	Sample Type	NWIS Record No.	Sample Type	NWIS Record No.
Equip Blank ____	_____	Sequential ____	_____	Trip Blank _____	_____
Field Blank ____	_____	Spike ____	_____	Other _____	_____

COMMENTS:_____

_____

_____

REFERENCE LIST FOR CODES USED ON THIS FORM

A complete set of fixed-value codes can be found online at: http://wwwnwis.er.usgs.gov/currentdocs/index.html

Sample Medium Codes

WS	Surface water
WSQ	Surface Water Quality-control sample (Replicate, Spike)
OAQ	Blank Water
SO	Sediment (beach sand or soil)
SOQ	Sediment Replicate

71999 Sample Purpose

10	Routine
XX	Spill

Time Datum Codes

Time Zone	Std Time Code	UTC Offset (hours)	Daylight Time Code	UTC Offset (hours)
Central	CST	-6	CDT	-5
Eastern	EST	-5	EDT	-4

Sample Type Code

9	Regular
7	Replicate
2	Blank
1	Spike

84164 Sampler Type

3070	Grab Sample (Dip)
4030	Peristaltic pump
8010	Other

Value Qualifiers

e	see field comment
f	sample field preparation problem
k	counts outside the acceptable range

50280 Purpose of Site Visit

1001	Fixed frequency, surface-water
1099	Other, surface-water

82398 Sampling Method

70	Grab Sample (Dip)
8010	Other
4033	Peristaltic pump

Null-value Qualifiers

e	required equipment not functional or available
f	sample discarded; improper filter used
o	insufficient amount of water
p	sample discarded; improper preservation
q	sample discarded; holding time exceeded
r	sample ruined in preparation

Parameter and method codes for field measurements and turbidity can be found in separate attachments at http://water.usgs.gov/usgs/owq/Forms.html

(Circle appropriate selections)

99100 Blank-solution type

10	Inorganic grade (distilled/deionized)
40	Pesticide grade (OK for organics and organic carbon)
50	Volatile-organic grade (OK for VOCs, organics, and organic carbon)
200	Other

99101 Source of blank water

10	NWQL
40	NIST
55	Wisconsin Mercury Lab
140	EMD Chemicals
150	Ricca Chemical Company
200	Other

99102 Blank-sample type

1	Source Solution
30	Trip
40	Sampler
50	Splitter
60	Filter
70	Preservation
80	Equipment (done in non-field environment)
90	Ambient
100	Field
200	Other

99106 Spike-sample type

10	Field
20	Lab

99107 Spike-solution source

10	NWQL

99108 Spike-solution volume, mL _____

99112 Purpose, Topical QC data

1	Routine QC (non-topical)

99105 Replicate-sample type

10	Concurrent	40	Split-Concurrent
20	Sequential	50	Split-Sequential
30	Split	200	Other

99111 QC sample associated with this environmental sample

1	No associated QA data
10	Blank
30	Replicate Sample
40	Spike sample
100	More than one type of QA sample
200	Other

A complete set of fixed-value codes can be found online at: http://wwwnwis.er.usgs.gov/currentdocs/index.html

Appendix. F-2: Analytical Services Request Forms for the Deepwater Horizon Incident Response

U.S. GEOLOGICAL SURVEY
ANALYTICAL SERVICES REQUEST (ASR)
and
CHAIN OF CUSTODY (COC)
For Gulf of Mexico BP Oil Response

SAMPLE IDENTIFICATION

LAB RECORD NUMBER SAMPLE TRACKING ID	User Code	4 5 6 9 E 7 P 6 0 Project Account Number	LAB USE ONLY LABORATORY ID

STATION ID*	2 0 1 Begin Date (YYYYMMDD)*	Begin Time*	SO Medium code*	9 Sample Type
USGS Project Contact Name	2 0 1 End Date (YYYYMMDD)	End Time	@usgs.gov **USGS Project Contact Email**	

SITE / SAMPLE / PROJECT INFORMATION (Optional)

State	*County*	*Geologic Unit Code*	Analysis Status	Analysis Source	Hydrologic Condition	Hydrologic Event	Turn Around Time Required

Note: State, County, and Geologic Unit Code data will not be entered in by Contract Laboratory

George Aiken 303 541 3036 Kenna Butler 303 541 3009	graiken@usgs.gov kebutler@usgs.gov	GOM BP Oil Spill
Research Labor Contact Phone	Email	**USGS Project Name**

Station Name or Field ID:
Sample conditions or hazards: Potential Gulf Oil Contamination

ANALYTICAL WORK REQUESTS: SCHEDULES AND CONTRACT ITEM NUMBERS (CINs)

Analysis schedule(s)

Note: Analysis schedules must be established and set up in advance with Contract Laboratory

			Containers/Preservatives						
Container	Quantity	Remarks: list analytical method no., specific analytes for metals and anion analyses, special instructions, and other comments	FILTERED	CHILL				DO NOT FREEZE	
125 ml DOC	1	DOC, filtered, 0.045um capsule filter	X	X				X	

CHAIN OF CUSTODY RECORD

ASR: Relinquished by:		Date:		Time:	
ASR: Received by:		Date:		Time:	

USGS DODESP Contract ASR, revision 2.1, 16Nov07

U.S. GEOLOGICAL SURVEY
ANALYTICAL SERVICES REQUEST (ASR)
and
CHAIN OF CUSTODY (COC)
For Gulf of Mexico BP Oil Response

SAMPLE IDENTIFICATION

LAB RECORD NUMBER SAMPLE TRACKING ID	User Code	4 5 6 9 E 7 P 6 0 Project Account Number	LAB USE ONLY LABORATORY ID

STATION ID*	2 0 1 Begin Date (YYYYMMDD)*	Begin Time*	SO Medium code*	9 Sample Type
USGS Project Contact Name	2 0 1 End Date (YYYYMMDD)	End Time	@usgs.gov **USGS Project Contact Email**	

SITE / SAMPLE / PROJECT INFORMATION (Optional)

State	*County*	*Geologic Unit Code*	Analysis Status	Analysis Source	Hydrologic Condition	Hydrologic Event	Turn Around Time Required

Note: State, County, and Geologic Unit Code data will not be entered in by Contract Laboratory

Robert (Scott) Carr 361 825 3216 or James Biedenbach 361 825 3217	Scott_carr@usgs.gov James_biedenbach@usgs.gov	GOM BP Oil Spill
Research Laboratory Contact Phone and Email		**USGS Project Name**

Station Name or Field ID:
Sample conditions or hazards: Potential Gulf Oil Contamination

ANALYTICAL WORK REQUESTS: SCHEDULES AND CONTRACT ITEM NUMBERS (CINs)

Analysis schedule(s)

Note: Analysis schedules must be established and set up in advance with Contract Laboratory

			Containers/Preservatives						
CIN	Quantity	Remarks: list analytical method no., specific analytes for metals and anion analyses, special instructions, and other comments	.	CHILL				DO NOT FREEZE	
1-L BGC	2	Pore Water Toxicity		X				**X**	

CHAIN OF CUSTODY RECORD

ASR: Relinquished by:		Date:		Time:	
ASR: Received by:		Date:		Time:	

U.S. GEOLOGICAL SURVEY – ANALYTICAL SERVICES REQUEST (ASR)
and
CHAIN OF CUSTODY (COC)
For Gulf of Mexico BP Oil Response

SAMPLE IDENTIFICATION

LAB RECORD NUMBER SAMPLE TRACKING ID	User Code	4 5 6 9 E 7 P 6 0 Project Account Number	LAB USE ONLY LABORATORY ID

STATION ID*	2 0 1 Begin Date (YYYYMMDD)*	Begin Time*	SO Medium code*	9 Sample Type
USGS Project Contact Name	2 0 1 End Date (YYYYMMDD)	End Time	@usgs.gov **USGS Project Contact Email**	

SITE / SAMPLE / PROJECT INFORMATION (Optional)

State	*County*	*Geologic Unit Code*	Analysis Status	Analysis Source	Hydrologic Condition	Hydrologic Event	Turn Around Time Required

Note: State, County, and Geologic Unit Code data will not be entered in by Contract Laboratory

Amanda Demopoulos 352 264 3490	ademopoulos@usgs.gov	GOM BP Oil Spill
Research Laboratory Phone and Email		**USGS Project Name**

Station Name or Field ID:
Sample conditions or hazards: Potential Gulf Oil Contamination

ANALYTICAL WORK REQUESTS: SCHEDULES AND CONTRACT ITEM NUMBERS (CINs)

Analysis schedule(s)

Note: Analysis schedules must be established and set up in advance with Contract Laboratory

			Containers/Preservatives						
CIN	Quantity	Remarks: list analytical method no., specific analytes for metals and anion analyses, special instructions, and other comments	.	CHILL					
500 ml BGC	1	Benthic Invertebrate sediment core preserved with 10% buffered		X					
		Formalin							

CHAIN OF CUSTODY RECORD

ASR: Relinquished by:		Date:		Time:	
ASR: Received by:		Date:		Time:	

USGS DODESP Contract ASR, revision 2.1, 16Nov07

U.S. GEOLOGICAL SURVEY
ANALYTICAL SERVICES REQUEST (ASR)
and
CHAIN OF CUSTODY (COC)
For Gulf of Mexico BP Oil Response

SAMPLE IDENTIFICATION

LAB RECORD NUMBER SAMPLE TRACKING ID	User Code	4 5 6 9 E 7 P 6 0 Project Account Number	LAB USE ONLY LABORATORY ID

STATION ID*	2 0 1 Begin Date (YYYYMMDD)*	Begin Time*	WS Medium code*	9 Sample Type
USGS Project Contact Name	2 0 1 End Date (YYYYMMDD)	End Time	@usgs.gov **USGS Project Contact Email**	

SITE / SAMPLE / PROJECT INFORMATION (Optional)

State	*County*	*Geologic Unit Code*	Analysis Status	Analysis Source	Hydrologic Condition	Hydrologic Event	Turn Around Time Required

Note: State, County, and Geologic Unit Code data will not be entered in by Contract Laboratory

Robert Eganhouse 703 648 5879	eganhous@usgs.gov	GOM BP Oil Spill
Research Laboratory Contact Phone and Email		**USGS Project Name**

Station Name or Field ID:
Sample conditions or hazards: Potential Gulf Oil Contamination

ANALYTICAL WORK REQUESTS: SCHEDULES AND CONTRACT ITEM NUMBERS (CINs)

Analysis schedule(s)

Note: Analysis schedules must be established and set up in advance with Contract Laboratory

			Containers/Preservatives						
CIN	Quantity	Remarks: list analytical method no., specific analytes for metals and anion analyses, special instructions, and other comments	.	CHILL					
1-L GCC	1	Isomeric Fingerprinting		X					

CHAIN OF CUSTODY RECORD

ASR: Relinquished by:		Date:		Time:	
ASR: Received by:		Date:		Time:	

USGS DODESP Contract ASR, revision 2.1, 16Nov07

U.S. GEOLOGICAL SURVEY
ANALYTICAL SERVICES REQUEST (ASR)
and
CHAIN OF CUSTODY (COC)
For Gulf of Mexico BP Oil Response

SAMPLE IDENTIFICATION

LAB RECORD NUMBER SAMPLE TRACKING ID	User Code	Project Account Number	LAB USE ONLY LABORATORY ID
		4 5 6 9 E 7 P 6 0	

STATION ID*	Begin Date (YYYYMMDD)*	Begin Time*	Medium code*	Sample Type
	2 0 1		SO	9

USGS Project Contact Name	End Date (YYYYMMDD)	End Time	USGS Project Contact Email
	2 0 1		@usgs.gov

SITE / SAMPLE / PROJECT INFORMATION (Optional)

State	*County*	*Geologic Unit Code*	Analysis Status	Analysis Source	Hydrologic Condition	Hydrologic Event	Turn Around Time Required

Note: State, County, and Geologic Unit Code data will not be entered in by Contract Laboratory

Robert Eganhouse 703 648 5879	eganhous@usgs.gov	GOM BP Oil Spill
Research Laboratory Contact Phone and Email		**USGS Project Name**

Station Name or Field ID:
Sample conditions or hazards: Potential Gulf Oil Contamination

ANALYTICAL WORK REQUESTS: SCHEDULES AND CONTRACT ITEM NUMBERS (CINs)

Analysis schedule(s)

Note: Analysis schedules must be established and set up in advance with Contract Laboratory

			Containers/Preservatives						
CIN	Quantity	Remarks: list analytical method no., specific analytes for metals and anion analyses, special instructions, and other comments	.	FREEZE					
250 ml BGC	1	Isomeric Fingerprinting		X					

CHAIN OF CUSTODY RECORD

ASR: Relinquished by:		Date:		Time:	
ASR: Received by:		Date:		Time:	

U.S. GEOLOGICAL SURVEY
ANALYTICAL SERVICES REQUEST (ASR)
and
CHAIN OF CUSTODY (COC)
For Gulf of Mexico BP Oil Response

SAMPLE IDENTIFICATION

LAB RECORD NUMBER SAMPLE TRACKING ID	User Code	4 5 6 9 E 7 P 6 0 Project Account Number	LAB USE ONLY LABORATORY ID

STATION ID*	2 0 1 Begin Date (YYYYMMDD)*	Begin Time*	SO Medium code*	9 Sample Type
USGS Project Contact Name	2 0 1 End Date (YYYYMMDD)	End Time	@usgs.gov **USGS Project Contact Email**	

SITE / SAMPLE / PROJECT INFORMATION (Optional)

State	*County*	*Geologic Unit Code*	Analysis Status	Analysis Source	Hydrologic Condition	Hydrologic Event	Turn Around Time Required

Note: State, County, and Geologic Unit Code data will not be entered in by Contract Laboratory

Ed Furlong 303 236 3941 Research Labor Contact Phone	efurlong@usgs.gov Email	GOM BP Oil Spill **USGS Project Name**

Station Name or Field ID:
Sample conditions or hazards: Potential Gulf Oil Contamination

ANALYTICAL WORK REQUESTS: SCHEDULES AND CONTRACT ITEM NUMBERS (CINs)

Analysis schedule(s)

Note: Analysis schedules must be established and set up in advance with Contract Laboratory

			Containers/Preservatives						
CIN	Quantity	Remarks: list analytical method no., specific analytes for metals and anion analyses, special instructions, and other comments	.	FREEZE				KEEP IN DARK	
1-L Teflon	2	Surfactant analysis, use clean teflon bottle supplied by NWQL		X					
		Wrap dry bottle in aluminum foil							

CHAIN OF CUSTODY RECORD

ASR: Relinquished by:		Date:		Time:	
ASR: Received by:		Date:		Time:	

USGS DODESP Contract ASR, revision 2.1, 16Nov07

U.S. GEOLOGICAL SURVEY
ANALYTICAL SERVICES REQUEST (ASR)
and
CHAIN OF CUSTODY (COC)
For Gulf of Mexico BP Oil Response

SAMPLE IDENTIFICATION

LAB RECORD NUMBER / SAMPLE TRACKING ID	User Code	Project Account Number	LAB USE ONLY / LABORATORY ID
		4 5 6 9 E 7 P 6 0	

STATION ID*	Begin Date (YYYYMMDD)*	Begin Time*	Medium code*	Sample Type
	2 0 1		SO	9

USGS Project Contact Name	End Date (YYYYMMDD)	End Time	USGS Project Contact Email
	2 0 1		@usgs.gov

SITE / SAMPLE / PROJECT INFORMATION (Optional)

State	*County*	*Geologic Unit Code*	Analysis Status	Analysis Source	Hydrologic Condition	Hydrologic Event	Turn Around Time Required

Note: State, County, and Geologic Unit Code data will not be entered in by Contract Laboratory

Research Laboratory Contact Phone and Email		USGS Project Name
Art Horowitz 770 903 9153	Horowitz@usgs.gov	GOM BP Oil Spill

Station Name or Field ID:
Sample conditions or hazards: Potential Gulf Oil Contamination

ANALYTICAL WORK REQUESTS: SCHEDULES AND CONTRACT ITEM NUMBERS (CINs)

Analysis schedule(s)

Note: Analysis schedules must be established and set up in advance with Contract Laboratory

			Containers/Preservatives						
CIN	Quantity	Remarks: list analytical method no., specific analytes for metals and anion analyses, special instructions, and other comments	.	CHILL				Keep in Dark	
500 g Whirlpak	1-2	Trace metals, Total Phosphorus, Total Nitrogen		X				X	

CHAIN OF CUSTODY RECORD

ASR: Relinquished by:		Date:		Time:	
ASR: Received by:		Date:		Time:	

USGS DODESP Contract ASR, revision 2.1, 16Nov07

U.S. GEOLOGICAL SURVEY
ANALYTICAL SERVICES REQUEST (ASR)
and
CHAIN OF CUSTODY (COC)
For Gulf of Mexico BP Oil Response

SAMPLE IDENTIFICATION

LAB RECORD NUMBER SAMPLE TRACKING ID	User Code	4 5 6 9 E 7 P 6 0 Project Account Number	LAB USE ONLY LABORATORY ID

STATION ID*	2 0 1 Begin Date (YYYYMMDD)*	Begin Time*	SO Medium code*	9 Sample Type
USGS Project Contact Name	2 0 1 End Date (YYYYMMDD)	End Time	@usgs.gov **USGS Project Contact Email**	

SITE / SAMPLE / PROJECT INFORMATION (Optional)

State	*County*	*Geologic Unit Code*	Analysis Status	Analysis Source	Hydrologic Condition	Hydrologic Event	Turn Around Time Required

Note: State, County, and Geologic Unit Code data will not be entered in by Contract Laboratory

John Lisle 727 803 8748 x3140 (office) X3094 (Lab)	jlisle@usgs.gov	GOM BP Oil Spill
Research Laboratory Contact Phone and Email		**USGS Project Name**

Station Name or Field ID:
Sample conditions or hazards: Potential Gulf Oil Contamination

ANALYTICAL WORK REQUESTS: SCHEDULES AND CONTRACT ITEM NUMBERS (CINs)

Analysis schedule(s)

Note: Analysis schedules must be established and set up in advance with Contract Laboratory

			Containers/Preservatives						
CIN	Quantity	Remarks: list analytical method no., specific analytes for metals and anion analyses, special instructions, and other comments	.	FREEZE					
400 ml Whirlpak	1	Bacteria		X					

CHAIN OF CUSTODY RECORD

ASR: Relinquished by:		Date:		Time:	
ASR: Received by:		Date:		Time:	

USGS DODESP Contract ASR, revision 2.1, 16Nov07

U.S. GEOLOGICAL SURVEY
ANALYTICAL SERVICES REQUEST (ASR)
and
CHAIN OF CUSTODY (COC)
For Gulf of Mexico BP Oil Response

SAMPLE IDENTIFICATION

LAB RECORD NUMBER SAMPLE TRACKING ID	User Code	Project Account Number	LAB USE ONLY LABORATORY ID
		4 5 6 9 E 7 P 6 0	

STATION ID*	Begin Date (YYYYMMDD)*	Begin Time*	Medium code*	Sample Type
	2 0 1		SO	9

USGS Project Contact Name	End Date (YYYYMMDD)	End Time	USGS Project Contact Email
	2 0 1		@usgs.gov

SITE / SAMPLE / PROJECT INFORMATION (Optional)

State	*County*	*Geologic Unit Code*	Analysis Status	Analysis Source	Hydrologic Condition	Hydrologic Event	Turn Around Time Required

Note: State, County, and Geologic Unit Code data will not be entered in by Contract Laboratory

Robert Rosenbauer 650 329 4198	brosenbauer@usgs.gov	GOM BP Oil Spill
Research Laboratory Contact Phone and Email		**USGS Project Name**

Station Name or Field ID:
Sample conditions or hazards: Potential Gulf Oil Contamination

ANALYTICAL WORK REQUESTS: SCHEDULES AND CONTRACT ITEM NUMBERS (CINs)

Analysis schedule(s)

Note: Analysis schedules must be established and set up in advance with Contract Laboratory

			Containers/Preservatives						
CIN	Quantity	Remarks: list analytical method no., specific analytes for metals and anion analyses, special instructions, and other comments	.	FREEZE					
1-L BGC	2	Oil Fingerprinting		X					

CHAIN OF CUSTODY RECORD

ASR: Relinquished by:		Date:		Time:	
ASR: Received by:		Date:		Time:	

USGS DODESP Contract ASR, revision 2.1, 16Nov07

U.S. GEOLOGICAL SURVEY – ANALYTICAL SERVICES REQUEST (ASR)
For USGS Contract No. 07CRCN0028 with TestAmerica Laboratories (TAL)

SAMPLE IDENTIFICATION

TAL RECORD NUMBER / SAMPLE TRACKING ID	User Code	Project Account Number	LAB USE ONLY / LABORATORY ID
		4 5 6 9 E 7 P 6 0	

STATION ID*	Begin Date (YYYYMMDD)*	Begin Time*	Medium code*	Sample Type
	2 0 1		WS	9

USGS Project Contact Name	End Date (YYYYMMDD)	End Time	USGS Project Contact Email
	2 0 1		@usgs.gov

SITE / SAMPLE / PROJECT INFORMATION (Optional)

State	County	Geologic Unit Code	Analysis Status	Analysis Source	Hydrologic Condition	Hydrologic Event	30 days (USGS contract) Turn Around Time Required

Note: State, County, and Geologic Unit Code data will not be entered in by Contract Laboratory

TAL Name & Ph.no.	TAL Contact Email	USGS Project Name
Marty Edwards 850-471-6227	Marty.edwards@ testamericainc.com	GOM BP Oil Spill

Station Name or Field ID:
Sample conditions or hazards: Potential Gulf Oil Contamination

ANALYTICAL WORK REQUESTS: SCHEDULES AND CONTRACT ITEM NUMBERS (CINs)

Note: Contract Item Numbers (CINs) are used as Lab Codes for this specific ASR.

Analysis schedule(s)

Note: Analysis schedules must be established and set up in advance with Contract Laboratory

			Containers/Preservatives						
CIN	Filtered (F) or Unfiltered (U)	Remarks: list analytical method no., specific analytes for metals and anion analyses, special instructions, and other comments	Unpres	H2SO4	HNO3	HCl	NaOH	ZnAc/ NaOH	
50130	U	DRO/ORO extended scan C10-C36, 1 1-L amber	X						
50114	U	GRO, 2x40ml VOA unpreserved	X						
50117	U	SVOC TCL, 2 1-L amber	X						
50109	U	VOC TCL, incl. BTEX; 2x40ml VOA unpreserved	X						
50136	U	HEM, 32 ounce wide mouth clear glass				X			
50068, 50092	U	TKN & TP, 250 ml wide mouth plastic w/H2SO4		X					
50017	U	Metals Scan, 250 ml wide mouth plastic w/HNO3			X				

CHAIN OF CUSTODY RECORD

ASR: Relinquished by:		Date:		Time:	
ASR: Received by:		Date:		Time:	

USGS DODESP Contract ASR, revision 2.1, 16Nov07

U.S. GEOLOGICAL SURVEY – ANALYTICAL SERVICES REQUEST (ASR)
For USGS Contract No. 07CRCN0028 with TestAmerica Laboratories (TAL)

SAMPLE IDENTIFICATION

TAL RECORD NUMBER SAMPLE TRACKING ID	User Code	4 5 6 9 E 7 P 6 0 Project Account Number	LAB USE ONLY LABORATORY ID

STATION ID*	2 0 1 Begin Date (YYYYMMDD)*	Begin Time*	SO Medium code*	9 Sample Type
USGS Project Contact Name	2 0 1 End Date (YYYYMMDD)	End Time	@usgs.gov **USGS Project Contact Email**	

SITE / SAMPLE / PROJECT INFORMATION (Optional)

State	*County*	*Geologic Unit Code*	Analysis Status	Analysis Source	Hydrologic Condition	Hydrologic Event	30 days (USGS contract) Turn Around Time Required

Note: State, County, and Geologic Unit Code data will not be entered in by Contract Laboratory

Marty Edwards 850-471-6227	Marty.edwards@ testamericainc.com	GOM BP Oil Spill
TAL Name & Ph.no.	TAL Contact Email	**USGS Project Name**

Station Name or Field ID:
Sample conditions or hazards: Potential Gulf Oil Contamination

ANALYTICAL WORK REQUESTS: SCHEDULES AND CONTRACT ITEM NUMBERS (CINs)

Note: Contract Item Numbers (CINs) are used as Lab Codes for this specific ASR.

Analysis schedule(s)

Note: Analysis schedules must be established and set up in advance with Contract Laboratory

			Containers/Preservatives						
CIN	Filtered (F) or Unfiltered (U)	Remarks: list analytical method no., specific analytes for metals and anion analyses, special instructions, and other comments	Unpres	H2SO4	HNO3	HCl	NaOH	ZnAc/ NaOH	
50137	Solid	O&G HEM, One 8 ounce clear glass for O&G, SVOC, & % Moisture	X						
50228	Solid	% moisture,	X						
50117	Solid	SVOC TCL	X						
50641	Solid	8270 SIM, Alkylated PAHs, 4 ounce clear glass	X						

CHAIN OF CUSTODY RECORD

ASR: Relinquished by:		Date:		Time:	
ASR: Received by:		Date:		Time:	

USGS DODESP Contract ASR, revision 2.1, 16Nov07

Appendix G. Manufacturer Guidance for Use of Multiparameter Sondes in Oil-Contaminated Waters

Attachment 1. YSI, Inc.: Cleaning, Care, and Deployment of Multiparameter Sondes and Sensors" (Published with permission.)

Recommended Procedures for Use of YSI Water Quality Monitoring Instruments during Oil Spills

Overview: This is a guidance document that is intended for users of YSI 6-Series sondes and handheld instruments in environments impacted by an oil spill. The specific form and impacts of oil in water on YSI's equipment can vary. These guidelines are our best practices for decontaminating and deploying equipment; however, they do not guarantee that sensors or equipment will not be impacted by the oil.

YSI encourages customers to continue to collect data during an oil spill. We ask all users who are working in oil-impacted areas to provide us with feedback on sensor performance and oil conditions, so that we can improve this document. Please send any information to environmental@ysi.com.

For the 2010 Gulf of Mexico oil spill, we will guarantee expedited (3-5 working days) repairs on equipment affected by the oil at our Ohio and Baton Rouge (USA) repair facilities.

Instrument Decontamination

If you have YSI instruments that are contaminated with crude oil, follow this decontamination procedure.

You will need:

1. Gloves
2. Eye protection (safety glasses with side shields; or goggles)
3. Cloths or lint free paper towels
4. Replacement brushes and wipers and hex wrench
5. Dawn dishwashing liquid and Simple Green (degreasing formula)
6. Buckets

7. Soft brushes for cleaning
8. Pipe cleaners and Q-Tips
9. Waste collection container

Procedure:

1. Wear gloves and eye protection when handling items contaminated with crude oil.
2. Spray all contaminated areas with Simple Green to remove as much contaminant as possible.
3. Use soft cloth or paper towels to wipe off excess oil from instruments and sensors.
   - o Be careful when wiping around sensor optics or membranes.
   - o Dispose of oil-saturated cloths according to local regulations *(see note below).*
4. Remove oil-coated wipers and brushes from sensors.
5. Submerge instrument in warm, soapy water.
6. Use soft brush to wipe away remaining oil.
7. Use small brush to clean inside the conductivity cell of the temperature-conductivity probe.
8. Rinse in soapy water.
9. Repeat steps 4-7, several times if necessary.
   - o Dispose of oily water according to local regulations for hazardous materials *(see note below).*
10. Do a final rinse in a fresh container of warm soapy water followed by a rinse in clean water.
11. Dry and install new wipers and brushes.

Oil Effects on Specific Water Quality Sensors

The most common problems with sensors will be related to sensors having been in contact with oil. Special attention should be paid to the following sensors in the decontamination and calibration steps.

1. **pH**: The performance of the pH and pH/ORP sensors due to the sensitivity of the glass bulb and reference junction. The pH sensor may require additional cleaning steps and may benefit from elevating the soapy water temperature to (35 C) and adding rapid stirring while soaking.
2. **Depth:** Spray Simple Green into depth port openings and use pipe cleaners to remove any contaminant.
3. **ROX DO Membranes:** The optical probe DO membrane would also benefit from a warmer soapy water temperature. Stirring or gentle sweeps with a soft paint brush across the membrane should aid in cleaning.
4. **Wipers:** Replace all wiper pads on a contaminated unit. Cleaning of EDS or V2-4 bristle type brushes may not be possible. If the bristles remain sticky after cleaning the brush must be replaced.

YSI incorporated
Who's Minding the Planet?®
1700/1725 Brannum Lane
Yellow Springs, OH
45387 USA
800 765 4974
937 767 7241
937 767 9353 fax
www.ysi.com
employee-owned

Instrument Deployment

If you need to prepare YSI instruments to deploy into water contaminated with crude oil, YSI suggests the following procedure. Crude oil is can be thick and sticky, and we cannot guarantee the same performance intervals of our sensor membranes and wipers as under normal conditions.

You will need:

1. YSIC-Spray nanopolymer coating
2. Disposable plastic bags (Grocery store type)
3. Rubber bands
4. Light weight line or cord
5. Dawn dishwashing liquid
6. Buckets
7. Soft brushes for cleaning
8. Replacement brushes and wipers and hex wrenc

Procedure:

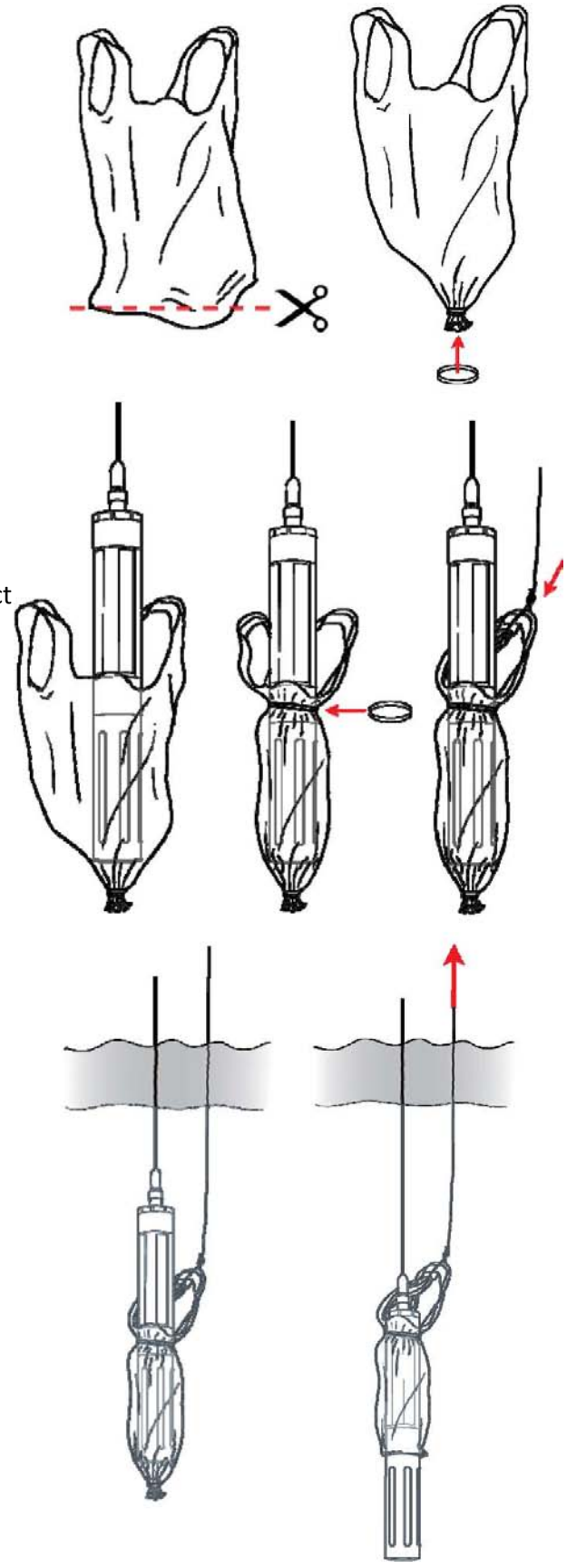
1. Apply C-Spray protective coating to exterior of instrument, sensors, and cable, according to the C-Spray instruction sheet.
    - Recent testing has demonstrated that C-Spray has no negative impacts on YSI optical sensors, ROX membranes or YSI pH probes.
    - ROX: Spray on and disperse over membrane and probe face. Allow to sit 5 minutes and wipe off excess with a Kimwipe
    - YSI pH: Spray probe body including bulb and junction area. Allow to sit 5 minutes, and shake off excess.
    - All other optical sensors: Remove wiper, spray onto probe face and allow to sit for 5 minutes. Remove excess with Kimwipe and polish probe face with dry Kimwipe to remove and streaking. Reinstall wipers.

1. Calibrate the sonde after application like you normally would.
2. For sampling applications, try one of the three following methods in order to deploy a sonde below a surface oil slick without impacting the sensors (see illustrations):

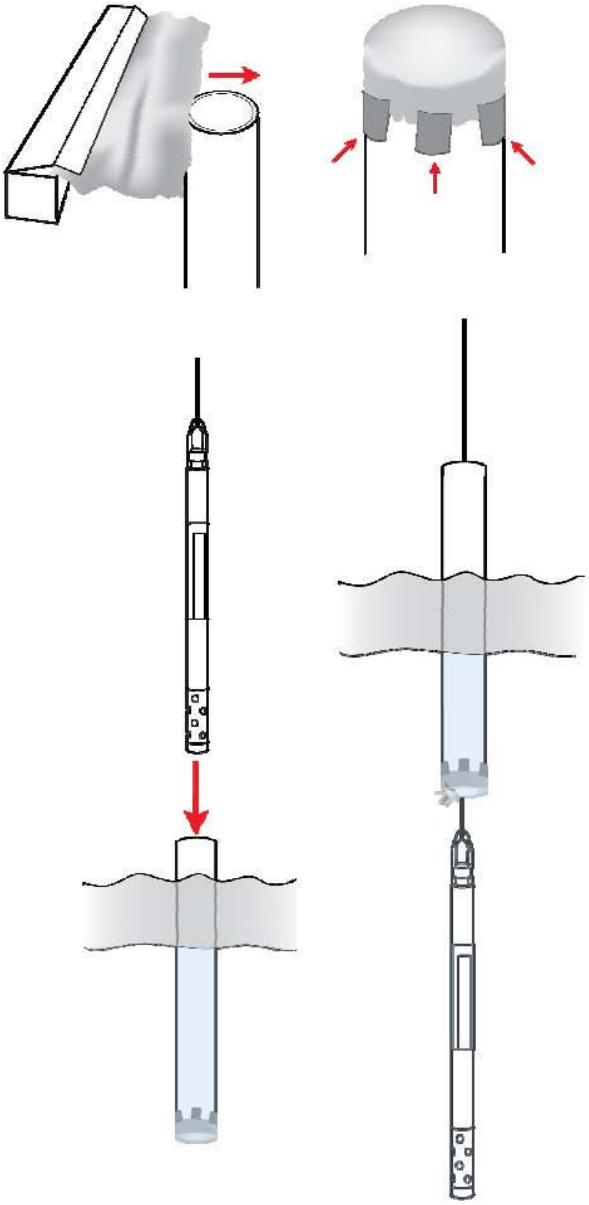
Deployment Methods:

1. Dispersants
    - If the oil film is light you can spray a dispersant onto the water surface before you lower the sonde. Mix “Dawn Dishwashing Soap” 50/50 with tap water in a squirt bottle.

2. Plastic Bag—This method works best with heavier instruments such as YSI 6600, 6920, 6820 sondes
   i. Place sonde in disposable plastic bag.
   ii. Cut off bottom of bag.
   iii. Gather bottom of bag around bottom of sonde/sensor and use a rubber band to close the bag.
   iv. Place second rubber band around the bag and body of sonde, below the bag handles.
   v. Attach a thin, sturdy line to bag handles.
   vi. Deploy sonde vertically and lower it through and below oil layer
   vii. Pull up on the line attached to the bag to pull up the bag and reveal the sensors to the water. You may need to "bounce" the line in order to push it through the opening.
   viii. When finished sampling, use an oar or other object to break apart the oil on the water surface before pulling instrument out of the water
   ix. Rinse instrument in bucket of soapy water. Brush clean.
   x. Remove bag and dispose properly
   xi. If necessary, replace wipers and brushes on instrument
   xii. Repeat process with bag for next deployment



3. PC Tube
   i. Tape one layer of plastic or foil to the bottom a PVC tube long enough to penetrate into water below the surface oil.
   ii. Place sonde or handheld sensor inside PVC tube.
   iii. Deploy sonde and tube vertically and lower it through and below oil layer.
   iv. Drop or push down on sonde or sensor while holding tube steady. The sonde will break through the foil, exposing the sensors to the water.
   v. When finished sampling, pull instrument up through the tube.
   vi. Rinse instrument and tube in bucket of soapy water. Brush clean.
   vii. If necessary, replace wipers and brushes on instrument.



Disposing of Oil-Contaminated Water or Materials

If you generate waste liquids and/or waste materials while cleaning, consult your local waste disposal contractors and waste water treatment authorities, or local regulatory agencies, for requirements associated with proper handling and disposal of these materials.

YSI Oil Decontamination & Deployment Procedures 5-18-2010

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Attachment 2. IN SITU, Inc.: Cleaning and Care of Multiparameter Sondes and Sensors

General Cleaning
Rinse the instrument body well, especially if it has been in contact with contaminated media. Level of cleaning for sensors/sonde/cable should be determined based on the level of contaminant exposure that has occurred.

For minor exposure follow general care instructions found in the following documents. Rinsing with warm soapy water and a soft bristle brush should remove moderate amounts of oily contaminants. Use commercial dish detergent for standard cleaning. Simple Green can also be used if more significant exposure occurs. If pH, DO and RDO sensors are removed, OxiClean can be used for sonde body and cable.

Air-dry or wipe with a lint-free tissue. Ultrasonic cleaning is not recommended. Follow all manufacturer recommended calibration procedures after cleaning has been performed.

O-ring Replacement
O-rings should be replaced if the sensors have been exposed to oily contaminants and sensors have to be removed from the ports for cleaning. In all other situations, the o-rings should only be replaced for annual maintenance on the instrument (replace battery compartment o-rings as well).

If the o-rings become damaged to the extent that they no longer provide an effective seal, they should be replaced. If there is any doubt whether the o-rings should be replaced, it is best to err on the side of safety and replace them.

Before replacing o-rings, clean all mating surfaces, including the o-ring grooves.
O-rings and lubricant are included in the MP TROLL 9000 Maintenance kit available from In-Situ Inc. or your distributor.

Conductivity Sensor
Check the sensor for decline in sensitivity of the electrodes. If necessary, flush the sensor with water, or swish in a mild detergent solution and rinse with tap water. A swab or soft-bristle brush may be gently used to clean the electrodes. Remember that the electrodes are made of graphite, which is soft and easily damaged.

pH, pH/ORP
If the platinum ORP sensor appears dull or oil-coated, it may be cleaned with a cotton swab dipped in alcohol. Rub gently until the platinum appears shiny. Rinse in clean water.
If a film develops on the glass electrode, or if the sensing glass or junction becomes dehydrated, the response may be sluggish or erratic, or the sensor may fail to calibrate. In these cases, rinse the sensor in 90% isopropyl alcohol and soak in a storage solution (Catalog No. 0065370) for at least an hour or overnight if needed. If this does not restore the response, try soaking in 0.1 M HCl solution for 5-10 minutes, followed by a thorough rinse in clean water. Replace junction and reference filling solution after cleaning.

Typical cleaning: First, rinse the sensor tip under a running cold water faucet or use a gentle jet of clean water from a rinse bottle. If this is not sufficient select the specific method (or combination of

methods) from the list below. After any of these methods have been applied, prepare the sensor for subsequent use by rinsing the sensor tip with water followed by an overnight soak in pH 4 buffer. Replacing junction and reference filling solution should be done if contaminant exposure occurs.
Oily or greasy residue: Use warm water with mild soap. Follow with a generous water rinse. Isopropyl alcohol can be used for short soaking periods of up to an hour. Strong solvents (chlorinated solvents, ethers, or any ketones including acetone) must be avoided.
Protein-like material, or slimy films: First clean the sensor in mild soap and warm water. Then soak in a 0.1M HCl solution for 10 minutes and rinse with DI water.

RDO
Cleaning the Sensor
1. Leave the cap on the sensor!
2. Rinse the sensor with warm soapy water and a soft bristle brush.
3. Replace sensing cap as needed.

Note: If any damage to the black layer of the sensor has occurred due to contamination, the sensing cap should be replaced to ensure accurate readings.

Do not use organic solvents—they will damage the foil. Do not remove the cap from the sensor prior to brushing. After cleaning the sensor, perform a 2-point user calibration.

If extensive mineral build-up is present, soak the cap end in vinegar for 15 minutes, then soak in deionized water for 15 minutes.

Cleaning the Optical Window (Perform only if changing the cap)
Remove the cap and gently wipe the window with the supplied lens wipe.
Caution: Do not wet the lens area with water or any solution.

Clark Cell DO
Inspect the sensor and membrane if readings begin to drift.
• Check for discoloration of the electrodes due to silver chloride (AgCl) deposition.
• Inspect the membrane for integrity of the surface, for the presence of algal growth or other contaminants, for crystallization that may indicate a leak in the membrane, and to ensure no air bubbles are trapped under the membrane.

Remove the membrane module and clean the electrodes as follows:
Cathode. Use a polishing strip to buff the platinum cathode until it is shiny. This removes any deposits, increasing the chemically active surface of the electrode for a stronger D.O. signal. **Anode.** If the sensor appears to be excessively discolored from its original matte grey color, clean the anode with ammonia and a soft brush. Extreme discoloration may be removed by soaking for a half-hour in ammonia before cleaning with a brush.
The surface of the anode should appear uniform, but not necessarily mirror-like.

Regular cleaning will prevent pitting of the anode surface, caused by accumulated silver chloride deposition. Severe pitting cannot be removed; the sole remedy is to replace the sensor.
After cleaning, rinse thoroughly and shake to dry. Then fill and attach a new membrane module as follows.

Replacing the Membrane Module

The D.O. sensor performs best in clean water. In environments with high organic content, the membrane performance can be affected ed. Rips, tears and other damage will also affect membrane performance. For best results, replace the membrane when the slope and offset calculated during calibration change dramatically.

The current applied is so small that the electrolyte solution can be expected to last longer than the membrane in most applications

To replace a membrane module:
1. Make sure the area around port 2 is free of dirt and moisture, then remove the sensor. Remove and discard the used membrane module.
2. Inspect and clean the sensor as needed (see above).
3. Fill a new membrane cap with electrolyte and attach it to the sensor.
Refer to “Fill the Membrane Module” in the instrument manual.
4. Install and condition the sensor. Refer to “Condition a Newly Installed Sensor” in the instrument manual.

Remember to condition the sensor for at least 2 hours, preferably 10 hours, before recalibrating with a new membrane. Even with all visible air bubbles removed, a certain amount of gas will be trapped under the membrane. The conditioning period will remove this excess oxygen.

Turbidity

The optical windows of the sensor are made of scratch-resistant sapphire. The optical components are not user-serviceable. Serious mechanical and temperature shock are about the only things that can damage the LED. Follow general cleaning instructions for cleaning oily contaminants from the sonde. If you feel the instrument has suffered such damage, contact In-Situ Technical Support.