Water Column Injury Ephemeral Data Collections:
Cruise 2: Surface Water Sampling Plan
Deepwater Horizon Oil Spill (DWHOS)
May 21, 2010

Prepared by: Debbie French-McCay (ASA) and Laurie Sullivan (NOAA)
Reviewed by: William Graeber (Entrix)

Proposed Cruise dates: May 21, 2010 – May 28, 2010

Objectives (Tier 1-3 from Ephemeral Data Plan)

The surface waters (upper mixed layer and potentially other deeper near-surface waters) are and will continue to be exposed to entrained oil droplets and dissolved soluble to semi-soluble hydrocarbons (aromatics primarily) resulting from:

A. Surfacing oil plumes from deepwater releases and horizontal transport of surfaced oil and the associated oil droplet plume rising from the release sites, with soluble to semi-soluble aromatics already dissolved from the droplets;
B. Dissolution of aromatics from the surface floating oil (after transport to other areas) into the wave-mixed layer (thickness variable with wave height, about 1m deep)
C. Natural entrainment of floating oil (primarily when winds exceed 12 kts) and dissolution of soluble to semi-soluble aromatics into the surface mixed layer (i.e., to 20-40m deep; with more exposure in the upper 1m)
D. Chemical dispersant-induced entrainment of oil and dissolution of soluble to semi-soluble aromatics into the surface mixed layer (i.e., to 20-40m deep; with exposure highest in the upper 1m but potentially extending deeper than for natural entrainment)
E. Transport of oil droplets and dissolved soluble to semi-soluble aromatics in surface advective flows, including in eddies, along fronts, etc.

The objective of this sampling plan is to document physical and chemical conditions of surface waters including:

A. Conductivity, Temperature and Depth (CTD) for characterizing the surface mixed layer and pycnoclines
B. Surface boat-mounted ADCP to measure surface currents in the upper ~300ft (91m) of the water column
C. UV fluorescence measurements to detect subsurface oil (*in situ* sensor packaged with the CTD) Not available for Cruise 2, Turner C3 Fluorometer will be avail be on May 28th
D. Whole water samples for measurement of
    - PAH (complete suite of alkylated PAHs),
    - BTEX,
    - TPH,
    - Dispersant concentrations,
    - Oil droplet size by microscope and video microphotography
E. Surface oil photography and oil samples for weathering analysis

Locations to be sampled:

Sampling and physical oceanographic data will be collected at stations placed in areas of aerially-applied oil dispersants and untreated oil at various stages of weathering. The design will be to radiate from a center near the wellhead so as to sample fresh and more weathered oil. The directions from center will be focused between bounds defined by:

A. The down-current direction, as indicated by the surface ship-mounted ADCP and the ADCP at the Wellhead.
B. The combined down-wind and down-current direction, as calculated by the vector sum of surface current plus 3.5% of wind speed directed 0^{o}-20^{o} to the right of downwind.
C. Any available aircraft support as to surface oil locations from USCG, Ocean Imaging, or other over flights (possibly completed in support of response operations).

Figure 1 shows an example transect design for a situation where the wind is from the SE and the currents are toward the ESE. The down-stream transect is aligned with the expected location of a rising plume being advected to the ESE by subsurface currents. In the last few weeks, currents have primarily (but not on all dates) been <0.1 kt below 100m (328ft), such that the direction of the surface current varying from 0.1-0.7 kts) has determined where the rising oil plume surfaced. Sustained SE winds would transport the oil moved to the east by currents in a northwesterly direction. The down-wind transect in Figure 1 is aligned with the majority of surface oil in such a situation.

Figure 1 indicates the 2-km exclusion zone and 5-nmile safety zone imposed by the response. The sampling stations will include locations between the 2-km and 5 nmile circles, as well as locations outside the 5-nmile circle. Sampling of the freshly-rising oil plume will be focused near the 2-km circle in the down-stream direction unless currents are strong at the time of sampling. Sampling under floating oil will extend farther from the source in the surface-oil areas down-wind and down-current of the source.

Samples will also be taken in 3 reference locations outside the plume, in clear waters without surface oil while en-route to the area near the Wellhead. We plan 5-7 days of sampling, or 4 stations per day sampling 4 depths (approximately 1m, halfway to the mixed-layer pycnocline, just above the mixed-layer pycnocline and just below the mixed-layer pycnocline), from near surface to approximately 75m (240 ft) depth. We estimate up to 200 discrete water samples (whole water) and approximately 40 filtered water samples will be taken. In addition, to these samples Entrix will collect samples for toxicity analyses at selected locations (approximately 4 stations) with as little impact to the primary mission as possible. The Jack Fitz will acquire and install an additional Conex Container and add chest refrigerators to provide cold storage for the additional samples.

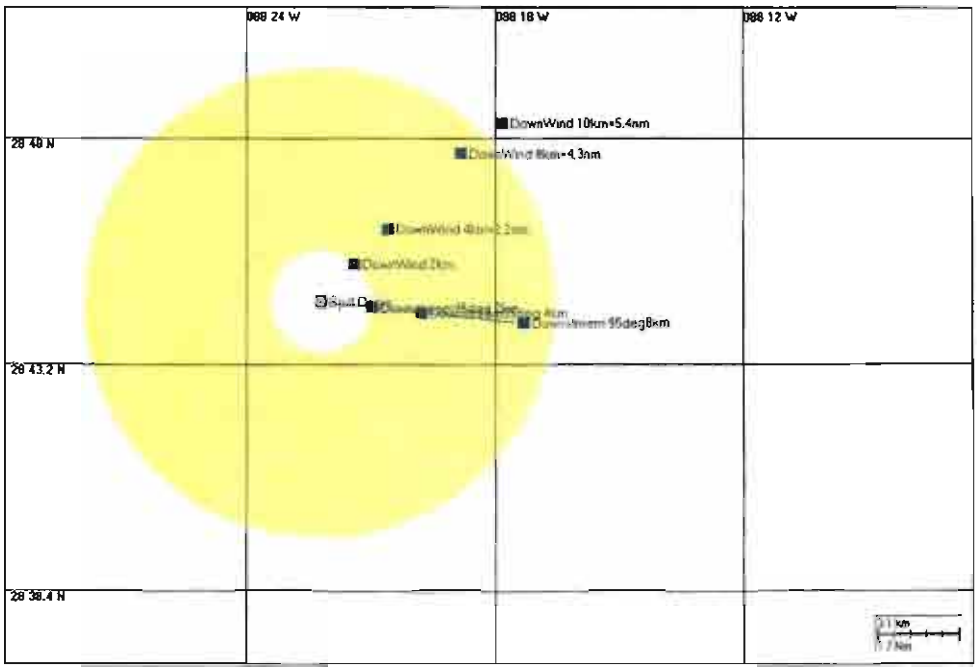


Figure 1. Example sample transect design for a situation where the wind is from the SE and the currents are from the ESE.

Methodology:

1. Physical oceanographic data collection upon arriving at each station:

A. **CTD**

Conductivity Temperature and Depth (CTD) will be conducted to determine water column stratification or other physical oceanographic parameters that will help determine depth of samples collected and further validate the modeling to be performed at a later phase of the assessment. The CTD probe will have a dissolved oxygen (DO) sensor. Appropriate instruments for this include Seabird CTD and YSI meters. A J-frame or larger, a hydrowire (at least 300ft long) and Niskin and/or Go Flow bottles will be used for sample collection

B. **Current**

A ship-mounted ADCP will be used to measure surface currents in the areas sampled. Other ACDP units are deployed in the area of interest. Data will be applied to this monitoring effort, as appropriate.

2. Detection and delineation of dispersed oil in surface layer:

Sampling will be performed along transects at different depths with the aid of a fluorometer to delineate horizontal and vertical extent of subsurface oil in the near-surface layer.
NOTE: A towed fluorometer is our preferred method for this effort. If one cannot be procured, then more conventional methods will be employed (i.e., vertical casts with a fluorometer in connection with collection of discrete water samples)

3. Water column sampling and collection:
Samples will be taken to test for the presence of dispersed oil and droplet sizes. Water samples at depth will be taken with a rosette sampler that can collect multiple samples at various depths and collect large enough samples for chemical analysis. The samples for dispersant measurements will be collected in 1 L plastic bottles. Droplet size will be determined using high resolution microphotography and a LISST particle sizer. Microscopic analysis (with a digital camera mounted to the microscope) will be used to identify particle types and to ground-truth the LISST instrument sampling.

Water samples will be collected for analytical chemistry: PAH (complete suite), BTEX, TPH, Dispersant concentrations. Two types of samples will be taken, and in both cases remaining sample water will be saved for other analyses:

A. A Portable Large Volume Water Sampling System (PLVWSS) (Payne et al., 1999) will be employed to separate the particulate/oil phase trapped on a 0.7 μm glass fiber filter and capture the dissolved phase (filtrate) in 3.8 L (1 gal) I-Chem Certified Clean amber glass jugs. The PLVWSS requires ~3.5 L of sample (for enhanced detection limits above the usual 1 L sample size), so before filter processing the bulk of the sample, duplicate 40 mL aliquots will be drained from the Go Flow bottle directly into pre-acidified VOA vials for analysis of BTEX and other alkylated benzenes. Then, after the majority of the rest of the sample is processed through the PLVWSS, the remaining 4-500 mL will be saved unfiltered for LISST and microscopic analysis for enumeration of droplet sizes and number density.

B. Whole water samples will be taken in 1L I-Chem Certified Clean amber glass jars. These samples will be analyzed for the full suite of PAHs and/or dispersant indicators along with Total Dissolved Solids (TDS) as desired. Remaining sample water will be saved unfiltered for microscopic and other instrumentation for enumeration of droplet sizes and number density.

Water samples will be collected at four depths: just below the surface, mid mixed-layer (between thermocline/pycnocline and surface), just above the thermocline, and just below the thermocline, using a conventional hydrowire with 5 L Go Flow Bottles and a rosette sampling array with pre-programmed sampling depths.

In addition, a Nisken bottle containing a video micro-photographic camera will be deployed on the hydrowire at selected stations to obtain in situ microphotography for oil droplet size analysis.

4. Surface oil samples for weathering analysis:
Surface oil samples will be taken and placed in (cleaned) amber 125 mL bottles. Digital photography will be used to document surface oil appearance and thickness. Surface oil samples will be measured for water content (i.e., mousse), PAH content and biomarkers. Surface sheen and very fluid fresh oil samples will be collected with pre-cleaned Teflon nets attached to fishing weights by casting from the leeward side of the Jack Fitz with a conventional fishing pole. After the Teflon nets are drug through the sheen, they are sealed in 125 mL glass jars for shipment to

the laboratory. Water content on mousse samples will be completed at the laboratory via Karl Fischer titration. PAH analyses will be completed by selected ion monitoring GC/MS and will include alkylated homologues as well as parent compounds. Biomarkers (steranes and triterpanes) will be completed on oil and other specific samples by selected ion monitoring GC/MS.

NOTE:
Sample collection methodology, handling, chain of custody and decontamination procedures will follow accepted standards to ensure the highest quality data will be collected. Discrete samples will be tested at an approved lab(s).

Limitations:
To accomplish the mission, it may be necessary to send a supply boat to bring samples back to shore for shipping to meet holding time requirements. If so, chain of custody must be maintained. An at sea transfer protocol memo is being prepared as an attachment to this plan. Please refer to that document for guidance on the additional contingencies and protocols for the at sea transfers. The at sea transfer is scheduled begin on day three of the mission, Monday 24, 2010.

Equipment needs:

Boat to accommodate 4 NOAA contractors (1 chief scientist, 1 ASA Staff for dissecting scope work, 1 ASA staff for video microphotography and LISST work, 1 WHOI staff to assist with LISST work and in taking water and oil samples plus QA/QC recording); 2 Entrix employees. Boat and personnel will be prepared for 7 days of transit time and sampling. Total Scientific crew - 6

Sampling deployment gear to sample up to 300 ft nominally CSA
Seabird CTD with dissolved oxygen and in situ fluorescence CSA
ROV with live-feed video camera and capability to collect water samples with attached Go Flow Bottles CSA/MAKO
Niskin and/or Go-flow bottle samplers CSA
Dissecting Microscope with camera fitting (rented from LSU) for droplet size measurements
LISST (for droplet mid-sized measurements)
Video micro-photographic camera in Niskin bottle sampler Dr. Yong Kim NOAA
>200 1 L amber glass jars for oil and water samples Entrix / NOAA
54 2.5 L amber glass jars for oil and water samples Entrix/NOAA
64 2.5 L amber glass jars for toxicity samples Entrix
64 1-gallon (3.8L) amber glass jugs Entrix / NOAA
Pre-acidified VOAs for BTEX samples (min 72; 144 optimal)
100 1L plastic bottles (wide mouth) for dispersant analyses
Coolers & Glassware Entrix / NOAA

Personnel
4 NOAA contractors
2 Entrix employees
4 CSA personnel
3 Mako Technologies (ROV operations) personnel

Vessel
All operations will be completed on the M/V Jack Fitz (165 ft) operated by Coastal Marine Logistics out of Golden Meadow, LA. This vessel has been chartered by CSA International, Inc. It is based in Golden Meadow, LA and is available at this time.

Estimated Costs

Jack Fitz Cruise #2: Estimated Costs for a 7 day mission					
Category	**Unit Cost**	**Units**		**Total Cost**	
		Type	Number		
Mobilization Costs	$ 41,400.00	Quantity	1	$	41,400.00
Vessel Costs	$ 32,857.14	Days	7	$	230,000.00
Video CTD Array (Shipping, Rental & Additional Insurance)	$ 33,350.00	Quantity	1	$	33,350.00
Microscope Rental (LSU)	$ 1,322.50	Quantity	1	$	1,322.50
NOAA Contractor Costs	$ 9,285.71	Days	7	$	65,000.00
Estimated Total for Jack Fitz Cruise #2				**$**	**371,072.50**

Safety Plan
A full operations and safety plan will be prepared for review and approval before any planned operations. In addition, the NOAA incident site safety plan (which all NOAA employees and contractors must sign prior to the cruise) is attached.

Distribution of Laboratory Results

The laboratory shall simultaneously deliver a copy of all electronic and hard copy data packages to NOAA (or its QA contractor) and to ENTRIX. Delivery of electronic data shall be by e-mail with a follow-up disk. Any preliminary data distributed to one party shall also be distributed in a similar manner to the other party.

Reference:

Payne, J.R., T.J. Reilly, and D.P. French, "Fabrication of a Portable Large-volume Water Sampling System to Support Oil Spill NRDA Efforts," in *Proceedings of the 1999 Oil Spill Conference*, American Petroleum Institute, Washington, D.C., pp. 1179-1184, 1999.

Attachments:

Description of Portable Large Volume Water Sampling System (PLVWSS)
Quality Assurance Guidance for water chemistry cruise
Water Sample Handling Procedures in support of the NRDA Cruise
Video array description
At Sea transfer protocol memo
DWHOS-LSU-microscope-rental-cruise2- repair or replacement
DWHOS-DIPSTIC-rental-UM- cruise2-repair or replacement
NOAA Site Safety Plan for Deepwater Horizon Incident
M/V Jack Fitz NRDA Cruise 2 HSE Plan

Water Column Injury Ephemeral Data Collections:
Cruise 2: Surface Water Sampling Plan
Deepwater Horizon Oil Spill (DWHOS)
May 21, 2010

Approvals

Approval of this work plan is for the purposes of obtaining data for the Natural Resource Damage Assessment. Each party reserves its right to produce its own independent interpretation and analysis of any data collected pursuant to this work plan.

Robert W Ricker
May 21, 2010

Federal Trustee Representative

Rob Ricker (NOAA)

Date

for Ralph Markarian
May 21, 2010

BP Representative

Ralph Markarian (ENTRIX, Inc.)

Date

PORTABLE LARGE-VOLUME SEAWATER SAMPLING SYSTEM (PLVWSS)

05/05/10

PLVWSS Specifications, Sampling Protocols, and Power Requirements

Container	Contents	Dimensions (inches)	Weight (lbs)	Power Requirements
Cruise Box No.1	Vacuum pump, in-line charcoal filter and water trap, vacuum gauge, support rack for 1 gallon amber-glass bottles, Teflon® stopper and suction tubing	24¼ W x 21¾ D x 19½ H	60	110 volts AC (from ship's AC outlet or portable generator)
Cruise Box No. 2	14.2 cm stainless steel Millipore® filter holder, Tygon® tubing, Teflon® solvent squirt bottles for equipment rinsing, Pall-Gelman Sciences 14.2 cm glass fiber filters, electrical extension cord, stainless steel forceps and spatula for filter manipulation	23¾ W x 23 ¾ D x 21¼ H	50	None

INSTRUCTIONS FOR SAMPLE COLLECTION AND FILTRATION

1) Place the Tygon® sampling tubing attached to the upper side of the filtration unit into the water (for near-surface samples if direct suction sampling is desired) or attach to the sampling port of the Go Flow Bottle used to collect samples at depth.

2) Plug in the vacuum pump (there is no on/off switch), and hold the Teflon® stopper firmly in the neck of the sample bottle. DO NOT FORCE THE STOPPER COMPLETELY INTO THE BOTTLE. The Viton® O-ring on the stopper is intended to make the seal with the upper lip of the sample bottle. Forcing the stopper into the neck of the bottle may cause the bottle to break, and it will certainly make it difficult to remove the stopper at the termination of sampling operations.

3) Press the Viton® O-ring on the stopper onto the top lip of the amber-glass bottle until a vacuum reading of 20 to 24 inches of Hg is obtained on the vacuum gauge attached to the pump. If the stopper starts to get sucked into the sample bottle, gently pull it out part way while still maintaining 20 to 24 inches of vacuum. Hold the stopper in place until water can be observed bubbling about 3 to 4 inches from the top of the amber glass bottle. This entire process may take from 5 to 7 minutes.

4) At this point, carefully watch the upper water level to ensure that the bottle does not become completely filled. Also, watch the vacuum tubing running from the Teflon® stopper to the in-line charcoal filter and water trap to see signs of water droplets starting to be drawn across into the trap. Stop collecting the sample when the water level is about 2 to 3 inches from the top of the 1-gallon bottle or when frequent water droplets are observed going over into the in-line trap.

5) To stop sampling, simply pull up on the Teflon® stopper to break the vacuum seal with the sample bottle. DO NOT TURN OFF THE VACUUM PUMP FIRST. This can damage the vacuum pump, and cause back diffusion of materials trapped in the in-line water trap back into the sample.

6) After the seal with the sample bottle is broken and the vacuum pressure has dropped back to ambient, unplug the vacuum pump.

7) Disconnect the Teflon® stopper from the transfer tubing coming from the bottom of the Millipore® filtration unit and wrap both ends of the tubes from the two-holed Teflon® stopper with aluminum foil. Place the original cap from the amber-glass bottle back on the bottle to seal it. Leave the sample in the pump box for safe storage until all other sampling operations are secure.

8) Drain any excess water from the tube running from the bottom of the filtration unit before opening the Millipore® filter housing. This will prevent any of the filtered material (SPM, sand, and free oil droplets) from being washed off the filter when the unit is opened. After all the water has drained from the bottom of the filtration unit, cap the tubing with aluminum foil and wrap the tubing around the legs for temporary storage.

9) Open the Millipore® filtration unit and carefully remove the outer ¼-inch circle of the glass-fiber filter from the perforated blue support base. Discard the outer edge of the filter. Using the stainless steel forceps and spatula provided with the PLVWSS, carefully fold the filter (while still on the blue support base) in half (and then in half again) to make a quarter-pie shape and then one more time making an eighth of a pie wedge. This entire operation should be done with the filter still resting on the perforated blue support base.

10) Place the folded filter wedge into a 125 mL Certified-Clean I-Chem bottle, seal and label it. The filters may be stored on ice or frozen in the field, if dry ice is available. Store frozen.

11) If another water sample is to be collected right away, place another glass-fiber filter into the Millipore® filtration unit, return the filtration unit to the cruise box/container, and proceed to the next station.

Finally, put the filtered water sample in the 1-gallor amber glass jug in a refrigerator (4^oC) or cooler with frozen Blue Ice packs for storage before transfer to the analytical laboratory. Alternatively, the dissolved-phase water sample may be preserved by acidification (pH < 2 with HCl) or poisoned with 50 to 100 mL of methylene chloride. Because of air-freight shipping considerations, preservation with refrigeration and shipment with Blue Ice is preferred, particularly if next-day air delivery to the laboratory is available.

Data Quality Assurance Plan for NRDA Water Column Chemistry Cruise II on the M/V Jack Fitz

Purpose

This document provides general guidance for field sampling data quality assurance for the collection of NRDA field samples for planned sampling cruise on May 21-28, 2010 to assist in the validation of 3-dimensional modeling of subsurface plume structure aboard the M/V Jack Fitz.

The current sampling plan involves sampling 4 depths at numerous stations directed by Dr. D. French-McCay (based on daily overflights) for BTEX, THC, PAHs and free oil droplet size. Sampling requirements as outlined for basic sampling to address field program objectives for adequate description of locations are presented in Table 1. This sampling scheme is derived from the Field Plan and Sampling Protocol documents.

Table 1: Required Analytical Samples for 3-dimensional modeling data support

Sample Type	Volume Needed	**Minimum** # of samples per location
BTEX	40 mL	2 per depth
THC and PAH	1 gallon	1 per depth
Oil Droplet distribution	10 mL	10 per sample depth

In addition to basic site description, additional sampling requirements for data verification and validation, as well as equipment and procedural validation are required. These samples and the suggested frequency are described below.

Laboratory Notebook

All errata and observations that do not have a logical spot on the Chain of Custody form shall be documented in a bound lab notebook with numbered pages. Additional notation shall be written in black or blue ink. Entry errors shall be crossed out with a single line, initialed, and dated.

Blank Samples

Laboratory Grade de-ionized (DI) water in certified clean glass containers will be provided by Pace Laboratories. 5 DI water samples shall be collected, where practical, using the laboratory provided water, according to the described methodology for BTEX and THC/PAH analyses (including filtration) at each sample location. These samples shall be handled and stored in accordance with the accepted methodology for each sample type. At stations where two DI samples are collected, one shall be collected before Go-Flo bottle sample collection, and one shall be collected after the last seawater sample is collected.

Storage Procedure Monitoring

Aqueous samples shall be refrigerated to 4 °C (+/- 0.5 °C). DO NOT FREEZE. Refrigeration temperature shall be recorded when samples are stored, and periodically monitored and recorded to ensure proper

refrigeration. A thermometer will be available to remain with the aqueous samples in storage for monitoring purposes.

Filter samples shall be frozen for storage. Storage temperature shall be kept at 0 °C or below. Refrigeration temperature shall be recorded when samples are stored, and periodically monitored and recorded to ensure proper refrigeration. A thermometer will be available to remain with the filter samples in storage for monitoring purposes.

Methods for sample replicates/splits

To accomplish random sample splits, two methods can be employed during the cruise. Method One will be simultaneous deployment of two 5 L Go-Flo bottles which will be closed at the same depth in order to collect sample water as similar as practical. Method Two involves deploying a single 10 L Go-Flo bottle and collecting samples in series from the same bottle upon retrieval. Method One will be the preferred method. Method choice must be documented on the Chain of Custody form as **Replicate** (Method One) or **Split** (Method Two).

Sampling Equipment Monitoring

All tubing and shall be visually inspected before sampling. Sampling tubing shall be changed when contamination is visually obvious. Tubing changes shall be documented in a separate laboratory notebook (date, time, location).

Sample Depth Determination and Verification

Where practical, sample depths shall be chosen to best elucidate modeling data needs. For all samples except ROV collected samples (where depth is dependent on visual observations of TV feed to facilitate collection of observed dispersed oil droplets in the water column), depths for Go-Flow samplers must be preset (based on CTD and fluorometry data) and the depth selections recorded. Verification of triggering sequence of the CTD shall be made and documented in order to verify samples were collected as expected. Go-Flo bottles shall be numbered and numbers documented with sample station and on Chain of Custody forms. Any malfunction of the triggering of the Go-Flo bottle operation shall be documented.

Water Sampling Protocols in Support of the NRDA Cruise WATER SAMPLES

Sampling Objectives

- To determine the concentration of oil compounds in the water column.
- To determine the source via fingerprinting, the degree of weathering, and background levels.
- To document exposure of water-column organisms and validate toxicity models.
- To maintain the integrity the sample(s) during sampling, transport, and storage.

Sample Volume

Analysis	*Sample Volume*	*Reporting Limit*
Volatile Aromatic Hydrocarbons (VAH)* by SIM GC/MS (collect in duplicate)	40 mL vials	0.1-1 μg/L (ppb)
Total Hydrocarbon (THC) by GC/FID	1-Liter	15 μg/L (ppb)
PAH (including alkylated PAHs) by SIM GC/MS	1-Liter	0.001 to 0.01 μg/L
	3.5 Liter	0.0005 to 0.003 μg/L

*sometimes referred to as VOA or BTEX analysis

Sampling Equipment/Containers

See separate NRDA Cruise Plan and PLVWSS procedures for use of the Portable Large Volume Water Sampling System (PLVWSS) for separating dissolved- and particulate/oil fractions by vacuum filtration immediately after collection.

- Collect VAH samples (wearing clean Nitrile gloves) by pouring directly from the collection device (4 or 5 L Go-Flow bottle or other sampler) into HCl-persevered 40 mL septum-capped vials. Ensure that there is no headspace (i.e., bubble) in the vial.
- Collect water samples for THC and PAH in glass containers, certified-clean to be organic-free (solvent rinsed). Amber glass is preferred. Leave headspace of about 1 inch for 1 L jars. If the Portable Large Volume Water Sampling System (PLVWSS) is used, the sample will first be processed by vacuum filtration through a 0.7 μm glass fiber filter as it is vacuum transferred from the Go Flow Bottle into the amber glass jug (see separate PLVWSS Protocol).
- If slicks are present, decon samplers before each use (see separate QA Plan for the NRDA Cruise). Wash with laboratory-grade detergent and clean water, with a triple clean-water rinse (distilled water from a local store is OK but laboratory grade, certified-clean DI water is better. If that cannon be obtained, clean "background" water from an up-current non-contaminated area may be used. If sampler is contaminate by an oil slick, an Alkanox wash followed by solvent rinse with isopropanol (or acetone) and methylene chloride is appropriate. (See separate QA Plan for sampler decon and blank protocol/frequency.) Collect waste solvent rinsate for proper disposal.

Sample Collection Methods

- Collect subsurface samples below the water surface so as not to include any surface oil.
- Take "near surface" samples from approximately 1 m below the surface; take "near bottom" samples within 5 m of the bottom.

- Sampling equipment MUST be deployed and retrieved in the closed position. Also applies to sample jars lowered by hand.
- On each cruise, try to sample the control/least oiled areas first, then more contaminated zones.
- Clear surface slicks with a boat hook or pole prior to deploying the equipment, but carefully so that the surface oil is not physically dispersed into the water column. Sweeping the area with sorbents may also be effective.

Preservation/Holding Times

- VAH (VOA vial): With no preservative the samples may be held for 7 days at 4°C in the dark. Addition of HCl can extend the holding time to 14 days at 4°C in the dark without loss of sample integrity.
- THC and PAH: No preservative added. Can be held at 4°C in the dark for up to 7 days.
- Immediately place all water samples in cooler and keep at 4^{o} C (do not freeze).
- Use packing material around containers to prevent breakage.
- Ship to the laboratory ASAP with complete COCs. They need at least one day to process prior to holding time expiration.
- **Volatile hydrocarbons** (benzene, toluene, ethylbenzene, and xylene, or BTEX). For oil spill applications, the standard EPA Method 8240 (purge & trap) should be modified by running the GC/MS in selected ion monitoring mode and expanding the scan list (retention times and ions) to include the higher alkylated (C3 and C4) benzenes. Detection limits should be 1 ppb for individual analytes; 0.1 ppb is possible.
- **Total hydrocarbons** (THC). Often referred to as total petroleum hydrocarbons, but most methods do not differentiate among petroleum, petrogenic, and biogenic hydrocarbons. THC by GC-FID (total area of FID gas chromatogram of combined f_1 and f_2 fractions after column chromatography) is often the preferred method because of the low detection limit (compared to other THC methods) and the direct measurement of individual hydrocarbons. This method does not detect low boiling compounds (below n-C_8). For NRDA, THC analyses generally will not provide the data needed to support calculation of toxic effects from PAH exposure, and will have to be corrected to equivalent PAHs. The THC results, however, can be used to tract oil weathering and map extent of exposure of water column resources, if meaningful detection limits can be reached. So, get a copy of the GC "trace." Detection limits are usually higher than those needed for aquatic injury assessment.
- **Polycyclic aromatic hydrocarbons** (PAH). Since most of the toxicity in oil is due to the PAHs, it is often the preferred analysis for NRDA. However, PAHs are expensive and require special laboratory skills. If PAHs are to be measured, it is important that the analytes include the alkyl-substituted PAH homologs, in addition to the standard PAH "priority pollutants." This method is referred to as Modified EPA Method 8270, because the list of PAHs is expanded to include the alkylated homologs, using GC/MS in the selected ion monitoring (SIM) mode. Detection levels should be 1 ppb for individual PAHs to support injury assessment using toxicity thresholds. Have the lab also run the source oil.

Other Considerations

- Contamination by surface slicks is of great concern. Document presence of slicks, weather, wave conditions, etc. which might suggest mixing of surface oil during sampling.

- Be aware of sources of contamination on the sampling vessel (exhaust fumes, engine cooling systems, oily surfaces). Work up-wind of any exhausts. Segregate dirty/clean areas. Lay out clean substrates to work on and replace frequently.
- Collect background samples from clean sites representative of pre-oiling conditions, as well as areas not yet oiled but in the potential path of the oil.
- Preservation chemicals should be provided by the lab.
- Use a computer or conceptual model of the extent of water-column contamination to determine the number and location of samples. Minimum guidelines are at least three samples per area of relatively uniform exposure or sub-waterbody. Also, sample along exposure gradients starting in the cleanest zone at regular intervals proportionate to the exposure area.

Contact James R. Payne at PECI for questions or additional information

[redacted]

Digital Micro-Video Camera System

Prepared by Yong Kim and Deborah French McCay, Applied Science Associates (ASA)
May 14, 2010

- Objectives: to understand the distribution and variability of in-situ oil droplet size as a function of depth and location relative to the subsurface oil release site

- Instrumentation:
(1) Underwater video camera with magnifying lenses housed in modified 20-L Niskin bottle, which will capture an image of droplets in the water column via in-situ capture of water
(2) CTD-OBS: measuring conductivity, temperature, depth and suspended solids concentrations
(3) LISST: laser in-situ scattering and transmissometry, which will measure droplet size up to 500 microns (an so chemically-dispersed oil droplets)
(4) ADV: acoustic device to measure turbulence intensity, which may affect the droplet sizes and dispersion (diffusion) rate

- Needs from the vessel:
(1) A-frame (or similar) with 7-ft or more of clearance
(2) Mechanical winch and hydrowire that can handle 300 lbs or more
(3) Compressed air, if possible. Otherwise, we may use scuba diving tanks.
(4) 110V Power for laptops, camera and strobes

- Cost estimate
(1) rental cost: $2000/week (assumed 5 weeks for this cost estimate)
(2) insurance (i.e., Letter of Insurance)for the total equipment cost, $60-70k
(3) cost for materials (e.g., batteries): <$5k
(4) shipping cost: A rig needs to be delivered from MD to LA by UPS urgent freight (~$3k) and a communication cable and some electronic parts will need to be shipped from Florida (~$1k). The return shipping we are assuming to be similar ($4k); however, it should turn out to be a lower cost).
(5) software cost: $6k for Simulink and relevant toolboxes as add-on for MatLab software (already in-house at ASA) – This software is only needed for the data collection and analysis as part of this project, and will not be used for other purposes. So, we may pass the software license to NOAA or other parties at the end of this project.

Costs:
Rental, shipping and materials $29,000
Travel costs for Yong Kim (PVD to Baltimore to New Orleans and return to PVD)
Labor costs for Yong Kim

CSA International, Inc.
8502 SW Kansas Avenue
Stuart, Florida 34997
www.csaintl.com
Phone:
Fax:

Date: 21 May 2010

To: William Graeber, ENTRIX

From: Alan Hart

Subject: Procedures for the At-Sea Transfer of Samples

Transfer of samples at sea is scheduled to occur on Tuesday, 25 May 2010 to ensure that holding times of samples are not exceeded. The process of sample transfer will occur as follows:

1) The marine forecast for the area will be checked on the morning of Monday, 24 May 2010.
2) Based on the forecast, the location of the transfer will be determined based on the following criteria:
    a) Seas less than 3 ft – the vessels will meet at a location within the study area at first light on Tuesday morning.
    b) Seas greater than 3 ft – the vessels will arrange to meet in calm waters near the mouth of the ship channel at first light. If the sea state is suitable to conduct the transfer at sea (<3 ft), transfer will occur. If the sea state is not suitable (>3 ft), the M/V Jack Fitz will transit back to shore for safe transfer of samples.
3) Upon rendezvous of the vessels, they will move along side in a safe manner. After it is determined that the coolers containing the samples can be safely transferred, all coolers will be passed from the M/V Jack Fitz to the receiving vessel for transport back to shore.
4) Custody of samples will be transferred to the appropriate person on board the receiving vessel. All samples will be maintained in a safe, secure manner until sample custody is passed to the appropriate personnel onshore.

May 6, 2010

Mark Benfield
Louisiana State University Department of Oceanography & Coastal Sciences
2179 Energy, Coast & Environment Building
Baton Rouge, LA 70803

Dr. Malinda Sutor
Louisiana State University Department of Oceanography and Coastal Sciences
2179 Energy, Coast, and Environment Building
Baton Rouge, LA 70803

Dear Dr. Mark Benfield and Dr. Malinda Sutor,

For the upcoming cruises in the Gulf of Mexico for the BP Deepwater Horizon oil spill, BP has agreed to repair or replace all damages in the use of Louisiana State University's Zeiss Axioscope 20 microscope and accessories for the water sampling event as part the Natural Resource Damage Assessment water sampling taking place between May 5 and May 5-8.. BP has also agreed to pay a $1000 fee to rent the equipment for the course of the cruises.

Sincerely,

Joyce Miley
Auditor
Safety & Operations Group

bp

Joyce Miley
Safety & Operations Group
Auditor

BP International
36089 Tompkins Rd.
Hempstead, TX 77445
USA

[redacted]

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 5-21-10

PRODUCER

Coverage Concepts, Inc.
4953 Nesconset Hwy

Port Jeff Sta NY 11776

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.

INSURERS AFFORDING COVERAGE | **NAIC #**

INSURED

CSA International Inc.
8502 SW Kansas Avenue
Stuart FL 34997

INSURER A: Star Indemnity & Liability Coverage
INSURER B:
INSURER C:
INSURER D:
INSURER E:

COVERAGES

THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. AGGREGATE LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	ADD'L INSRD	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YYYY)	POLICY EXPIRATION DATE (MM/DD/YYYY)	LIMITS	
		GENERAL LIABILITY				EACH OCCURRENCE	$
		COMMERCIAL GENERAL LIABILITY				DAMAGE TO RENTED PREMISES (Ea occurence)	$
		CLAIMS MADE ☐ OCCUR ☐				MED EXP (Any one person)	$
						PERSONAL & ADV INJURY	$
						GENERAL AGGREGATE	$
		GEN'L AGGREGATE LIMIT APPLIES PER:				PRODUCTS - COMP/OP AGG	$
		POLICY ☐ PRO-JECT ☐ LOC ☐					
		AUTOMOBILE LIABILITY				COMBINED SINGLE LIMIT (Ea accident)	$
		ANY AUTO					
		ALL OWNED AUTOS				BODILY INJURY (Per person)	$
		SCHEDULED AUTOS					
		HIRED AUTOS				BODILY INJURY (Per accident)	$
		NON-OWNED AUTOS					
						PROPERTY DAMAGE (Per accident)	$
		GARAGE LIABILITY				AUTO ONLY - EA ACCIDENT	$
		ANY AUTO				OTHER THAN AUTO ONLY: EA ACC	$
						AGG	$
		EXCESS / UMBRELLA LIABILITY				EACH OCCURRENCE	$
		OCCUR ☐ CLAIMS MADE ☐				AGGREGATE	$
							$
		DEDUCTIBLE					$
		RETENTION $					$
		WORKERS COMPENSATION AND EMPLOYERS' LIABILITY Y / N				WC STATU-TORY LIMITS ☐ OTH-ER ☐	
		ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? ☐ **(Mandatory in NH)**				E.L. EACH ACCIDENT	$
		If yes, describe under SPECIAL PROVISIONS below				E.L. DISEASE - EA EMPLOYEE	$
						E.L. DISEASE - POLICY LIMIT	$
A		**OTHER** Ocean Marine	MASIHNY0000062009	7/1/09	7/1/10	DIPSTIC	

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES / EXCLUSIONS ADDED BY ENDORSEMENT / SPECIAL PROVISIONS

*A Hull and Machinery/Excluding Collision Liability/Deductible Per Schedule /Vessels Scheduled On Policy
Protection & Indemnity/$10,000,000./ Including Collision Liability/Deductible $5,000.Per Occurrence/ Includes Charterer's Liability
Contractors Equipment/As Scheduled and $100,000. Unscheduled /$2,500. Per Unit $25,000. Agg. Per Occ./ $5,000. Per Occ.for Unscheduled Equipment
CERTIFICATE HOLDER IS ADD'L INS. & LOSS PAYEE FOR DIPSTIC SYTEM TOTAL VALUE $90,000

CERTIFICATE HOLDER

Dr. Lawrence Sanford
University of Maryland Center for Environmental Science
Horn Point Laboratory
2020 Horns Pt Rd., P.O. Box 775
Cambridge, Maryland 21613

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL ENDEAVOR TO MAIL 30 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO DO SO SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE INSURER, ITS AGENTS OR REPRESENTATIVES.

AUTHORIZED REPRESENTATIVE <>

IMPORTANT

If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

DISCLAIMER

This Certificate of Insurance does not constitute a contract between the issuing insurer(s), authorized representative or producer, and the certificate holder, nor does it affirmatively or negatively amend, extend or alter the coverage afforded by the policies listed thereon.

MS CANYON 252 SAFETY CONFIRMATION

NAME: _____

CELL PHONE NUMBER: _____

EMAIL ADDRESS: _____

I HAVE READ AND UNDERSTAND THE MS CANYON 252 SITE SAFETY PLAN

_____**SIGNATURE**

_____**DATE**

I HAVE COMPLETED THE FOLLOWING LEVEL OF HAZWOPER TRAINING:

□ **NONE** □ **24 HOUR** □ **40 HOUR**

I HAVE COMPLETED THE FOLLOWING BP SAFETY TRAINING MODULE(S):

***NOTE: IF YOU HAVE COMPLETED THE ON-LINE TRAINING, YOU HAVE COMPLETED MODULE 3**

□ **MODULE 1** □ **MODULE 2** □ **MODULE 3**

I HAVE COMPLETED FACE-TO-FACE TRAINING DURING THIS RESPONSE AT HOUMA

□ **YES** □ **NO**

EMERGENCY CONTACT INFORMATION

NAME: _____

PHONE NUMBER: _____

Please return this form, completed in its entirety, to either:
□ The drop box in Room G401 at the Houma Command Center, or
□ The following email address: dwhnrda@gmail.com

SUBJECT: Safety Plan

PREPARED FOR: NRDA (Natural Resources Damage Assessment),
Shore Survey Operations

1. INTENT

1.1. The intent of this Field Safety Plan is to establish a structured process and disciplined approach to the mitigation of health, safety and environmental risks associated with our operations and activities. This safety plan applies to the Natural Resources Damage Assessment (NRDA) Team.

2. COMMUNICATIONS

2.1. A daily pre-operations meeting will be conducted on-site with each team. Job Hazard Analysis' are located at the end of this document. Specific topics of discussion will include:

- Lessons learned from the prior day's mission.
- Current weather and short-term forecast.
- PPE requirements.
- Communications.
- Food and Water.
- Potential hazards to watch out for.

2.2. Each team is equipped with a cellular phone and/or a satellite phone. NRDA Field Teams will contact NRDA Operations (located at ICP Houma) as identified below to help ensure personnel accountability.

2.2.1. Departing for field sampling area.

2.2.2. Arriving field sampling area.

2.2.3. Four hour intervals during operations.

2.2.4. Departing field sampling area for day/shift.

2.2.5. Termination of operations (e.g. transition to over-the-road vehicle and/or arrival place of lodging).

2.2.6. As soon as practical to report any health, safety, security, or environmental incident.

2.2.7. Use one of the following NRDA Ops (ICP Houma) contact numbers:

2.2.7.1. PRIMARY -

2.2.7.2. For non-routine issues and the above number can not be reached, CALL Nir Barnea (NOAA Safety) -

2.3. NRDA Team Members at ICP Houma will update the Shore Survey Teams Status Display upon notification from a NRDA Shore Survey Field Team.

2.4. Each NRDA Shore Survey Field Team will be provided with a copy of this safety plan.

3. VEHICLE SAFETY

3.1. Pre-Trip Plan (Maps, directions)

3.2. Seat Belt use is mandatory

3.3. Observe posted safety notifications and speed limits.

3.4. DRIVER - Cell phone use both hand-held and hands-free, texting, and e-mailing is prohibited while driving. If necessary, park in a safe location (off the road) and use while parked.

4. ACCIDENTS – INJURIES – SPILLS – NEAR MISSES

4.1. Accidents, injuries, spills or near misses must be reported to the NRDA Operations Supervisor as soon as practical. Required documentation will be managed by the NRDA Operations Supervisor with assistance by involved personnel. The NRDA Operations Supervisor will notify appropriate Incident Management Team personnel including the BP Safety Officer at the Incident Command Post in Houma.

5. TRAINING

5.1. Any member of a NRDA Field Team is required to have the following Safety Training.

- Required BP Safety Training
- HAZWOPER Certification
- PHI Helicopter Pre-Flight Safety Briefing

6. PERSONAL PROTECTIVE EQUIPMENT

6.1. Each NRDA Field Team Member is expected to utilize Personal Protective Equipment as appropriate for the activity being performed (refer to the Job Hazard Analysis incorporated within this document).

7. LEADERSHIP

7.1. While on an aircraft, boat or airboat, NRDA Team Members will follow pilot/co-pilot/captain/operators safety related instructions at all times. The NRDA Operations Supervisor is responsible for directing team activities and will help decide if safety issues preclude scheduled activities. All team members are responsible for individual and collective safety.

8. JOB HAZARD ANALYSIS (see following pages)

- Shore Operations
- Small Boat / Air Boat Operations
- Helicopter Operations

TASK	NRDA Shore Survey Operations	PERFORMED BY	Caleb T. King (Coast Guard - Safety)
LOCATION	Various locations of affected areas	REVIEWED BY	Lisa DiPinto (NOAA - NRDA Coordinator)
DATE PREPARED	5/8/2010 New [X] Revised [ ]	PPE REQUIREMENTS	Personal Flotation Device (PFD) Safety Glasses or Goggles *(tinted as necessary)* Tyvek Coveralls and Boot Covering Nitrile Gloves

Issue of Concern / Activity	Potential Hazards	Control Measures
Entering / Departing Boat	Wet surfaces, change in stability	Watch where you step; use available handrails; assistance by others.
Walking Shore	Heat Stress	Stay hydrated and take breaks. Monitor each other. Know symptom of heat stress and how do address them.
	Sun Burn	Apply sunscreen to exposed skin. Wear a hat with a brim to shade face.
	Insect Bites / Stings	Use mosquito repellant; and maintain Sting Swabs in First Aid Kit.
	Eye strain (sun light)	Wear tinted eyewear.
	Animals (snakes, alligators, and other non-domestic types)	Careful placement of feet and hands; No open toed shoes.
	Fall Into Water	Wear Personal Flotation Device when 10-feet or closer to water.
	Loss of Communication	Establish and maintain communications with ICP Houma, other vessels, and never separate NRDA workers from vessel where communications cannot be maintained.
	Working alone	Maintain buddy system at all times, personnel should not work alone
Activity where Personal Contamination is Anticipated	Hand contamination and/or other exposed skin as well as clothing	Wear Tyvek (or similar) boot covering and coveralls; Nitrile gloves; Safety Glasses or Goggles depending on liquid splash potential.
Use of Tools	Cuts / Scrapes	Use tools as designed and refrain from over-exerting shovel tips where loss of control could happen.

TASK	Small Boat / Air Boat Operations
LOCATION	Various locations of affected areas
DATE PREPARED	5/8/2010 New [X] Revised [ ]

PERFORMED BY	Caleb T. King (Coast Guard - Safety)
REVIEWED BY	Lisa DiPinto (NOAA - NRDA Coordinator)
PPE REQUIREMENTS	Personal Flotation Device (PFD) Safety Glasses or Sun Glasses Hearing Protection

Issue of Concern / Activity	Potential Hazards	Control Measures
Entering / Departing Boat	Wet surfaces, change in stability	Watch where you step; use available handrails; assistance by others.
Vessel in Transit	Fall Overboard	Personal Flotation Device.
	Collision, Allision, or Grounding	Follow Navigational Rules of the Road; Maintain awareness; Know location; Maintain Communications.
	Overloading Vessel	Distribute weight evenly and do not exceed vessel capacity plate.
	Mechanical Issues	Keep spare parts, tools, etc. onboard and always know your fuel levels.
	Airborne Particulates and Insects	Wear safety glasses, sun glasses, or prescription glasses.
	Heat Stress	Stay hydrated and take breaks. Monitor each other. Know symptom of heat stress and how do address them.
	Sun Burn	Apply sunscreen to exposed skin. Wear a hat with a brim to shade face.
	Pinch Points	Maintain control of doors/hatches; Keep fingers and feet clear of lines/ropes
	Noise	Double hearing protection must be worn onboard air boats.

TASK	**Air Operations**	**PERFORMED BY**	Caleb T. King (Coast Guard - Safety)
LOCATION	Heliports and along affected areas	**REVIEWED BY**	Lisa DiPinto (NOAA - NRDA Coordinator)
DATE PREPARED	5/8/2010 New [X] Revised [ ]	**PPE REQUIREMENTS**	Hearing Protection Personal Flotation Device (PFD)

Issue of Concern / Activity	Potential Hazards	Control Measures
Boarding Helicopter	Noise, Tail Rotor, Rotor Wash	Hearing Protection, Never walk behind helicopter, keep all items secured
In Flight	Noise, Water Landing, Motion Sickness	Hearing Protection, PFD, Medication
Departing Helicopter	Noise, Tail Rotor, Rotor Wash	Hearing Protection, Never walk behind helicopter

ENTRIX	WATER COLUMN PROFILING SERVICES	

Water Column Profiling Services to Measure Dissolved-Phase Aromatic Hydrocarbons and Free Oil Droplets as a Function of Depth and Location Relative to the Subsurface Oil Release

Cruise 2

GOM BLOCK

MISSISSIPPI CANYON 252

PROJECT HSE PLAN

ENTRIX Corporation

CSA International, Inc. (CSA)

REVISION STATUS			APPROVAL		
Rev	**Date**	**Reason for Issue**	**Originator**	**Reviewed**	**Approved**
A	4-May-2010	Issued for Comment	L. Powell		
B	7-May-2010	Changed vessel	F. Ayer		
C	7-May-2010	Changed HSE Manager	F. Ayer		
D	20- May-2010	Cruise 2	R. Mulcahy		

Dist:	**Subject**	**HSE Management**				
As per page 2	**Activity:**	**Project HSE Plan**				
	Location:	**GOM Block MC252**				
		Location	Disc	Document Type	Sequence No	Rev
	Doc. No.					**4**

PARTY APPROVAL FOR USE IN OPERATIONS

Bureau Veritas Stephen C. Donham, CIH HSE Manager	Lynwood Powell HSE Manager

Record of Document Issue

Name	Company / Department	Copy No.	Date
Digital and Paper Copies			
ENTRIX			
Barry Gillespie	VP/Manager-Mid South Region		
Jeffrey Wakefield	Senior Project Resource Economist		
James Payne	Chief Scientist-Payne Env. Consultants		
Bureau Veritas			
Stephen C. Donham, CIH	HSE Manager		
CSA			
Fred Ayer	VP/Project Manager-Stuart, FL		
Bruce Graham	Project Senior Scientist-Field		
Lynwood Powell	HSE Manager-Stuart, FL		
Tony Wadley	Site Safety Coordinator-Field		
Frank Johnson	Operations Director-Field		
Terry Stevens	Operations Manager-Field		
Gordon Stevens	Operations Manager-Stuart, FL		

TABLE OF CONTENTS

Page

1.0 INTRODUCTION 5
1.1 **General HSE Policy** 7
1.1.1 CSA HSE Goals 7
1.1.2 Site Safety Hazard Analysis and Risk Assessment 7
1.1.3 Deviation from Safety Standards 8
1.1.4 Management of Change 8

2.0 LINE MANAGEMENT 9
2.1 **Site Safety Coordinator** 9
2.2 **Project Scientist/QA Coordinator** 9
2.3 **Operations Director** 9
2.4 **Operations Manager** 9

3.0 HAZARD COMMUNICATION 10
3.1 **General** 10
3.2 **Reporting** 10
3.3 **Project Site** 10
3.3.1 General Vessel Safety 10
3.3.2 Pre-Mobilization Safety Briefing (PMSB) 11
3.3.3 Chemical Hazards 11
3.4 Areas of Safety Concern 12
3.4.1 Mobilization 12
3.4.2 Offshore 13
3.4.3 Winch and Davit Operations and Safety Procedures 15
3.4.4 Demobilization 16
3.4.4.1 Offshore 16
3.4.4.2 Onshore 17
3.5 Emergency Program 17
3.5.1 Personnel on Board (POB)/Next of Kin (NOK) 17
3.5.2 Overall Strategy 18
3.5.3 Post Event Incident Reporting 18
3.5.4 Emergency Response 18
3.5.5 Emergency Response Organization 20
3.5.6 Medivac Plan 21

4.0 MEDICAL/FIRST AID PROGRAM 22

5.0 SUBSTANCE ABUSE PROGRAM 23

6.0 PERSONAL PROTECTIVE EQUIPMENT SAFETY PROGRAM 24

7.0 HEARING CONSERVATION PROGRAM 26

8.0 LIFE SAVING EQUIPMENT 27

9.0 MOB AND FIRE EMERGENCY PROCEDURES 28
9.1 MAN OVERBOARD 28
9.2 RULES FOR ABANDONMENT 28

9.3 FIRE ON BOARD 28

10.0 WATER SURVIVAL PLAN 29

11.0 EQUIPMENT INSPECTION PROGRAM 30

12.0 ELECTRICAL SAFETY PROGRAM 31
12.1 INSTALLATION AND MAINTENANCE OF ELECTRICAL EQUIPMENT 31
12.2 ELECTRICAL ACCIDENT PREVENTION PROCEDURES 31

13.0 SPILL PREVENTIVE/CLEANUP PLAN 33

14.0 SHORT-TERM EMPLOYEE PROGRAM 34

APPENDIX 35
APPENDIX A 36
Hazards Analysis/Risk Assessment 36
APPENDIX B 40
MSDS for Project chemicals 40
APPENDIX C 41
FORMS 41

1.0 INTRODUCTION

ENTRIX has contracted CSA International, Inc. (CSA) to conduct a Water Column Profiling Survey (WCPS) to Measure Dissolved-Phase Aromatic Hydrocarbons and Free Oil Droplets as a Function of Depth and Location Relative to the Subsurface Oil Release in Mississippi Canyon Block 252 (**Figure 1**). The objective of the project is to collect data to calibrate 3-dimensional modeling of subsurface oil plume structure, fate, and transport.

CSA has chartered the M/V Jack Fitz as the support vessel to conduct all survey operations for this project. The survey will consist of performing water column profiles using a General Oceanics model 1018 Rosette Water Sampling system and hydrographic profiles using a Seabird SBE-19 Profiling Conductivity-Temperature-Depth (CTD). Also a Teledyne-RDI Acoustic Doppler Current Profiler (ADCP) will be mounted on an over-the-side pole and used to collect real-time water current data. In addition a Sub-Atlantic Super Mohawk ROV system will be used to collect sediment and water samples and record video at the seabed. The survey vessel will deploy all sampling equipment at predetermined locations using a-frame, davit and winch systems. Within MC Block 252, water depths are expected to be approximately 5,000ft.

This document represents CSA International, Inc. (CSA) health, safety, and environment (HSE) policies and procedures for the ENTRIX WCPS. CSA is responsible for the overall safety management of the survey program.

Marine sampling can be inherently hazardous, and proper precautions need to be taken. Precautions for general vessel safety and chemical hazards to be observed on all CSA surveys are discussed in this document. The physical hazards unique to sampling equipment and operations and sampling precautions are discussed. The Project Scientist and the Site Safety Coordinator are responsible for ensuring that CSA HSE policies and procedures are consistently followed and enforced. Sampling activities will be suspended if the safety of the work crew cannot be ensured. Due to safety considerations all operations will be conducted during daylight hours only.

Figure 1. Location of Survey Site in Mississippi Canyon Block 252

1.1 General HSE Policy

This HSE Plan specifies the safety rules and standards for all CSA personnel and subcontractors during field onshore, shipboard, and laboratory activities. The HSE Plan is a tool to help implement and maintain the CSA safety policies and procedures.

1.1.1 CSA HSE Goals

The safety goal for CSA is to prevent all injuries, protect worker health, and cause no damage to the environment. CSA is vitally concerned for the health and safety of all its employees, subcontractors, facilities, and materials used during all phases of operations. We rely on each employee to actively support and implement the HSE policies and procedures. All CSA personnel are responsible for HSE compliance. The HSE policies are intended to create and maintain a safe working environment for all employees and protect the environment.

All employees and subcontractors are to be familiar with the client's HSE policies and work rules. In particular, all employees and subcontractors are to read from the client's corporate safety manuals all sections pertaining to:

- client sites that may be visited by CSA personnel during the conduct of CSA's work; and
- any activities which are procedurally similar to CSA's activities for the project.

PROJECT OPERATIONS WILL BE SHUT DOWN
IF SAFETY OF PERSONNEL CANNOT BE ASSURED

1.1.2 Site Safety Hazard Analysis and Risk Assessment

The Site Safety Coordinator will perform a site safety hazard/risk analysis as necessary for any special operations which might be required for this project. Safety procedures are routinely assessed for effectiveness specific to the project. The Site Safety Coordinator monitors safety procedures and evaluates them on a specific task by task basis. This information is relayed to the CSA Corporate Safety Supervisor and changes, if any, are made to further ensure personnel safety.

A project-specific Hazards Analysis/Risk Assessment is presented in **Appendix A**. **Table 1** provides the risk ranking descriptions. The HSE Risk Assessment was conducted for each potential hazard by ranking the consequence of the hazard and likelihood of the hazard occurring as summarized in **Table 2**.

Table 1. Risk ranking descriptions.

Risk Ranking	Description
A	Broadly acceptable
B	Tolerable
C	Subject to further study; identification of risk reduction measures and Cost Benefit Analysis
D	Subject to further study; identification of risk reduction measures and Cost Benefit Analysis
E	Unacceptable

Table 2. Risk matrix.

Likelihood of Occurrence		Consequence of Hazard				
		1	8	16	50	100
		Minor	Moderate	Major	Critical	Catastrophic
0.5	Insignificant	A (0.5)	A (4)	B (8)	B (25)	C (50)
1	Remote	A (1)	B (8)	B (16)	C (50)	D (100)
2	Infrequent	A (2)	B (16)	C (32)	D (100)	D (200)
5	Occasional	A (5)	C (40)	C (80)	D (250)	E (500)
10	Frequent	B (10)	C (80)	D (160)	E (500)	E (1,000)

1.1.3 Deviation from Safety Standards

Any deviation from the standard safety requirements as outlined in this HSE Plan and the client's particular Corporate Safety Manual shall be registered by the Site Safety Coordinator with the appropriate feedback from personnel. Follow-up by the Site Safety Coordinator requires reporting any deviations to the CSA Corporate Safety Supervisor.

1.1.4 Management of Change

If for any reason there is a request to make changes, the following will apply: The ENTRIX Representative will be notified of any changes to material, equipment, personnel, or procedures that could affect the safety of the operation or materially affect the scope or completion of the work.

Changes to any aspect of the work program will be subject to a risk assessment by CSA and ENTRIX to ensure any potential adverse effects of the change may be identified and either eliminated or controlled to minimize risk as much as reasonably practicable. Proposed changes will require the approval of the CSA Project Manager (or a designated representative) and the ENTRIX Technical Representative prior to implementation. Any such changes or additions to the operation and the subsequent risk assessment will be communicated prior to implementation to all relevant personnel likely to be affected by the change.

Any implemented change will be documented by completing a CSA Management of Change Order (See **Appendix C-Forms**).

2.0 LINE MANAGEMENT

2.1 Site Safety Coordinator

The Site Safety Coordinator for this project will be **Tony Wadley** and his role in the project includes the following:

- HAZWOPER/CPR/First Aid trained;
- Ensures that first aid supplies are in good order and easily accessible;
- Conducts pre-mobilization safety briefing;
- Conducts daily safety/tool box meetings at the beginning of each day and notifies the client representative if any conditions or specific health and safety hazards will be encountered during the work to be done during the day;
- Responsible for ensuring all safety rules are followed and understood;
- Understands that if unsafe conditions exist, personnel are not required to work; and
- Will not rush to complete a job at the expense of safety.

2.2 Project Scientist/QA Coordinator

The Project Scientist/QA Coordinator for this project will be **Bruce Graham** and his role in the project includes the following:

- Responsible for data collection and quality;
- First line of incident reporting;
- Coordinates daily survey progress assessment meetings;
- Responsible for reporting and recording all injuries, accidents, and near misses to the designated client representative on board and to the CSA home offices. The initial report will be oral, which will then be followed by a written record; and
- HAZWOPER/CPR/First Aid trained

2.3 Operations Director

The Operations Manager for this project will be **Frank Johnson** and his role in the project includes the following:

- Coordinates with Project Scientist on overall survey goals;
- Coordinates operations with ship's crew;
- Responsible for equipment installation and operation;
- Responsible for daily operations of sampling equipment; and
- HAZWOPER/CPR/First Aid trained.

2.4 Operations Manager

The Lead Technician for this project will be **Terry Stevens** and his role in the project includes the following:

- Insure all sampling equipment is in proper working order;
- Inspects CSA equipment daily to ensure it is in proper working order;
- Assist in sample/data collection and processing;
- Responsible for implementing safety procedures; and
- HAZWOPER/CPR/First Aid trained.

EACH EMPLOYEE IS RESPONSIBLE FOR HIS OWN AND OTHERS' SAFETY.
HE ALSO HAS AN OBLIGATION TO WORK SAFELY AND REPORT ANY UNSAFE CONDITIONS.

3.0 HAZARD COMMUNICATION

3.1 General

All employees and contract personnel are informed of all potential health and safety hazards related to the project and are instructed on how to avoid the risk of an accident. When operating offshore CSA personnel will conduct daily meetings and communicate progress with onshore support. Personnel to relay program status and any logistical concerns and requirements via SAT Phone email.

3.2 Reporting

All survey personnel will be provided with sampling guides that summarize sample collection and processing activities and identify potential hazards.

In the event of an injury accident the Site Safety Coordinator initially will notify the Project Manager and/or Project Director and the client or its agent verbally. An Incident/Accident Notification form will be completed within 24 hours of an accident/injury/near miss and a copy will be sent to the CSA HSE Manager. "Incident/Accident Notification" forms (**Appendix C**) will be kept on site.

A daily progress report will be prepared for the HSE manager and will detail the technical aspects of the sampling acquisition as well as details and will include the following:

- Close calls/near misses;
- Any unsafe condition;
- Any CSA employee having a problem working safely;
- Any accident/incident;
- Any failure of safety equipment;
- Hazard reports & safety observations;
- Inspections & audits completed;
- Emergency drills completed;
- Personnel on Board;
- HSE issues or concerns; and
- Interaction with other vessels and fishermen

3.3 Project Site

Mobilization/Demobilization: Golden Meadow, Louisiana
Survey Site: GOM Block MC252
Schedule and Duration: Mobilization – May 7-8 2010; 2 day survey
Weather: Monitored and assessed daily

3.3.1 General Vessel Safety

To ensure adequate preparation for emergencies that may possibly arise, prior to selecting and/or chartering a vessel for survey operations, the Site Safety Coordinator will ensure that the proper safety equipment are or will be available when the vessel is mobilized for a survey. If any equipment are not available (e.g., in foreign countries where vessels of opportunity are used) arrangements should be made to have the safety equipment made available either from in-country sources or by shipping them to the mobilization port.

3.3.2 Pre-Mobilization Safety Briefing (PMSB)

A Pre-mobilization Safety Briefing will be conducted by the CSA Site Safety Coordinator and the ENTRIX HSE Manager.

The following list is a summary of items to be discussed:
1. Description of project and goals
2. Communications – key to acquiring goals
3. Team members, assignments, and shifts
4. Coordination with ship's crew
5. Designation of person in charge on deck
6. Complexity of the operations – moving platform, machinery, openings
7. Pre-operation checks – vessel preparation
8. Safety equipment – vessel and sampling
9. Hazards - vessel and equipment – Hazid Actions/JSA/Toolbox
10. Limitations of personnel and equipment (Lifting, rigging, and safe working loads)
11. Environmental conditions (wind, weather, sea state, etc.)

An HSE induction for all personnel involved with the offshore field survey will be conducted by CSA prior to or during vessel mobilization.

All vessel crew members will be briefed on the operation of all primary sampling equipment, cranes, winches, blocks, cables, and A-frame prior to mobilization.

It is the responsibility of the Site Safety Coordinator and survey team members to ensure that proper rigging and lifting procedures are used.

The vessel's captain will be responsible for conducting the following drills: M.O.B., Fire, Abandon Ship, and Medical Emergency. These drills will be conducted once before the survey begins and weekly thereafter.

3.3.3 Chemical Hazards

Isopropyl Alcohol, Hexane, and Liquinox will be used during the field surveys. Material Safety Data Sheets (MSDS) for each chemical product will be aboard the vessel located near the chemicals and on the bridge. All personnel will be aware of the chemical products being used and safety considerations needed to prevent injuries.

The Site Safety Coordinator will ensure that field personnel review all relevant Material Safety Data Sheets (MSDS) before mobilizing for a field survey.

It is the responsibility of all personnel on board to take advantage of the information available, to wear the protective equipment provided, and to follow recommendations for handling any hazardous material.

Protective safety equipment will be worn when handling hazardous chemicals and include: chemical-resistant gloves, laboratory aprons, safety glasses or goggles, masks, and/or respirators.

In some areas, contact with marine sediment may present a potential health hazard from chemical and/or biological constituents of the sediment. Possible routes of exposure to chemical/biological hazards include inhalation, skin and/or mucous membrane absorption, ingestion, and injection. Potentially hazardous chemical/biological sediment constituents may include hydrogen sulfide, mercury and other heavy metals, polynuclear aromatic hydrocarbons, polychlorinated biphenyls, solvents, and various types

of bacteria and viruses. Other potentially hazardous substances may include chemicals used as sample preservative agents or sampler decontamination agents.

Crew members should exercise caution to avoid coming into contact with potentially contaminated sediment during sampling operations. Crew members should exercise good personal hygiene after sampling and prior to eating or drinking.

Exposure to airborne contaminants can be greatly reduced if the vessel steams to windward in a way that minimizes risk to the sampling crew from exposure to volatiles. Having respirators on hand will reduce exposure to volatile fumes that may be present when mixing large quantities of chemicals or using a solvent rinse during equipment decontamination.

During sampling, caution, common sense, and good judgment should dictate appropriate safety gear to be worn in any given situation on deck. Hardhats, gloves, and steel-toed shoes must be worn in working conditions where there is a possibility of injury to the head, hands, or feet. Work vests must be worn while working on the fantail, or while working near an open gunwale. If in doubt, survey team members should ask the designated Site Safety Coordinator.

Collecting samples in extremely hot and humid weather carries the risk of dehydration and heat stroke. Survey team members should carry an adequate supply of potable water or other liquids for protection against dehydration in hot weather. The Site Safety Coordinator will ensure that survey team members continually drink to replace lost fluids in periods of work in hot weather.

3.4 Areas of Safety Concern

3.4.1 Mobilization

There is a large variety of marine sampling equipment in use today, and each has the potential for causing serious injury. Many types are heavy, ranging from under 50 lbs for a small sediment grab or plankton net to up to 2,000 lbs for a large Ewing piston corer. Unless the equipment is secure on deck or fully deployed and submerged, care must be taken to avoid crushing or other impact-related injuries from the handling of this gear.

This project will use a large ROV to collect all chemical and infaunal samples. The ROV is very heavy and all personnel must be aware of the corer weight and potential for uncontrolled motions during deployment and recovery. Proper tag line procedures will be stressed during the pre-mobilization briefing. Work gloves will be worn at all times when using tag lines.

Also, an appreciable amount of vertical clearance is usually required to clear the gunwale during deployment and retrieval, which in turn can increase the risk of uncontrolled lateral motion unless suitable tag lines are used.

A typical box corer is fairly heavy (from 200 to 900 lbs) and is also both tall and wide at the base. At least 100 square feet of deck area is required to safely manage this equipment. Good foot protection is mandatory when handling this equipment.

Essentially all types of sediment grabs utilize their own weight, some type of tensioning device, or other form of mechanical advantage to actuate the sampler upon contact with the bottom. Care must therefore be taken to minimize the risk of accidental or premature closure while handling. The box corer for this project has a release which triggers upon contact with the bottom. The sample is collected during retrieval.

In general, all sampling equipment uses the same type of marine hardware to attach to the appropriate lifting device. Periodically, all connections (e.g., cabling, shackles, pins, swivels, etc.) should be inspected to ensure the integrity of all points along the sampling assembly. The placement of the survey equipment on the deck will be discussed with the captain to assure safety and structural concerns are addressed. Welders attaching equipment to the vessel need to be certified in the operation of the welding and cutting equipment as well as using the appropriate materials to secure the equipment to the vessel. Tag lines will be attached to all equipment when it is being placed on or removed from the vessel.

Concern: Lifting equipment onto vessel.
Precaution(s): Lift with legs, back straight, good footing, and avoid twisting. Get help if load is too heavy. Avoid pushing, pulling, or prying while working aloft. Approved hard hats and safety boots/shoes with toe protection should be worn while working on the fantail.

Concern: Slippery deck.
Precaution(s): Guard rails; shoes, boots with sufficient anti-skid soles to minimize potential for slippage; employees to wear personal floatation device (PFD) while on the work deck at sea and if transfers are required.

Concern: Installation of equipment.
Precaution(s): Secure all equipment in case of rough seas. In the case of installation of navigational antenna and cables, two people will be on hand at all times for this part of the mobilization and will inform vessel captain of antenna installation and positioning and have the radar unit switched off (antennae should not be moving).

Concern: Loose containers.
Precaution(s): Secure all shipping containers to ensure they cannot break loose and cause physical harm during rough sea condition.

Concern: Confined space.
Precaution(s): Keep clean and ventilated. Check for proper lighting. Conform to vessel permit to work and confined space entry requirements

Concern: Lock out/tag out procedures (faulty equipment).
Precaution(s): Unplug equipment before doing repair and tag it as such. Reactivate the system only through an established and published procedure that ensures each person has removed his own lock and tag first.

Concern: Installation of first aid kit.
Precaution(s): Ensure all personnel are aware of the location of the first aid kit on the vessel.

Concern: Location of fire extinguishers.
Precaution(s): Ensure all personnel are aware of the location of the fire extinguishers on the vessel.

3.4.2 Offshore

A sampling device is least secure while suspended in the air during the transitional period between the deck of a vessel and the surface of the water; a pitching and/or rolling deck during rough weather will aggravate this situation. Care must be taken to ensure that sufficient restraining, or tag lines or other devices are in place to meet these conditions. Because of the increased potential for damage or injury, all personnel on deck and in the wheelhouse must be notified before a sampling device leaves the deck during deployment or breaks the surface upon retrieval. If the winch operator is remotely located from the

scene of operations, a clear system of signals must be established between the lead deck person and the winch operator, usually via hand signals or electronic communication.

OSHA requires that hard hats be worn when working beneath suspended equipment, or when the potential of injury to the head exists due to lateral impact. All crew members should have a suitable level of seamanship skills, based upon their level of responsibility. Listed below are some of the items related to seamanship and gear-handling that, when overlooked, have been known to cause serious accidents on board ship.

- A capstan is potentially more dangerous than a winch drum, as the wraps are not enclosed and could instantly slip off the end if not handled properly.
- If a hydraulic hose fails, winches can free-wheel, and load-bearing rams can collapse under a load unless backed up with balance-check valves.
- Different kinds of line and wire rope have different characteristics, which may not be suitable for all applications (e.g., nylon is 25 percent stronger than polypropylene, but it is much more elastic and can be lethal if parted under a strain; polypropylene will float, making it less susceptible to propeller entanglement).
- An eye splice over a thimble will only cause a 5 percent reduction in line strength, but a knot (depending on type) can reduce the strength in a line by as much as 55 percent due to unequal strain on the fibers (a line will usually break under a strain at that point where it is forced to bend).
- Theoretically, the longer a line under a strain, the weaker it is when compared against its rated breaking strength (the chances are statistically greater of encountering a section weaker than the last as line length increases).
- The recommended working load-to-breaking strain for wire rope and line is typically 1 to 5. If the load ever exceeds 75 percent of the breaking strength, permanent damage could result, which can lead to unexpected breakage.
- Topside operations may be more dangerous on larger ships than smaller vessels because it is harder to keep track of safety concerns when activities are spread over a larger area of deck.
- Crew members should always stand clear of slack or looped line lying on deck to avoid entanglement. A sudden strain on slack line can entrap arms and legs; personnel may be severely injured or carried overboard.

In the event the sediment grab or winch wire becomes entangled in an object on the bottom, in the ship's propellers, or as a result of a malfunction in the winch or a-frame, the personnel on the bridge will be notified immediately.

The Operations Manager conducting sampling operations will confer with the ship's master and will direct the survey team members and vessel personnel in order that the situation is safely resolved.

Inclement weather may introduce additional hazards. Heavy equipment can be much more difficult to manage, and footing may become unsure due to slippery decks and/or increased vessel motion, and the risk of falling overboard may increase. Some state agencies requires that all railings be a minimum of 36 inches in height, and OSHA requires that an approved life vest be donned when working over the water or if there is an increased risk of falling overboard. A safety line will be secured across the opening from which the survey equipment will be deployed and retrieved. Vessel accommodations should be able to provide relief to crew members in case of cold or heat stress.

The vessel's Captain is responsible for determining the relative safety due to inclement weather on all operations. If necessary, survey operations will be suspended. The Captain will decide whether to stay on station or transit to port until weather conditions improve. If operations are suspended the Operations Manager will direct the movement and securing of equipment and materials until sampling resumes.

Concern: Chemicals.
Precaution(s): Familiarization with use and handling of chemicals to be used on project. Splash-proof goggles, organic vapor masks, and protective gloves will be used when handling chemicals. Chemicals will only be used in well-ventilated areas.

Concern: Acids, bases, and other hazardous chemicals.
Precaution(s): Briefing and MSDS sheets regarding all hazardous chemicals. Use of rubber gloves when handling dangerous chemicals such as water quality fixatives. Availability of first aid kits, eye wash kits, and spill kits. Prior to applicable activities, the Site Safety Coordinator will remind survey team members of the location of first aid kits, eye wash kits, and spill kits.

Precautions should be taken when handling hazardous materials during sampling and sample processing. Gloves and safety glasses should be worn as needed.

Concern: Man overboard.
Precaution(s): Single (one) employee is not allowed on rear deck of the vessel alone – two men or more are required on deck during at-sea operations. All employees are to wear PFDs while on deck of the vessel.

3.4.3 Winch and Davit Operations and Safety Procedures

CSA will be utilizing the services of Jambon Boat Rentals, LLC (JBR) who will provide the vessel M/V Jack Fitz to facilitate the sampling effort. An a-frame/davit was constructed to serve as the deployment/retrieval system for the rosette water sampler. The a-frame/davit is welded to the gunwale and deck and exceeds any loads anticipated for the field survey tasks. The winch will be the CSA deepwater electro-hydraulic unit manufactured by Sea-Mac.

CSA and JBR are responsible for training field personnel in the safe working procedures of the equipment being utilized for this project. Under the terms of the contract, CSA and JBR will provide competent personnel to carry out the work. As such CSA and JBR will address the a-frame, davit, and winch systems which include electro-hydraulic winches and hydraulic power units (HPU). The purpose of this document is to outline a systematic approach to mobilization, training, and standards which will optimize safety and program efficiency.

Systems safety and operational planning and implementation are a two-tier function:

1. Pre-cruise planning will address the specific operational requirements associated with the equipment. It is the responsibility of the Operations Manager to ensure that all requirements relative to mobilization, operation, and maintenance are implemented through in-house planning and discussion.

2. On-board, prior to the actual operation, it is the Operations Managers responsibility to coordinate mobilization, training, and operational procedures with the ship's Captain and crew, CSA Technicians, Project Scientist, and Operations group. This is to ensure that all individuals involved clearly understand what is required of them and that all equipment is appropriate and have been inspected.

The following points will be addressed during the Pre-mobilization Safety Briefing and Operations Training:

- Read all warning tag information and become familiar with all controls before operating winch.
- Never attempt to clean, oil, or perform any maintenance on a machine with the engine or prime mover running, unless instructed to do so.

- Never operate winch controls unless you are properly positioned at the operator's station and you are sure personnel are clear of the work area.
- Assure that personnel who are responsible for hand signals are clearly visible and that the signals to be used are thoroughly understood by everyone.
- Ground personnel should stay in view of the operator and clear of winch drum. Do not allow ground personnel near winch line under tension. A safe distance of at least 1-1/2 times the length of the unspooled cable should be maintained.
- Inspect rigging and winch at the beginning of each work shift. Defects should be corrected immediately.
- Keep equipment in good operating condition.
- Do not exceed the maximum pressure, PSI (kPa), or flow, GPM (LPM), stated in the winch specifications for hydraulically driven winches.
- Match winch line speeds to job conditions.
- Leather gloves should be used when handling winch cable.
- Never attempt to handle winch cable when the hook end is not free. Keep all parts of body and clothing clear of cable rollers, cable entry area of fairleads and the winch drum.
- When winding winch cable on the winch drum, never attempt to maintain tension by allowing winch cable to slip through hands. Always use "hand-over-hand" techniques, being careful to keep hands and clothing away from winch drum and fairlead rollers.
- Never use winch cable with broken strands. Replace winch cable.
- Do not weld on any part of the winch.
- Use recommended hydraulic oil and gear lubricant.
- Install guarding to prevent personnel from getting any part of body or clothing caught at a point where the cable is wrapped onto the drum or drawn through guide rollers.
- Install switches or valves which will shut off power to the winch in locations where they can be reached by anyone entangled in the cable before being drawn into the winch or any "pinch-point."
- "Deadman" controls, which automatically shut off power to the winch whenever the operator leaves his station, should be installed whenever practical.
- Never allow anyone to stand under a suspended load.
- Avoid sudden "shock" loads or attempting to "jerk" load free. This type of operation may cause heavy loads in excess of rated capacity, which may result in failure of cable and winch.
- It is imperative that the person operating the unit follow directions while maintaining situational awareness for the task at hand.

Never put your hands into, around, or near the spool or rollers when operating.
Serious injury can occur!

3.4.4 Demobilization

At the completion of all planned survey tasks there can exist the opportunity for injury due to survey team members and ships crew rushing demobilization efforts. When these demobilization procedures are performed too quickly the risk of an accident is increased.

3.4.4.1 Offshore

Concern: Personnel anxious to disembark vessel.
Precaution(s): Must use cautious, methodical procedures.

Concern: Loose trash/debris.
Precaution(s): All trash/debris will be stored and removed.

Concern: Transferring equipment/personnel from vessel to dock. Dropped objects
Precaution(s): PFDs required (see also slippery deck hazard).

3.4.4.2 Onshore

Concern: Personnel anxious to disembark.
Precaution(s): Must use cautious, methodical procedures.

Concern: Loose trash/debris.
Precaution(s): All trash/debris will be stored and removed.

Concern: Safe disposal of trash, hazardous chemicals, fixatives, etc.
Precaution(s): Careful identification, marking, disposal, packing, and transport (if required) of hazardous materials. Proper neutralization of chemicals will be completed if required.

Concern: Leakage of sample preservatives (mostly formaldehyde).
Precautions: Briefing on safe handling of formaldehyde and other possible fixatives. Double bagging of fixed samples, eyewash capabilities, flushing of neutralization of skin contact.

3.5 Emergency Program

The vessel master has a direct responsibility for the health, safety and welfare of all persons on board and for dealing with the immediate response to emergencies. In the event of an emergency CSA will provide emergency response management in cooperation with the vessel's captain to insure the health, safety, and welfare of all persons on board. The Site Safety Coordinator will work along side the captain in the event of a medical emergency.

In the event of injury or illness to personnel, CSA have responsibility for the evacuation of any person on board from the vessel to the nearest port or heliport, depending upon the nature and severity of injuries. From there CSA have responsibility to transfer their own and subcontractor personnel to hospital for treatment. ENTRIX has responsibility for the transfer, hospitalization and ongoing welfare of their own personnel. CSA and their subcontractors have full responsibility for the response to and management of all emergencies arising onboard or involving the vessel.

CSA will mobilize an AED and First Aid Kit for the survey. All CSA personnel are trained in the proper use of an AED and First Aid administration.

3.5.1 Personnel on Board (POB)/Next of Kin (NOK)

A POB/NOK list for the vessel shall be issued prior to departure from the harbor and will be updated should personnel change out, which is not currently planned. Copies of the vessel POB/NOK lists will be transmitted to CSA and ENTRIX offices. All parties will undertake to keep the NOK information confidential.

In the event of an emergency, CSA where necessary shall liaise with the relevant authorities and provide a verified POB list. The onshore response personnel of CSA (and 3rd party contractors if necessary), will be responsible for providing support to relatives of CSA personnel and subcontractors on board during an emergency. The ENTRIX response team would take this responsibility for ENTRIX vessel personnel.

Prior to vessel mobilization medical evacuation support services were researched in south Louisiana. A hospital and helicopter service, identified prior to mobilization, will be contacted in the event of an emergency.

3.5.2 Overall Strategy

An emergency is defined as an unplanned event, or situation, which poses an actual or potential threat to the safety or integrity of:

- Life and limb or health of personnel on board the vessel
- The environment or,
- The reputation of CSA or ENTRIX

An emergency can be further defined as any event, incident or situation, which poses a continuing threat and requires the mobilization of assistance or support from sources external to the affected party.

Both offshore and onshore emergency response actions will be clear, co-coordinated and will be based on the agreed arrangements listed in this document.

CSA emergency response team will take the lead role in responding to all emergencies.

Local services will respond in an emergency to provide support to CSA. Depending upon the nature and scale of the emergency, the CSA shore support may also respond.

In event of an emergency, a number of CSA personnel will remain on call for the duration of the ENTRIX contract. CSA will have a team on standby in Florida to provide support, consisting of the CSA HSE Manager, an Operations Manager, and other support personnel as required.

Vessel

The vessel captain and the CSA Site Safety Coordinator in cooperation with the ENTRIX HSE field representative will insure Muster, Fire, MOB, loss of power, and Communication drills will be run before beginning field tasks. The Fire drill will include pressure to and discharge of the fire hoses.

3.5.3 Post Event Incident Reporting

Formal written reports will be prepared by CSA after an emergency has been resolved. A report need not be final, but may be an interim or preliminary document. A report should not only identify the sequence of events and causes of the incident, but also the adequacy of the response and corrective actions.

3.5.4 Emergency Response

Responsibilities during an emergency include the following:

Offshore Response

Vessel Master-M/V Jack Fitz	
Responsibility:	Safety of all persons on board the vessel Overall control of the vessel Emergency Response Team On-scene commander Liaison with other vessels if in the survey area Obtaining medical advice as required
Actions:	Controlling emergency and safeguarding personnel Notify the relevant authorities, if necessary Notify CSA On-Duty Operations Notify the ENTRIX representative on the vessel Calling onshore medical authorities
ENTRIX HSE Representative	
Responsibility:	Providing assistance to the Vessel Master as requested Initial notification of ENTRIX HSE Manager
Actions:	Call duty person as above and inform them of nature of emergency and onshore assistance if required.

Local Onshore Response

CSA Project Manager	
Responsibility:	Primacy for supporting the vessel and coordinating the onshore emergency response in accordance with CSA Emergency Response procedures.
Actions:	Coordination of emergency response via the existing CSA emergency response organisation and arrangements, including provision of logistical support Notification of and Liaison with external agencies including Medical Support Notification and regular updating of ENTRIX representative. Informing CSA personnel and subcontractor NOK of injuries etc. Arranging medivacs to shore in response to injuries, illness or other incidents on board for all POB. Arranging reception and transfer to hospital for any injured CSA or subcontractor personnel
ENTRIX HSE Manager	
Responsibility:	The health, safety and welfare of ENTRIX personnel involved in any emergency, once they have returned to shore. The reputation and standing of ENTRIX
Actions:	Mobilize to ENTRIX offices in response to call out from ENTRIX Survey Rep. Keep updated of events via CSA emergency personnel Make arrangements to meet and greet any injured or affected ENTRIX personnel in port or heliport as required Arrange transfer and hospitalization of injured ENTRIX personnel as required Arrange for medivacs as required for ENTRIX personnel Ensure notification of NOK for any affected ENTRIX personnel. Seek support on preparation and issue of media statements as required, in conjunction with CSA.

3.5.5 Emergency Response Organization

The response organization for the baseline environmental survey is shown in **Figure 2** below. Call out and communication routes are also shown in this figure.

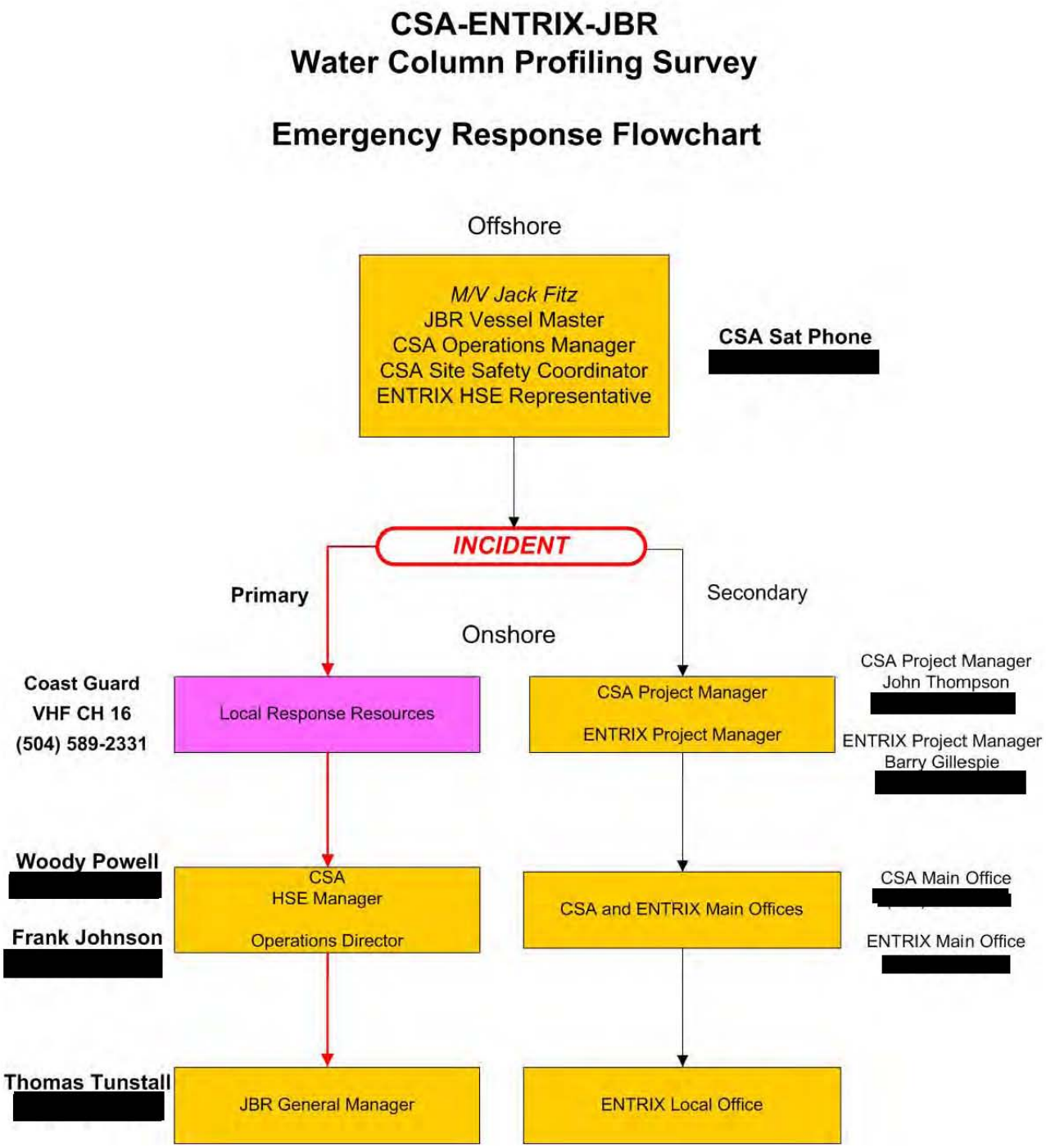


Figure 2. Emergency Response Organization Flowchart

3.5.6 Medivac Plan

Should a medical emergency require the immediate evacuation of a person or persons from the survey vessel, the vessel should immediately head toward the nearest shore facility. The Coast Guard should be contacted immediately on VHF channel 16. The Coast Guard air station is located approximately 13 miles south of New Orleans in Belle Chasse, La

Any applicable client transport coordinators or helicopter dispatchers should be contacted by either satellite phone or cellular telephone for assistance with the emergency. They will arrange helicopter evacuation of the injured person(s) from the platform or shore facility to the nearest emergency medical facility. If medical treatment is needed for a non-life threatening situation, the vessel should head to the nearest shore facility from which the injured person(s) can then travel to the nearest medical facility to obtain necessary medical treatment.

The arrangements listed in this document shall apply to the Emergency Response Procedures for the period that the vessel is contracted for the purpose of completing the survey.

Emergency contact numbers for communications during emergency situations are provided below.

Vessel Emergency Contact Numbers

Vessel-M/V Jack Fitz	
Master	
Satellite Phone	
Vessel Call Sign	
Thomas Tunstall, JBR	[redacted]

CSA Emergency Contact Numbers

CSA	
Satellite Phone-OnBoard Vessel	[redacted]
Fred Ayer, CSA Project Manager	[redacted]
Gordon Stevens, CSA Operations	[redacted]
Lynwood Powell, HSE Manager	[redacted]

ENTRIX Emergency Contact Numbers

ENTRIX	
Ryan Holem, HSE Manager	[redacted]

4.0 MEDICAL/FIRST AID PROGRAM

CSA personnel are all properly trained in cardio-pulmonary resuscitation (CPR) and first aid. Training allows CSA personnel to give immediate and temporary care to a victim of an accident or sudden illness until a physician can be obtained. This effective first aid consists of common sense, training, and knowledge of the following:

- Procedures for treating bleeding;
- Procedures for heart attack victims;
- Procedures for choking victims;
- Procedures for treating victims of burns;
- Procedures for treating electric shock victims;
- Procedures for treating victims of exposure to chemicals;
- Procedures for treating victims of inhalation of toxic gas or smoke;
- Procedures for treating shock victims;
- Procedures for treating victims of heat exhaustion;
- Procedures for treating victims of heat stroke;
- Procedures for treating victims of frostbite;
- Procedures for treating victims of hyperthermia; and
- Procedures for treating victims of skin poisoning or swallowed poisons.

5.0 SUBSTANCE ABUSE PROGRAM

CSA is committed to maintaining a drug-free workplace. In recognition of the dangers to our employees and the company of drug abuse in the workplace, and pursuant to the provisions of the U.S. Drug-Free Workplace Act of 1988 and Federal Acquisition Regulation 23.504, all employees are subject to the following:

- Unlawfully manufacturing, distributing, dispensing, possessing, or using a controlled substance is prohibited in the workplace.
- Any employee who unlawfully manufactures, distributes, dispenses, possesses or uses a controlled substance in the workplace will be subject to discipline up to and including dismissal.
- All employees, as a condition of continued employment, must abide by the statement and are required to notify the company of any criminal drug statute conviction for a violation occurring in the workplace no later than five days after such conviction.
- This Drug-Free Workplace Statement does not amend, limit, restrict, modify or otherwise alter any other company rules, regulations, procedures or policies.

CSA employees tested for substance abuse must meet the U.S. Department of Transportation (DOT) standards for drug and alcohol testing to be able to work as CSA's representatives on designated projects. The medical forms may be made available for the client's inspection with prior approval from the employee.

DOT regulations require screening for the following drugs (known as the NIDA 5 Panel):

- Marijuana;
- Barbiturates;
- Opiates;
- Amphetamines;
- PCP; and
- Cocaine.

6.0 PERSONAL PROTECTIVE EQUIPMENT SAFETY PROGRAM

The following outlines CSA policy pertaining to the issuance and use of certain personal protective equipment (PPE) that will be issued by CSA. Each employee will be responsible for ensuring his PPE is kept clean and in good working condition.

Protective gear for sampling personnel should include the following:

- a hard hat;
- steel-toe shoe/boots;
- equipment handling and chemical-resistant gloves (e.g., leather or Nitrile);
- safety glasses/goggles;
- respiratory protection;
- rain gear (if necessary);
- coldwater survival gear (if necessary); and
- hearing protection (if safe noise levels are exceeded).

In addition to the above PPE personnel deploying and retrieving equipment over the side of the vessel will be required to wear a safety harness and utilize a retractable lifeline securely connected to a point on the vessel.

It is important to note that the ship's captain has the ultimate responsibility and authority to immediately override the authority of all other on board personnel, especially where the general welfare of crew and vessel are concerned.

During the dockside mobilization, the Site Safety Coordinator will conduct an inventory of the safety-related equipment and materials and provide a report to the Project Scientist and Operation Manager of their status, location, and availability.

Hard Hats. Each employee will be expected to wear a hard hat at all times when working out on deck. These safety hats will meet the specifications contained in American National Standards Institute, Z89.1-1969, Safety Requirements for Industrial Head Protection.

Steel-toed Shoes/Boots. Steel-toed shoes or boots will be required while outside of office area or on any work site, e.g., work deck.

Gloves – Work and Chemical. Work gloves will be provided for handling of equipment and supplies to reduce the potential of hand injuries. Nitrile, rubber, gloves will be provided for the handling of all chemicals and solvents.

Safety Glasses/Goggles. All employees will be issued and must wear approved safety glasses with side shields at all times while in the work area. Those employees who wear prescription glasses will wear safety glasses over their glasses. This also applies to those employees who wear contact lenses.

All employees will be issued and expected to wear 1) approved impact-type goggles with side shields when engaging in any activity that involves hazards to the unprotected eye from chipped or flying particles; and 2) approved splash proof goggles when they are handling hazardous chemical liquids, powders, or vapors as well as when they are in the vicinity of these chemicals.

Employees who wear prescription glasses will wear goggles over their glasses. This also applies to employees who wear contact lenses; these employees must make it apparent that they do wear contact lenses.

Respiratory masks
Protective respiratory mask will be provided to all employees. Any employee handling chemicals or solvents is required to wear a respiratory mask in addition to gloves and goggles.

Protective Outerwear
An outerwear capable of protecting the employee from oily products will be worn during all sampling operations. A Tyvek or suitable alternative is required.

Rain gear
Rain gear is not provided for most offshore surveys. It is the responsibility of the employee to provide adequate protection when working outside of the confines of the vessel.

Cold water survival gear
Cold water survival gear will not be necessary for this survey due to the time of year and the location of the survey area.

Hearing protection
Hearing protection is mandatory in all designated high noise areas. Ear plugs and ear muffs will be provided.

During operations which require special equipment and outerwear, the previously mentioned mandatory equipment and requirements pertaining to the equipment may be voided or amended.

7.0 HEARING CONSERVATION PROGRAM

All employees will wear the appropriate hearing protection provided by CSA while in a high noise area (85 decibels [dBA] or above for an 8-hour time period). A sign will be posted in high noise areas.

The Site Safety Coordinator will ensure any employees working in a high noise area are wearing hearing protection.

CSA also urges its employees to use common sense in a "noisy environment." If it is necessary to shout to communicate, an area is considered a high noise area whether or not signs are posted.

8.0 LIFE SAVING EQUIPMENT

All personnel working or riding on the deck of a boat or barge, or when transferring between vessels or onto a platform, must wear a U.S. Coast Guard (USCG)-approved PFD with reflector tape strips. There will be one PFD for each employee. On-board personnel should familiarize themselves with the ship's man overboard procedures and the vessel's life saving equipment location.

9.0 MOB AND FIRE EMERGENCY PROCEDURES

9.1 MAN OVERBOARD

- Throw a ring buoy overboard as close to the person as possible.
- Notify the personnel on the bridge immediately; bridge records vessel position.
- Post a lookout to keep the person overboard in sight.
- Maneuver the vessel to pick up the person in the water.
- Crew member wearing a PFD attaches a safety line and stands by to jump into the water to assist the person overboard if necessary.
- If person is not immediately located, notify Coast Guard and other vessels in the area by radio telephone.
- Continue search until released by the Coast Guard.

9.2 RULES FOR ABANDONMENT

- Review rules posted on vessel prior to vessel leaving dock.
- Take instructions from vessel's captain and proceed to pre-assigned station on the vessel.

9.3 FIRE ON BOARD

- Review rules posted on vessel prior to vessel leaving dock.
- When alarm sounds proceed to pre-assigned station on the vessel.
- Vessel’s captain will instruct survey team members.

10.0 WATER SURVIVAL PLAN

All employees must become familiar with the use and operation of survival gear and emergency instructions posted on the vessel.

In case of vessel evacuation:

1. Put on a PFD and remove your safety hat.
2. Do not dive into the water but jump in feet first.
3. If swimming in rough water, turn your back to the wind or waves. Keep your head out of water and use a breast stroke.
4. If there is an oil or fuel fire on the water, swim UNDER the water. Before surfacing, use your hands to splash a breathing hole above your head. Close your eyes before surfacing, take a breath, and then resubmerge (feet first).
5. If there is oil and/or debris on the water surface, keep your head up and out of the water. Push the oil/debris away from you as you swim. Protect eyes, nose, and mouth.
6. If swimming in cold water, conserve body heat, and help to prevent hypothermia by minimizing movement.
7. Do not swim to rescuers – let them come to you.

CONSERVE YOUR ENERGY! YOUR SURVIVAL MAY DEPEND ON IT!

11.0 EQUIPMENT INSPECTION PROGRAM

CSA will insure the following equipment is aboard the vessel:

- Fire extinguishers;
- PFDs;
- Safety Harnesses;
- Retractable lifelines;
- Ear protectors;
- Hard hats;
- Safety glasses;
- Safety shoes;
- Organic vapor masks; and
- Protective gloves.

The above equipment shall be inspected daily prior to use for wear and tear and so noted by the designated CSA safety person in his Project Log. During daily inspections, emphasis will be put on equipment security (i.e., safely secured for rough seas), and equipment maintenance.

The safety person will be knowledgeable with U.S. 29 CFR 1926 (Subparts E, F, I, J, K, L, N, and O): Personal Protective and Life Saving Equipment; Fire Protection and Prevention; Tools (Hand/Power); Welding and Cutting; Electrical; Ladders and Scaffolding; Cranes, Derricks, Hoists, Elevators, and Conveyors; Motor Vehicles, Mechanized Equipment, and Marine Operations.

12.0 ELECTRICAL SAFETY PROGRAM

12.1 INSTALLATION AND MAINTENANCE OF ELECTRICAL EQUIPMENT

All installation and maintenance of electrical equipment must comply with the pertinent provisions of the national electrical code. All electrical work will be performed by competent personnel who are familiar with code requirements and qualified for the class of work to be performed. All applicable electrical wire, apparatus, and equipment will be of a type approved by Underwriters Laboratories, Inc., Factory Mutual Engineering Corp., or any other nationally recognized testing laboratory.

12.2 ELECTRICAL ACCIDENT PREVENTION PROCEDURES

The best qualified available employee will be appointed to be the electrical job supervisor. That person will have total responsibility for the electrical work.

Each job should be thoroughly planned, making sure that adequate and proper equipment and sufficient personnel are available to perform the job safely. No job is to be rushed to completion at the expense of safety.

A special safety meeting will be conducted before starting a job to brief all workers involved to make sure all questions are answered and that no confusion exists among the workers.

All possible circuits in the vicinity of the work area should be de-energized and secured in this condition by grounding, locking, and tagging. If it is not possible to de-energize all circuits, use barriers, rubber goods, or any other protective equipment necessary to make the work area safe. Danger signs will be displayed in appropriate locations and on associated equipment as required to afford maximum personnel protection.

Complete attention should be devoted to the job at hand. Preoccupation or day-dreaming cannot be tolerated while working with electrical equipment.

Even low voltage (e.g., 32 volts AC) as well as many battery-powered systems are hazardous and require proper precautions.

All unsafe electrical equipment should be de-energized immediately and tagged "unsafe for use." This action and also notification of inoperable or damaged electrical tools, appliances, etc., should be reported to the immediate supervisor at once. Unqualified persons should not attempt to repair such equipment.

Under no circumstances should the hand or finger be used to test for voltage in a circuit. Only proper and safe test instruments should be used.

In case of an accident or an electrical fire, all power should be cut off immediately. Emergency switches are generally installed at convenient locations to stop electrical machinery. Know where these switches are. Use only fire extinguishers which have been approved for use on an electrical fire. Foamite or other conductive fluids, including water, must not be used on an electrical fire under any circumstances.

Electrical work of any kind will not be performed if an electrical storm is in progress in the immediate vicinity.

Adverse conditions such as darkness, poor weather, isolation, or any abnormal situations may make working alone unduly hazardous. These occasions should be identified by established management guidelines from which the employee can carefully assess the task to be performed and determine whatever assistance might be necessary to perform the job safely. All electrical conductors and equipment will be approved and meet the standards in 29 CFR Subpart K covering the electrical equipment and work practices for this project (copy follows).

13.0 SPILL PREVENTIVE/CLEANUP PLAN

All personnel involved on a project should be aware of all possible polluting situations and take steps to prevent such occurrences.

CSA Operations Managers will insure the MARPOL rules and regulations are posted on the vessel and are followed by all members of the survey team.

Should a spill occur, the following will be available:

- Absorbent pads for use on local spills on vessel and, if necessary, small discharges into the water;
- Absorbent booms for installation around drums and apparatus that could cause a spill on vessel;
- Should portable generators/winches be used that involve fueling, a catchment tray will be provided to prevent gasoline/oil or other fluids from being spilled;
- Shore personnel to locate suitable disposal container close to dock for trash removal from vessel; and
- Trash bags and ties for general trash storage will be provided on vessel.

In case of large spills, the vessel is to cease operations, stay in the area and call in to the local client base, local Coast Guard, or other appropriate regulatory agency.

PICK UP ANY TRASH YOU SEE -- NOT JUST YOUR OWN.
AND REMEMBER NO TRASH/DEBRIS/WASTE/POLLUTANT IS TO BE DEPOSITED ANYWHERE BUT IN THE CORRECT RECEPTACLE.

14.0 SHORT-TERM EMPLOYEE PROGRAM

Any CSA employees that have been with the company less than six months will be identified as "Short-Term Employees" to all personnel including the client or its agent prior to start-up and mobilization of project.

Short-term employees will be given a job-specific orientation prior to the general job safety meeting dealing with the client's site safety expectations and procedures and hands-on training by CSA for upcoming job assignments.

Short-term employees will expect to be given special supervision during their 90-day probationary period with the orientation reinforced at the end of their first week's employment with CSA and at the end of their first month's employment. The employee will then be evaluated by their supervisor monthly for the next three months. It is implied here and to be understood by the short-term employee that he will be teamed with an experienced employee whenever possible. Under no circumstances will two short-term employees be teamed on a job without approval.

APPENDIX

APPENDIX A

Hazards Analysis/Risk Assessment

HAZARDS ANALYSIS/RISK ASSESSMENT

Hazard	Consequences/Risk	Severity	Safeguard(s)/Control Measure(s)	Risk Matrix		Recommendations	Responsibility	Status
				Likelihood	Risk Rank			
Lifting accidents, dropped equipment	Injuries, damage to or loss of equipment/material	Major	Lifting procedures, lift plan, worker awareness, qualified/experienced personnel	Remote	B	Review procedures in toolbox meeting prior to activity	Operations Supervisor	Open
Boarding/loading boats	Trips, falls, injuries, damage to or loss of equipment	Minor	Designated boarding/ loading areas and procedures, first aid, clear work procedures	Infrequent	A	Review procedures in toolbox meeting prior to activity	Operations Supervisor	Open
Navigation and positioning control	Wrong locations, work delays, impact to work productivity	Moderate	Obtain latest nautical charts, set up and check CSA vessel GPS navigation during mobilization, prepare pre-plots, provide accurate locations, provide coordinates in a digital exchange file	Remote	B	Confirm accuracy of coordinates through backup GPS	Project Scientist	Open
Deployment/handling of sample collection equipment	Pinching injury, impact/crushing injury, entanglement, MOB	Moderate	Worker training, established procedures, work gloves, HSE briefing	Infrequent	B	Review procedures in toolbox meeting prior to activity	Operations Supervisor	Open
Man overboard (MOB)	Loss of personnel	Major	PFDs, work deck rules, safety chain, MOB procedures	Infrequent	C	Review procedures in toolbox meeting prior to activity	Operations Supervisor	Open
General health and safety (offshore/on water)	Heat exhaustion and overheating, exposure, dehydration, minor injuries	Moderate	Adequate drinking water available, sunscreen, light clothing, clear decks, designated work areas and clear work procedures, first aid	Infrequent	B	Review during HSE induction	Operations Supervisor	Open
Spillage of fuels, oils, and lubricants	Environmental degradation, regulatory fines, damage to reputation	Major	Refueling on land or in port only, adequate capacity for full-day operations	Infrequent	C	Review procedures in toolbox meeting prior to activity	Operations Supervisor	Open
General health and safety (onshore)	Exposure, dehydration, minor injury	Moderate	Adequate shade, adequate drinking water available, sunscreen, light clothing, clear/designated work areas, clear work procedures, work breaks	Infrequent	B	Review during HSE induction	Operations Supervisor	Open
Road/driving accidents	Collisions, damage to vehicles or equipment, injury	Major	Use of licensed and experienced drivers, safe driving at posted speeds, seatbelts	Remote	B	Review procedures in toolbox meeting prior to activity	Operations Supervisor	Open

Hazard	Consequences/Risk	Severity	Safeguard(s)/Control Measure(s)	Risk Matrix		Recommendations	Responsibility	Status
				Likelihood	Risk Rank			
Food-/water-/blood-borne pathogens	Debilitating illness, impacts to productivity	Moderate	Worker training, HSE briefing, emergency response plan	Infrequent	B	Review during HSE induction	Operations Supervisor	Open
Unsafe weather/sea state conditions	Damage to vessels	Major	Weather forecast reviews, continuous monitoring of local weather, ongoing communications, delay/cancel/abort weather thresholds	Remote	B	Conduct continuous monitoring of weather while on site, morning forecast reviews and postpone mobilization if predicted to exceed limitations	Operations Supervisor	Open
Rough sea conditions	Injuries, MOB, damage to or loss of equipment/materials	Moderate	Check for secure deck and equipment/materials before getting underway, use of PFDs	Infrequent	B	Cross check for clear deck prior to getting underway	Operations Supervisor	Open
Vessel mechanical failure or damage	Loss of vessel, vessel adrift, stranded divers	Major	Rigorous vessel maintenance and inspection, standby vessel, float plan, established communications	Remote	B	Ensure valid vessel inspections, pre-day vessel checklists	Vessel Master	Open
Unsafe deck conditions (e.g., wet, cluttered)	Slips, trips, falls, MOB, damage to equipment	Major	Clear decks, designated work areas, clear work procedures, emergency response plan	Frequent	D	Review procedures and PPE requirements in toolbox meeting prior to activity; install safety line across stern	Vessel Master	Open
Underwater obstructions, contact with bottom, grounding	Damage to seabed features/organisms, damage to boats/ equipment, injuries	Major	Review of nautical charts, mapping of navigation hazards, experienced boat operators	Remote	B	Review transit route for obstructions, shallow water	Vessel Master	Open
Other vessel/traffic shipping	Collisions	Major	Deck watch	Remote	B	Review of shipping patterns, contact any vessels in vicinity	Vessel Master	Open
Medical emergencies (injured/unconscious worker), limited timely medical access/support	Lack of/late medical attention leading to medical complications, possibly disablement/ fatality	Major	Emergency procedures for worker extraction, established communications to shore, standby vessel, local emergency support, emergency response plan, emergency oxygen on-board, comprehensive first aid equipment	Remote	B	Prior arrangements with Port/ambulance, advice to Navy and/or Coast Guard; post-emergency contact infomation readily available on all vessels/boats	Operations Supervisor	Open
Emergency preparedness	Inadequate response to emergencies	Minor	Conduct weekly drills, HSE inspection to review emergency systems	Infrequent	A	Review procedures in toolbox meeting prior to activity	Operations Supervisor	Open

Hazard	Consequences/Risk	Severity	Safeguard(s)/Control Measure(s)	Risk Matrix		Recommendations	Responsibility	Status
				Likelihood	Risk Rank			
As Sea Transfer of Samples and Supplies	Personnel injury	Major	Only conduct transfer during calm sea conditions. Personnel should wear PPE's at all times. Lift and twisting motions should be moderated.	Likely	D	Care and observations of sea conditions. Transfers should only be conucted in calm conditions	Site Safety Officer	Open
Confined Space Entry	Loss of consciousness, fatality, impact to work productivity	Major	Real-time air monitoring, forced air ventilation, full body harness, rescue tri-pod	Remote	B	Review procedures in toolbox meeting prior to activity	Site Safety Officer	Open

APPENDIX B

MSDS for Project chemicals

Project Chemicals:

Liquinox

Isopropyl Alcohol

Hexane

LIQUINOX MSDS

Section 1 : PRODUCT AND COMPANY IDENTIFICATION

Chemical family: Detergent.

Manufacturer: Alconox, Inc.
30 Glenn St.
Suite 309
White Plains, NY 10603.

Manufacturer emergency phone number: 800-255-3924.
813-248-0585 (outside of the United States).

Supplier: Same as manufacturer.

Product name: Liquinox

Section 2 : INGREDIENT INFORMATION

C.A.S.	CONCENTRATION %	Ingredient Name	T.L.V.	LD/50	LC/50
25155-30-0	10-30	SODIUM DODECYLBENZENESULFONATE	NOT AVAILABLE	438 MG/KG RAT ORAL 1330 MG/KG MOUSE ORAL	NOT AVAILABLE

Section 3 : HAZARD IDENTIFICATION

Route of entry: Skin contact, eye contact, inhalation and ingestion.

Eye contact: May cause irritation.

Skin contact: Prolonged and repeated contact may cause irritation.

Inhalation: May cause headache and nausea.

Ingestion: May cause vomiting and diarrhea.
May cause gastric distress.

Effects of chronic exposure: See effects of acute exposure.

Section 4 : FIRST AID MEASURES

Skin contact: Remove contaminated clothing.
Wash thoroughly with soap and water.
Seek medical attention if irritation persists.

Eye contact: Check for and remove contact lenses.
Flush eyes with clear, running water for 15 minutes while holding eyelids open: if irritation persists, consult a physician.

Inhalation: Remove victim to fresh air.
If irritation persists, seek medical attention.

Ingestion: Do not induce vomiting, seek medical attention.
Dilute with two glasses of water.
Never give anything by mouth to an unconscious person.

Section 5 : FIRE FIGHTING MEASURES

Flammability: Not flammable.

Conditions of flammability: Surrounding fire.

Extinguishing media: Carbon dioxide, dry chemical, foam.
Water
Water fog.

Special procedures: Self-contained breathing apparatus required.
Firefighters should wear the usual protective gear.
Use water spray to cool fire exposed containers.

Auto-ignition temperature: Not available.

Flash point (°C), method: None

Lower flammability limit (% vol): Not applicable.

Upper flammability limit (% vol): Not applicable.

Sensitivity to static discharge: Not available.

Sensitivity to mechanical impact: Not available.

Hazardous combustion products: Oxides of carbon (COx).
Hydrocarbons.

Rate of burning: Not available.

Explosive power: Containers may rupture if exposed to heat or fire.

Section 6 : ACCIDENTAL RELEASE MEASURES

Leak/Spill: Contain the spill.
Prevent entry into drains, sewers, and other waterways.
Wear appropriate protective equipment.
Small amounts may be flushed to sewer with water.
Soak up with an absorbent material.
Place in appropriate container for disposal.
Notify the appropriate authorities as required.

Section 7 : HANDLING AND STORAGE

Handling procedures and equipment: Protect against physical damage.
Avoid breathing vapors/mists.
Wear personal protective equipment appropriate to task.
Wash thoroughly after handling.
Keep out of reach of children.
Avoid contact with skin, eyes and clothing.
Avoid extreme temperatures.
Launder contaminated clothing prior to reuse.

Storage requirements: Store away from incompatible materials.
Keep containers closed when not in use.

Section 8 : EXPOSURE CONTROLS / PERSONAL PROTECTION

Gloves / Type:

Wear appropriate gloves.

Respiratory / Type: None required under normal use.

Eye / Type:

Safety glasses recommended.

Footwear / Type: Safety shoes per local regulations.

Clothing / Type: As required to prevent skin contact.

Other / Type: Eye wash facility should be in close proximity.
Emergency shower should be in close proximity.

Ventilation requirements: Local exhaust at points of emission.

Exposure limit of material: Not available.

Section 9 : PHYSICAL AND CHEMICAL PROPERTIES

Physical state: Liquid.

Appearance & odor: Odourless.
Pale yellow.

Odor threshold (ppm): Not available.

Vapour pressure (mmHg): @ 20°C (68°F).
17

Vapour density (air=1): >1

By volume: Not available.

Evaporation rate (butyl acetate = 1): < 1.

Boiling point (°C): 100 (212F)

Freezing point (°C): Not available.

pH: 8.5

Specific gravity @ 20 °C: (water = 1).
1.083

Solubility in water (%): Complete.

Coefficient of water\oil dist.: Not available.

VOC: None

Chemical family: Detergent.

Section 10 : STABILITY AND REACTIVITY

Chemical stability: Product is stable under normal handling and storage conditions.

Conditions of instability: Extreme temperatures.

Hazardous polymerization: Will not occur.

Incompatible substances: Strong acids.
Strong oxidizing agents.

Hazardous decomposition products: See hazardous combustion products.

Section 11 : TOXICOLOGICAL INFORMATION

LD50 of product, species & route: > 5000 mg/kg rat oral.

LC50 of product, species & route: Not available.

Sensitization to product: Not available.

Carcinogenic effects: Not listed as a carcinogen.

Reproductive effects: Not available.

Teratogenicity: Not available.

Mutagenicity: Not available.

Synergistic materials: Not available.

Section 12 : ECOLOGICAL INFORMATION

Environmental toxicity: No data at this time.

Environmental fate: No data at this time.

Section 13 : DISPOSAL CONSIDERATIONS

Waste disposal: In accordance with local and federal regulations.

Section 14 : TRANSPORT INFORMATION

D.O.T. CLASSIFICATION: Not regulated.

Special shipping information: Not regulated.

Section 15 : REGULATORY INFORMATION

WHMIS classification: Not controlled.

DSL status: Not available.

SARA hazard catagories sections 311/312: Immediate (Acute) Health Hazard: No.
Delayed (Chronic) Health Hazard: No.
Fire Hazard: No.
Sudden Release of Pressure: No.
Reactive: No.

SARA Section 313: None

TSCA inventory: All components of this product are listed on the TSCA inventory.

Health Hazard: 1
Flammability: 0
Reactivity: 0

Health Hazard: 1
Flammability: 0
Physical hazard: 0
PPE: A

Section 16 : OTHER INFORMATION

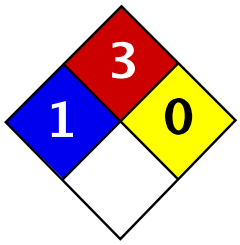
Supplier MSDS date: 2006/07/14

Data prepared by: Global Safety Management
3340 Peachtree Road, #1800
Atlanta, GA 30326

Phone: 877-683-7460
Fax: (877) 683-7462

Web: www.globalsafetynet.com
Email: info@globalsafetynet.com.

General note: This material safety data sheet was prepared from information obtained from various sources, including product suppliers and the Canadian Center for Occupational Health and Safety.



Health	2
Fire	3
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Isopropyl Alcohol, 70% MSDS

Section 1: Chemical Product and Company Identification

Product Name: Isopropyl Alcohol, 70%

Catalog Codes: SLI1669

CAS#: Mixture.

RTECS: Not applicable.

TSCA: TSCA 8(b) inventory: Isopropyl alcohol; Water

CI#: Not available.

Synonym: 2-Propanol, 70%; Isoprpanol, 70%; Isopropyl Rubbing Alcohol

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Isopropyl alcohol	67-63-0	70
Water	7732-18-5	30

Toxicological Data on Ingredients: Isopropyl alcohol: ORAL (LD50): Acute: 5045 mg/kg [Rat]. 3600 mg/kg [Mouse]. 6410 mg/kg [Rabbit]. DERMAL (LD50): Acute: 12800 mg/kg [Rabbit].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, . Slightly hazardous in case of skin contact (sensitizer, permeator). Non-corrosive for skin. Non-corrosive to the eyes. Non-corrosive for lungs.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC [Isopropyl alcohol].
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female, Development toxin [POSSIBLE] [Isopropyl alcohol].

The substance may be toxic to kidneys, liver, skin, central nervous system (CNS).
Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: The lowest known value is 399°C (750.2°F) (Isopropyl alcohol).

Flash Points: CLOSED CUP: 18.3°C (64.9°F) - 24 deg. C (75 deg. F)

Flammable Limits: The greatest known range is LOWER: 2% UPPER: 12.7% (Isopropyl alcohol)

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances:
Highly flammable in presence of open flames and sparks, of heat.
Flammable in presence of oxidizing materials.
Non-flammable in presence of shocks

Explosion Hazards in Presence of Various Substances:
Slightly explosive in presence of open flames and sparks, of heat.
Non-explosive in presence of shocks.

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards:
Vapor may travel considerable distance to source of ignition and flash back. CAUTION: MAY BURN WITH NEAR INVISIBLE FLAME.
Hydrogen peroxide sharply reduces the autoignition temperature of Isopropyl alcohol.
After a delay, Isopropyl alcohol ignites on contact with dioxgenyl tetrafluorborate, chromium trioxide, and potassium tert-butoxide. When heated to decomposition it emits acrid smoke and fumes. (Isopropyl alcohol)

Special Remarks on Explosion Hazards:
Secondary alcohols are readily autooxidized in contact with oxygen or air, forming ketones and hydrogen peroxide. It can become potentially explosive.
It reacts with oxygen to form dangerously unstable peroxides which can concentrate and explode during distillation or evaporation. The presence of 2-butanone increases the reaction rate for peroxide formation.
Explosive in the form of vapor when exposed to heat or flame. May form explosive mixtures with air.
Isopropyl alcohol + phosgene forms isopropyl chloroformate and hydrogen chloride.
In the presence of iron salts, thermal decompositon can occur, whicn in some cases can become explosive.
A homogeneous mixture of concentrated peroxides + isopropyl alcohol are capable of detonation by shock or heat.
Barium perchlorate + isopropyl alcohol gives the highly explosive alkyl perchlorates.
It forms explosive mixtures with trinitormethane and hydrogen peroxide.
It produces a violent explosive reaction when heated with aluminum isopropoxide + crotonaldehyde.
Mixtures of isopropyl alcohol + nitroform are explosive.
(Isopropyl alcohol)

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

Large Spill:
Flammable liquid.
Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids.

Storage:
Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves (impervious).

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
Isopropyl alcohol
TWA: 983 STEL: 1230 (mg/m3) [Australia]
TWA: 200 STEL: 400 (ppm) from ACGIH (TLV) [United States] [1999]
TWA: 980 STEL: 1225 (mg/m3) from NIOSH
TWA: 400 STEL: 500 (ppm) from NIOSH
TWA: 400 STEL: 500 (ppm) [United Kingdom (UK)]
TWA: 999 STEL: 1259 (mg/m3) [United Kingdom (UK)]
TWA: 400 STEL: 500 (ppm) from OSHA (PEL) [United States]
TWA: 980 STEL: 1225 (mg/m3) from OSHA (PEL) [United States]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Alcohol like.

Taste: Not available.

Molecular Weight: Not applicable.

Color: Clear Colorless.

pH (1% soln/water): Neutral.

Boiling Point: The lowest known value is 82.5°C (180.5°F) (Isopropyl alcohol). Weighted average: 87.75°C (189.9°F)

Melting Point: May start to solidify at -88.5°C (-127.3°F) based on data for: Isopropyl alcohol.

Critical Temperature: The lowest known value is 235°C (455°F) (Isopropyl alcohol).

Specific Gravity: Weighted average: 0.84 (Water = 1)

Vapor Pressure: The highest known value is 4.4 kPa (@ 20°C) (Isopropyl alcohol). Weighted average: 3.77 kPa (@ 20°C)

Vapor Density: The highest known value is 2.07 (Air = 1) (Isopropyl alcohol). Weighted average: 1.63 (Air = 1)

Volatility: Not available.

Odor Threshold: The highest known value is 22 ppm (Isopropyl alcohol)

Water/Oil Dist. Coeff.: The product is equally soluble in oil and water.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, diethyl ether, n-octanol, acetone.

Solubility: Easily soluble in cold water, hot water, methanol, diethyl ether, n-octanol, acetone.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, flame, ignition sources, incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, acids, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Reacts violently with hydrogen + palladium combination, nitroform, oleum, $COCl_2$, aluminum triisopropoxide, oxidants
Incompatible with acetaldehyde, chlorine, ethylene oxide, isocyanates, acids, alkaline earth, alkali metals, caustics, amines, crotonaldehyde, phosgene, ammonia.
Isopropyl alcohol reacts with metallic aluminum at high temperatures.
Isopropyl alcohol attacks some plastics, rubber, and coatings.
Vigorous reaction with sodium dichromate + sulfuric acid. (Isopropyl alcohol)

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation.

Toxicity to Animals:
Acute oral toxicity (LD50): 5143 mg/kg (Mouse) (Calculated value for the mixture).
Acute dermal toxicity (LD50): 18286 mg/kg (Rabbit) (Calculated value for the mixture).

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC [Isopropyl alcohol].
DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female, Development toxin [POSSIBLE] [Isopropyl alcohol].
Contains material which may cause damage to the following organs: kidneys, liver, skin, central nervous system (CNS).

Other Toxic Effects on Humans:
Hazardous in case of skin contact (irritant), of ingestion, of inhalation.
Slightly hazardous in case of skin contact (sensitizer, permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive/teratogenic effects (fertility, fetoxicity, developmental
abnormalities(developmental toxin)) based on animal studies.
Detected in maternal milk in human. (Isopropyl alcohol)

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects:
Skin: May cause mild skin irritation, and sensitization.
Eyes: Can cause eye irritation.
Inhalation: Breathing in small amounts of this material during normal handling is not likely to cause harmful effects. However, breathing large amounts may be harmful and may affect the respiratory system and mucous membranes (irritation), behavior and brain (Central nervous system depression - headache, dizziness, drowsiness, stupor, incoordination, unconciousness, coma and possible death), peripheral nerve and senstation, blood, urinary system, and liver.
Ingestion: Swallowing small amouts during normal handling is not likely to cause harmful effects. Swallowing large amounts may be harmful. Swallowing large amounts may cause gastrointestinal tract irritation with nausea, vomiting and diarrhea, abdominal pain. It also may affect the urinary system, cardiovascular system, sense

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Isopropanol, solution (Isopropyl alcohol) UNNA: 1219 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Isopropyl alcohol
Illinois toxic substances disclosure to employee act: Isopropyl alcohol
Rhode Island RTK hazardous substances: Isopropyl alcohol
Pennsylvania RTK: Isopropyl alcohol
Florida: Isopropyl alcohol
Minnesota: Isopropyl alcohol
Massachusetts RTK: Isopropyl alcohol
New Jersey: Isopropyl alcohol
New Jersey spill list: Isopropyl alcohol
TSCA 8(b) inventory: Isopropyl alcohol; Water
TSCA 4(a) final testing order: Isopropyl alcohol
TSCA 8(a) IUR: Isopropyl alcohol
TSCA 8(d) H and S data reporting: Isopropyl alcohol: Effective date: 12/15/86 Sunset Date: 12/15/96
TSCA 12(b) one time export: Isopropyl alcohol
SARA 313 toxic chemical notification and release reporting: Isopropyl alcohol 70%

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).
CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R11- Highly flammable.
R36- Irritating to eyes.

S2- Keep out of the reach of children.
S46- If swallowed, seek medical advice immediately and show this container or label.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves (impervious).
Lab coat.
Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 05:53 PM

Last Updated: 11/06/2008 12:00 PM

Material Safety Data Sheet
Instant FAME/Instant Anaerobe Methods
Hexane

SECTION 1 – CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MSDS Name: Hexane
MSDS Preparation Date: 06/19/2009
Synonyms or Generic ID: n-Hexane, Hexyl-hydride, Dipropyl, normal-Hexane, Hex.
PIN (UN#/ NA#): UN1208
Company Identification:
Microbial ID
125 Sandy Drive
Newark Delaware 19711
For Information, call: (800)276-8068, (302)737-4297
For Domestic CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

SECTION 2 – COMPOSITION, INFORMATION ON INGREDIENTS

CAS #	Chemical Name	Percent	EINECS/ELINCS	ACGIH TLV	Hazards
110-54-3	Hexane (contains a mixture of isomers)	100	203-777-6	50 ppm	Flammable, mild irritant

State: Liquid	Appearance: colorless	Odor: Gasoline Like
Boiling Point (C): 62-69°C 760mm HG	pH: not available	Specific Gravity: 0.678
Vapor Pressure (mm Hg): 151mm Hg @ 25°C	Vapor Density (AIR=1): 2.97	
Solubility in Water: insoluble		

SECTION 3 – HAZARDS IDENTIFICATION

Appearance: clear, colorless.

DANGER! Extremely flammable liquid and vapor. Vapor may cause flash fire. Breathing vapors may cause drowsiness and dizziness. Causes eye, skin, and respiratory tract irritation. May be harmful if absorbed through the skin. Aspiration hazard if swallowed. Can enter lungs and cause damage. Possible risk of impaired fertility. Long-term exposure may cause damage to the nervous system of the extremities (the hands, arms, legs and feet). Dangerous for the environment.
Target Organs: Central nervous system, respiratory system, eyes, skin, peripheral nervous system, testes.

Potential Health Effects
Eye: Causes mild eye irritation.
Skin: Prolonged and/or repeated contact may cause defatting of the skin and dermatitis. Causes irritation with burning pain, itching, and redness. Absorbed through the skin. There have been no reports of skin sensitization in people occupationally exposed to n-hexane. Skin sensitization was not observed in a maximization test using 25 volunteers.
Ingestion: May cause gastrointestinal irritation with nausea, vomiting and diarrhea. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal. May cause central nervous system depression.
Inhalation: Causes respiratory tract irritation. Exposure produces central nervous system depression. Vapors may cause dizziness or suffocation. n-Hexane vapor concentrations can become so high that oxygen is displaced, especially in confined spaces.

Chronic: Prolonged or repeated skin contact may cause defatting and dermatitis. Prolonged or repeated exposure may cause adverse reproductive effects. Chronic exposure may cause visual disturbances. Laboratory experiments have resulted in mutagenic effects. Peripheral neuropathy symptoms include: muscular weakness, paresthesia, numbing of the hands, feet, legs and arms, unsteadiness, and difficulty in walking and standing. Repeated exposure may cause nervous system abnormalities with muscle weakness and damage, motor incoordination, and sensation disturbances. Chronic exposure produces peripheral neuropathy.

SECTION 4 – FIRST AID MEASURES

Eyes: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical aid.
Skin: In case of contact, flush skin with plenty of water. Remove contaminated clothing and shoes. Get medical aid if irritation develops and persists. Wash clothing before reuse.
Ingestion: Potential for aspiration if swallowed. Get medical aid immediately. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If vomiting occurs naturally, have victim lean forward.
Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively. For ingestion, the stomach should be intubated, aspirated, and lavaged with a slurry of activated charcoal--protect the airway from aspiration of gastric contents. Monitor arterial blood gases in cases of severe aspiration.

SECTION 5 – FIRE FIGHTING MEASURES

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool. May accumulate static electrical charges, and may cause ignition of its own vapors. Extremely flammable liquid and vapor. Vapor may cause flash fire. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas. This liquid floats on water and may travel to a source of ignition and spread fire.
Extinguishing Media: Use dry chemical, carbon dioxide, or appropriate foam. Solid streams of water may be ineffective and spread material. Water may be ineffective because it will not cool material below its flash point.
Flash Point: -7.6 to -15°C
Autoignition Temperature: 225 deg C (437.00°F)
Explosion Limits, Lower:1.2 vol %
Upper: 7.7 vol %
NFPA Rating: (estimated) Health: 1; Flammability: 3; Instability: 0

SECTION 6 – ACCIDENTAL RELEASE MEASURES

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Large spills may be neutralized with dilute alkaline solutions of soda ash, or lime. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Remove all sources of ignition. Provide ventilation. Do not get water inside containers. A vapor suppressing foam may be used to reduce vapors. Absorb spill using an absorbent, non-combustible material such as earth, sand or vermiculite.

SECTION 7-HANDLING AND STORAGE

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Take precautionary measures against static discharges. Keep away from heat, sparks and flame. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use only with adequate ventilation. Avoid breathing vapor or mist.
Storage: Keep away from heat and flame. Keep away from sources of ignition. Store in a tightly closed container. Keep from contact with oxidizing materials. Store in a cool, dry, well ventilated area away from incompatible substances.

SECTION 8 – EXPOSURE CONTROL/ PERSONAL PROTECTION

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local explosion-proof ventilation to keep airborne levels to acceptable levels.

Exposure limits:

Chemical Name	ACGH	NIOSH	OSHA
Hexane (contains a mixture of isomers)	50 ppm TWA; Skin-potential significant contribution to overall exposure by the cutaneous route	50 ppm TWA; 180 mg/m3 TWA 1100 ppm IDLH	500 ppm TWA; 1800 mg/m3 TWA

OSHA Vacated PELs: Hexane (contains a mixture of isomers): 50 ppm TWA; 180 mg/m3 TWA
Personal Protective Equipment
Eyes: Wear chemical splash goggles.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respiratory use.

Other Protective Equipment: Make eye bath and emergency shower available.

SECTION 9 – PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Liquid
Appearance: Clear colorless
Odor: Gasoline-like
pH: Not available.
Vapor Pressure: 151 mm Hg @ 25°C
Vapor Density: 2.97(Air = 1)
Evaporation Rate: Not available.
Viscosity: 0.31 mPas 20°C
Boiling Point: 62 - 69°C @ 760 mmHg
Freezing/Melting Point:-95 °C
Decomposition Temperature: Not available.
Solubility: Insoluble.
Specific Gravity/Density:0.678
Molecular Formula:C6H14
Molecular Weight:86.18

SECTON 10 – STABILITY AND REACTIVITY

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Ignition sources, excess heat, electrical sparks, confined spaces.
Incompatibilities with Other Materials: Strong oxidizing agents.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.
Hazardous Polymerization: Will not occur.

SECTION 11 – TOXICOLOGICAL INFORMATION

CAS# 110-54-3: MN9275000
LD50/LC50:
CAS# 110-54-3:
Draize test, rabbit, eye: 10 mg Mild;
Inhalation, mouse: LC50 = 150000 mg/m3/2H;
Inhalation, rat: LC50 = 48000 ppm/4H;
Inhalation, rat: LC50 = 627000 mg/m3/3M;
Oral, rat: LD50 = 25 gm/kg;
Carcinogenicity:
CAS# 110-54-3: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
Epidemiology: Occupational polyneuropathy has resulted from hexane exposures as low as 500 ppm, but the minimum levels of n-hexane that are neurotoxic in humans haven't been established. Nearly continuous exposure of animals at 250 ppm has caused neurotoxic effects.
Teratogenicity: No evidence of teratogenicity or embryotoxicity in anmial studies with hexane. Fetotoxicity has been observed in the presence of maternal toxicity.
Reproductive Effects: Severe testicular damage has been observed in rats exposed to hexane at concentrations which have produced other significant toxicity. Although subneurotoxic doses of its principle toxic metabolite, 2,5-hexanedione, can induce progressive testiculartoxicity in rats, there have been no reports of human sterility or other reproductive toxicity associated with n-hexane exposures.
Mutagenicity: Positive results (chromosomal damage in the bone marrow cells) obtained for rats exposed by inhalation to n-hexane.
Neurotoxicity: n-Hexane is a mild irritant and CNS depressant in acute exposure, but its principal effects are damage to the sensory and motor peripheral nerves, particularly in chronic exposure.

SECTION 12 – ECOLOGICAL INFORMATION

Ecotoxicity: No data available. Estimated BCF values = 2.24 and 2.89. These values suggest that hexane will show low bioconcentration in aquatic organisms. Estimated Koc value = 4.11. This product will show slight soil mobility and is expected to rapidly volatilize from moist surface soils.
Environmental: Terrestrial: Volatilization and adsorption are expected to be the most important fate processes. Aquatic: Photolysis or hydrolysis are not expected to be important. Atmospheric: Expected to exist entirely in the vapor phase in ambient air, expected half life 2.8 days. Expected to biodegrade but not bioconcentrate.
Physical: No information available.
Other: No information available.

SECTION 13 – DISPOSAL CONSIDERATIONS

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

SECTION 14 – TRANSPORT INFORMATION

Proper Shipping Name: Hexanes
Hazard Class: 3
UN Number: UN1208
Packing Group: II
Flash Point: -22

SECTION 15 – REGULATORY INFORMATION

US FEDERAL
TSCA
CAS# 110-54-3 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
CAS# 110-54-3: 5000 lb final RQ; 2270 kg final RQ.
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 110-54-3: immediate, delayed, fire.
Section 313
This material contains Hexane (contains a mixture of (CAS# 110-54-3, 100%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Parts 261.3
Clean Air Act:
CAS# 110-54-3 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 110-54-3 can be found on the following state right to know lists: New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65
California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations
European Labeling in Accordance with EC Directives
Hazard Symbols:
XN F N
Risk Phrases:
R 11 Highly flammable.
R 38 Irritating to skin.
R 48/20 Harmful : danger of serious damage to health by prolonged exposure through inhalation.
R 62 Possible risk of impaired fertility.
R 51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
R 65 Harmful: may cause lung damage if swallowed.
R 67 Vapours may cause drowsiness and dizziness.

Safety Phrases:
S 16 Keep away from sources of ignition - No smoking.
S 29 Do not empty into drains.
S 33 Take precautionary measures against static discharges.
S 36/37 Wear suitable protective clothing and gloves.
S 9 Keep container in a well-ventilated place.
S 61 Avoid release to the environment. Refer to special instructions /safety data sheets.
S 62 If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.

WGK (Water Danger/Protection)
CAS# 110-54-3: 1
Canada - DSL/NDSL
CAS# 110-54-3 is listed on Canada's DSL List.
Canada - WHMIS
This product has a WHMIS classification of B2, D2B.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.
Canadian Ingredient Disclosure List
CAS# 110-54-3 is listed on the Canadian Ingredient Disclosure List.

SECTION 16 – Other Information

This Material Safety Data Sheet has been prepared in accordance with 29 CFR 1910.1200 and contains information believed to be accurate and complete at the date of preparation. The statements contained herein are offered for informational purposes only. MIDI Inc. believes them to be accurate but does not purport to be all-inclusive. The above-stated product is intended for use only by persons having the necessary technical skills and facilities for handling the product at their discretion and risk. Since conditions and manner of use are outside our control, we (MIDI Inc.) make no warranty of merchantability or any such warranty, express or implied with respect to information and we assume no liability resulting from the above product or its use. Users should make their own investigations to determine suitability of information and product for their particular purposes.

APPENDIX C

FORMS

Pre-Mobilization Safety Briefing

HSE Indoctrination Record

Job Safety Hazard Analysis

Hazard Analysis/Risk Assessment Acknowledgement

Daily Safety Meeting

Incident/Accident Notification

Next of Kin Information

Daily Survey Report

Management of Change Order

CSA INTERNATIONAL, INC.
PRE-MOBILIZATION SAFETY BRIEFING (PMSB)

A PMSB will be conducted by the CSA Site Safety Coordinator

The following is a summary of items to be discussed:

1) Description of project and goals
   - Sediment & Water collection, hydrographic profiler casts, ADCP, ROV Ops
2) Communications – key to acquiring goals
   - Accident prevention - safe and healthy environment
3) Team members, assignments, and shifts
   - CSA, ENTRIX, and M/V Jack Fitz crew
4) Coordination with boat driver/vessel's crew
   - Efficient procedures
   - Emergencies - medical, fire, man overboard (MOB), abandon ship
5) Designation of person in charge on deck
   - Shift leader
6) Complexity of the operations
   - Mobilization, Field, Demobilization
   - Collection Processes
7) Pre-operation checks
   - Vessel preparation
   - Location of vessel safety equipment
8) Safety equipment
   - Vessel
   - Sampling
   - First-aid
9) Hazards
   - Vessel operations
   - Sampling operations
   - Vessel and equipment: slips, trips, falls, bumps, pinching;
10) Limitations of personnel and equipment
   - Lifting, rigging, and safe working loads
   - Personal protective equipment
11) Environmental conditions
   - Wind, sea state, etc.

The PMSB/HSE induction for all personnel involved with the field activities will be conducted prior to vessel mobilization. Daily briefings will be conducted for survey personnel. All vessel crew members will be briefed on the operation of all primary and support equipment and primary sampling equipment (especially the winch, blocks, cable, and A-frame) prior to mobilization. It is the responsibility of the survey team members to ensure that proper rigging and lifting procedures are used. The vessels' Masters will be responsible for conducting the following drills: MOB, fire, abandon ship, and medical emergency. These drills will be conducted once before the survey begins and weekly thereafter.

CSA INTERNATIONAL, INC.

HEALTH, SAFETY, AND ENVIRONMENTAL INDOCTRINATION RECORD

Name:

Date:

Employer:

I have received indoctrination and training for following:

1. Company safety policies of CSA, ENTRIX, and JBR safety requirements, and the names of persons assigned to safety supervision duties.

2. Requirements and my individual responsibilities for accident prevention, maintaining a safe and healthy work environment, preventing damage to property, and protecting safety of others.

3. Provisions for medical facilities and procedures for reporting or correcting unsafe conditions and practices, and reporting accidents.

4. Job hazards and means used to control or eliminate those hazards, including applicable "Job Safety Analyses (JSA)" (major activity, locations, hazards, controls).

5. Accident Reporting - Both my individual and my Supervisor's responsibilities for reporting all accidents, even minor.

6. Sanitation - Water, toilet facilities.

7. Medical Facilities - Location of nearest medical emergency facilities, emergency phone numbers, first-aid kits and material data safety sheets.

8. Emergency Plans – man overboard, fire, medical, severe weather, spill response, and other emergency procedures.

9. Personal protective equipment.

10. Daily housekeeping requirements.

11. Fire prevention.

12. Policy on use of ropes, slings, and chains.

13. Hazards of floor and wall openings.
14. Hearing protection.
15. Requirements when working around hot substances.
16. Precautions with welding, cutting, and grounding of machinery.
17. Temporary electrical requirements.
18. Proper use of hand tools and power tools.
19. Proper precautions with compressed gas cylinders.
20. Requirements for ramps, runways, platforms, and scaffolds.
21. Clear access and ladder safety.
22. Material handling, storage, and disposal.
23. Hazardous materials.
24. If I am injured I (do) (do not) want the following person notified:

Name:

Phone:

Signature: _____ Date _____

Safety Officer Signature: _____ Date _____

CSA INTERNATIONAL, INC.

JOB SAFETY HAZARD ANALYSIS FORM

JOB TITLE:	**JSHA No.**____	**Page**___**of**___	**DATE**: **New**___ **Revised**___
Employer: **Facility**: **Location**:	**Classification(s) Doing Job**: **Supervisor**:	**Required /Recommended Personal Protective Equipment**:	**Analysis by**: **Reviewed by**: **Approved by**:

Sequence of Basic Job Steps	Potential Hazards	Recommended Action or Procedure

CSA INTERNATIONAL, INC.

HAZARDS ANALYSIS/RISK ASSESSMENT ACKNOWLEDGEMENT

My supervisor has reviewed this hazard analysis with me, and I understand the hazards and required precautionary actions. I will follow the requirements of this hazard analysis or notify my supervisor if I am unable to do so. I understand that there are Environmental, Safety, and Health professionals on staff if I need further assistance or clarification.

Name (please print)	Signature	Date

CSA INTERNATIONAL, INC.

DAILY SAFETY MEETING FORM

DATE:_____

PROJECT TITLE:_____

CONDUCTED BY:_____

IN ATTENDANCE: **Print Name** **Sign Name**

SUBJECT(S) DISCUSSED: **Potential Safety Hazards and Resolutions**

INCIDENT/ACCIDENT NOTIFICATION FORM Directions for filling out form

Email within 24 hrs to – Lynwood Powell, CSA Stuart Office –

Originators Reference No: ***Number assigned by project/asset as in its incident summary***		
Date of Incident:	**Time:**	**Exact Location**: **Location of the incident/Project Group**
Name of Person(s) involved: ***Injured party, any other people involved***		
Employing Company: ***Injured party and all people involved***		
Type of Incident: ***LTI, Near Miss, RWC, Medical Treatment, etc.***		
Initial Potential Consequence: ***Assign initial potential consequence as per The Risk Assessment Matrix***		
Description of Incident:	Where, when, what, how, who, operation in progress at the time (only factual)	

Provide details of the incident including:

- ***timing,***
- ***order of events,***
- ***Personnel involved their position, company, etc.***
- ***their role in the incident,***
- ***any relevant information available at the time of reporting***
- ***medical/emergency response details***
- ***any other important information***

Immediate Action:	Immediate remedial action and actions to prevent reoccurrence or escalation

In this section provide only immediate remedial actions (corrective) and actions TO PREVENT REOCCURRENCE. Do not include medical response into this section

Remedial Actions:

Provide long term remedial actions (if identified at the stage of reporting). For the incidents requiring further investigation do not include remedial actions. Those will have to be reported as a part of a final investigation report

Name: **Title:** **Date:**

Signature:

CSA International, Inc.

INCIDENT NOTIFICATION FORM

E-mail/Fax within 24 hrs to – Lynwood Powell, CSA Stuart Office –

Originators Reference No:		**Project/Asset Group:**
Date of Incident:	**Time:**	**Exact Location**:
Client/Employing Company:		
Type of Incident:		
Initial Potential Consequence:		
Description of Incident: Where, when, what, how, who, and the operation in progress at the time (only factual).		
Immediate Action: Immediate remedial action and actions to prevent reoccurrence or escalation.		
Remedial Actions:		

Name: **Title:** **Date:**

Signature:

CSA International, Inc.

NEXT-OF-KIN INFORMATION

Person	Name	Relationship	Phone
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]

CSA INTERNATIONAL, INC.
DAILY SURVEY REPORT

Client: ENTRIX
Project: Water Column Profiling Survey
Location: GOM; MC Block 252
Job Number: CSA-2290
Date:

Vessel: M/V Jack Fitz
Client Rep:
Current location:
Satellite Phone #:
Onboard Email:

Weather Report
Wind speed/dir:
Wave height:
General:

PERSONNEL ON BOARD

CSA	*Client*	*Vessel*

CSA INTERNATIONAL, INC.
Daily Survey Report (*Cont'd*)

SAMPLE SUMMARY

Total Stations:		Total Stations:	
# Complete:	0	# Complete:	0
% Complete:	0.00%	% Complete:	0.00%

DAILY ACTIVITIES LOG

Time	*Description*

SUMMARY OF PROJECT TIME

Operation	*today*	*previous total*	*Total*
Mob/Demob			0
Operations			0
Standby Weather			0
Standby Other			0
Standby in Port			0
Standby Client			0
Technical Downtime			0
Vessel Downtime			0
Maintenance Time			0
TOTAL	0	0	**0**

CSA INTERNATIONAL, INC.
Daily Survey Report (*Cont'd*)

PLANNED ACTIVITY FOR NEXT 24 HOURS

ACCIDENTS/INCIDENTS

HAZARDS REPORTS

AUDITS COMPLETED

SIGHTINGS OF/INTERACTIONS WITH FISHERMEN

EMERGENCY DRILLS COMPLETED

HSE ISSUES/CONCERNS

MARINE MAMMAL/SEA TURTLE SIGHTINGS

CURRENT ESTIMATE OF COMPLETION DATE

CSA INTERNATIONAL, INC.
Daily Survey Report (*Cont'd*)

MONTHLY EVENTS

Event	*Quantity*
Number of Fatalities	
Number of Lost Time Injuries	
Number of Restricted Work Injuries	
Number of Medial Treatment Injuries	
Number of First Aid Injuries	
Number of Fires and Explosions	
Number Incidents involving Equipment Damage	
Number of Near Misses	
Number of Spills (to sea or land)	
Number of Security Incidents	
Number of hazard reports /STOP cards or safety observations	
Number of incidents involving stakeholder complaints	
Amount of waste generated, categorized by type. (monthly only)	
Amount of fuel oil / diesel used	

At the completion of the survey a report on injury absences and details of ongoing HSE Programs/Initiatives will be completed.

CSA INTERNATIONAL, INC.

Management of Change Order

Date:

To:

Subject:

Comments:

Project Change	Reason for Change

Approved by:

CSA Project Manager

Client Representative

GulfofMexicoSPU

bp

MC-252 Incident
SIMOPS Plan

2	5/15/2010	Final – Issued for Use	Geir Karlsen	Houston IC
2	5/10/2010	Issued for Comments	Geir Karlsen	Houston IC
2	5/7/2010	Issued for Comments	Geir Karlsen	Houston IC
1	4/29/2010	Final – Issued for Use	Geir Karlsen	Houston Incident Commander
0	4/28/2010	Final – Issued for Comments	Geir Karlsen	Houston Incident Commander
Rev	**Date**	**Document Status**	**Custodian/Owner**	**Authority**

Document	Organization ID	Sector ID	Discipline ID	Document Class	Sequence Number	Document Revision
Control Number	2200	T2	DO	PN	4001	2

AMENDMENT RECORD

Revision Number	Amender Initials	Date	Amendment
A	G. Karlsen	April 24, 2010	Initial draft.
B	K. Mouton	April 25,2010	Edits
C	G. Karlsen	April 27, 2010	Comments incorporated.
0	G. Karlsen	April 28, 2010	Comments incorporated, issued for use. Clarified and added comment to Section 1.3: Clarified section and added comment "Source Control SIMOPS Director covers an area of appr. 1,000-m from site". Added Sections 6.9 on Aviation and Section 6.10 on Helicopter Refueling. Added section 1.8 (HazID of operating in contaminated waters and added HazID documents. Updated contact details and general cleanup of doc. Added doc. number from Doc. Control.
1	G. Karlsen	April 29, 2010	Removed 1000-m radius circle from map Fig. 9 and updated with debris field.
2	G. Karlsen	May 15, 2010	Revised doc. to take into account the Discoverer Enterprise over the cofferdam with Thunder Horse light intervention riser and Massachusetts barge aft end and the Q4000 top kill operations to the ESE of the well. Updated maps, riser location and debris map, field arrival procedures, issued standby areas, safe zone for Discoverer Enterprise riser deployment, updated org. chart, coms. plan, frequency management plan, SIMOPS HazID action items list and contact details. Added section 1.5 on VOC and LEL levels. Added section 6.6 on fire fighting vessels. Added coms. chart fig. 4. Added Fig. 9 Discoverer Enterprise and Q4000 escape routes. General corrections and clarifications. Updated Figure 1 with contact details. Added Section 1.4 VOC and LEL Environment. Updated Table 3 Acoustic Allocations. Updated Table 4 Fan Beam Heights. Expanded and clarified Section 4.1.1 Planned SIMOPS Activities. Added contact details to Figure 3. Updated Figure 9. SIMOPS Coordinator chairs the daily SIMOPS call ref. 2.5. Added Well Specific Operating Guidelines to take into consideration VOC and LEL levels. Removed section on Management of Change. The process is not in use (ref. Neil Cramond). May 10: Removed Well Specific Operating Criteria for Air Quality. Document was a DRAFT only document that had not been approved for use by TOI or BP drilling groups. May 15: Updated maps. Added Figure 12 through **Figure 16** WSOC for operating in elevated LEL and VOC environment. Updated HazID action items. Added coms. guideline Figure 4. Added Section 4.2.1 Fire and Emergency Drill.

REVIEWER SIGN-OFF			
	Name	**Signature (PLEASE PRINT)**	**Date**
Custodian/Owner	Geir Karlsen		
Reviewer (s)	BP Marine Assurance Rep		
	BP Houston IMT Operations		
	BP Wells Rep		
	BP (IMT) Safety Officer		
	BP (IMT) Source Control Operations		
	USCG Houston		
Authorizer (s)	BP Discoverer Enterprise Lead		
	BP DD II Team Leader		
	BP DD III Team Leader		
	BP Q4000 Team Leader		
	BP GoM Marine Authority		
	Transocean Incident Commander		
	BP Incident Commander		
	BP On-Scene Commander		

TABLE OF CONTENTS

1 Introduction 7
1.1 SIMOPS Plan Objectives 7
1.2 What Does Success Look Like? 8
1.3 The SIMOPS Team 8
1.3.1 Onshore SIMOPS Director Responsibility 9
1.3.2 Offshore Vessel Source Control SIMOPS Branch Director Responsibility 10
1.3.3 Offshore Spill Operations SIMOPS Branch Director Responsibility 10
1.3.4 Vessel Representative (Vessel Person In Charge – VPIC) 10
1.3.5 SIMOPS Coordinator 10
1.4 VOC and LEL Environment 11
1.5 HazID Assessing Operations in a Contaminated Environment 12
2 Field Communications and Emergencies 13
2.1 Crisis Management 13
2.2 Severe Weather Contingency Plan 13
2.3 Emergency Evacuation Plan 13
2.4 Incident Notification 13
2.5 Daily SIMOPS Conference Call 14
2.6 SIMOPS Communication Guideline 16
2.7 Field Communications 16
2.7.1 Hailing Channel 16
2.7.2 Radio 16
2.7.3 Emergency Communications 16
3 Acoustic Frequency Management and Position Referencing 17
3.1 Enabling and Disabling of Transponders and Responders 17
3.2 Safe Distance 19
3.3 Echo Sounder Turnoff 19
3.4 Acoustic Frequency Coordination 19
3.4.1 Coordination of Acoustic Activities 19
3.5 Acoustic Equipment Use Notifications 19
3.5.1 Acoustic Field Operations 19
3.6 Fan Beam 20
3.7 RADius Position Reference System 22
4 SIMOPS Events 23
4.1 SIMOPS Events 23
4.1.1 Planned SIMOPS Activities 23
4.2 Emergencies during SIMOPS Events 25
4.2.1 Fire and Emergency Drills 25
4.3 SIMOPS Approval 25
5 Dropped Objects Prevention 26

5.1 Drilling Vessels 26
5.2 Source Vessels and Marine Clean-up Vessels 26
6 Area Vessel Control and Aviation 27
6.1 Surface Conditions 27
6.1.1 Sheen and Plume 27
6.1.2 Marine Debris 27
6.2 Vessel Arrival at MC-252 Incident Site 27
6.2.1 Arrival and Departure Procedures at MC-252 Incident 27
6.3 Heading Change and Notice to Fleet 27
6.4 Core Fleet 28
6.4.1 Staging Area 29
6.4.2 Standby Area 29
6.5 Source Control Vessels 29
6.6 Oil Spill Response Vessels 29
6.7 Firefighting Vessels 29
6.8 VHF Hailing Channels 29
6.9 Working Channels 29
6.10 GoM 500-Meter Zone Practice 30
6.11 Aviation 30
6.11.1 Helicopter Fueling 30
7 References 55
7.1.1 BP 55
7.1.2 Transocean (TOI) 55
Appendix A: Contact Details – MC-252 Incident 56

FIGURES

Figure 1: SIMOPS Organization 9
Figure 2: Incident Notification Chart 14
Figure 3: Vessel Arrival and Departure Procedures 28
Figure 4: MC-252 Communications Plan VHF and UHF 31
Figure 5: MC-252 Incident Regional Map With 20-nm Zone and Vessel Standby Areas 33
Figure 6: Relief Well and Top Kill Operation 35
Figure 7: Riser Leak Collection and Top Kill Vessel Locations 37
Figure 8: Escape Zones Discoverer Enterprise and Q4000 Fleet 39
Figure 9: Marine SIMOPS HazID Action Items Page 1 41
Figure 10: Marine SIMOPS HazID Action Items Page 2 43
Figure 11: Marine SIMOPS HazID Action Items Page 3 45
Figure 12: DD II and DD III LEL and VOC Operating Limits 47
Figure 13: Discoverer Enterprise LEL and VOC Operating Limits 49
Figure 14: Q4000 LEL and VOC Operating Limits 51
Figure 15: Construction Vessel LEL and VOC Operating Limits 53
Figure 16: Support Vessel LEL and VOC Operating Limits 53

TABLES

Table 1: Action Levels For Elevated VOC and LEL Levels 12
Table 2: Conference Call Center 15
Table 3: MC-252 Acoustic Allocation Summary 18
Table 4: Fan Beam Height 21
Table 5: Vessels using Position Reference Systems 21
Table 6: SIMOPS Preplanning General Checklist 24

1 Introduction

1.1 SIMOPS Plan Objectives

The goal of the MC-252 Incident Simultaneous Operations (SIMOPS) Plan is safe and efficient execution of the SIMOPS between all marine assets deployed in support of the spill and source control operations. It excludes shrimping, fishing and vessels of opportunity. Air support is run as a separate entity, is shown in the SIMOPS organization chart (ref. Figure 1, page 9) and is managed through the Houma Air Command.

The following assets are being utilized:

- Transocean Offshore Inc.
  - Development Driller II (DDII) semisubmersible drilling rig.
  - Development Driller III (DDIII) semisubmersible drilling rig.
  - Discoverer Enterprise (DEN) drillship and riser leak recovery vessel.
- Helix Q4000 semisubmersible for top kill operation.
- HOS Strong Line and HOS Centerline shuttle tankers for top kill operation.
- BOA Sub-C construction support vessel.
- Ocean Intervention 3 and Ocean Intervention 1 (OI3 and OI1) ROV and construction support vessel.
- Skandi Neptune ROV and construction support vessel.
- Viking Poseidon ROV and construction support vessel.
- C-Express ROV support vessel.
- Iron Horse ROV support vessel.
- Wild Well Control fire fighting, water cannon and dispersant vessel(s).
- ROV construction and work boats of opportunity.
- Harvey Gulf Thunder tug for Discoverer Enterprise support.
- Tankers, barges, AHVs and tug boats of opportunity.
- BP Logistics and Aviation (PHI, Chouest, Tidewater, VIH, Cougar, Graham Gulf)
- Marine Spill Response Corp (MSRC).
- National Response Corp (NRC).
- Airborne Services Inc (ASI).
- USCG.
- US Navy.

The plan seeks to:

- Inform all members of the SIMOPS principles required for conducting safe and efficient simultaneous operations.
- Identify the SIMOPS hierarchy and priorities for the major scopes of work between Spill Recovery, Well Control Operations, Source Vessel Operations, Relief Well Drilling, Flow Back and Top Kill operations.
- Outline high-level procedural steps complimented by the detailed processes, procedures and plans (3P) issued by the respective groups. The 3P's are issued and reviewed in conjunction with Hazard Identification (HazID) assessments or planning meetings just prior to the SIMOPS event.

Concurrent operations onboard the assets described above are NOT covered or included in the SIMOPS Plan unless these activities affect other activities at site.

1.2 What Does Success Look Like?

Success is defined as zero SIMOPS clashes, zero SIMOPS impact to schedules and zero SIMOPS incidents.

Getting to zero is only possible by keeping strict discipline by all stakeholders, adhering to all elements of the plan and keeping open communications between groups and vessels.

Vessels and groups MUST NOT assume that other players or adjacent vessels are informed of upcoming operations and vessel movements.

Remember: "Good SIMOPS is all in the communications."

1.3 The SIMOPS Team

SIMOPS Director – Overall responsibility for coordinating the execution of SIMOPS events. The SIMOPS Director resides in Houston (see Section 1.3.1, page 9).

Offshore Spill Operations SIMOPS Branch Director – Overall responsibility for coordinating the execution of Spill SIMOPS events. Position resides onboard Louisiana Responder.

Offshore Source Vessel Control SIMOPS Branch Director – Overall responsibility for coordinating the execution of Source Vessel Control SIMOPS events. Position resides offshore onboard the DD III or the Discoverer Enterprise. The Branch Director generally controls the areas inside the rigs 500-m zones and an area of appr. 1,000-m from the MC-252 well site. See **Figure 7**, page 37.

BP Logistics – Overall responsibility for providing vessel and air support to the project. Group resides in Houston.

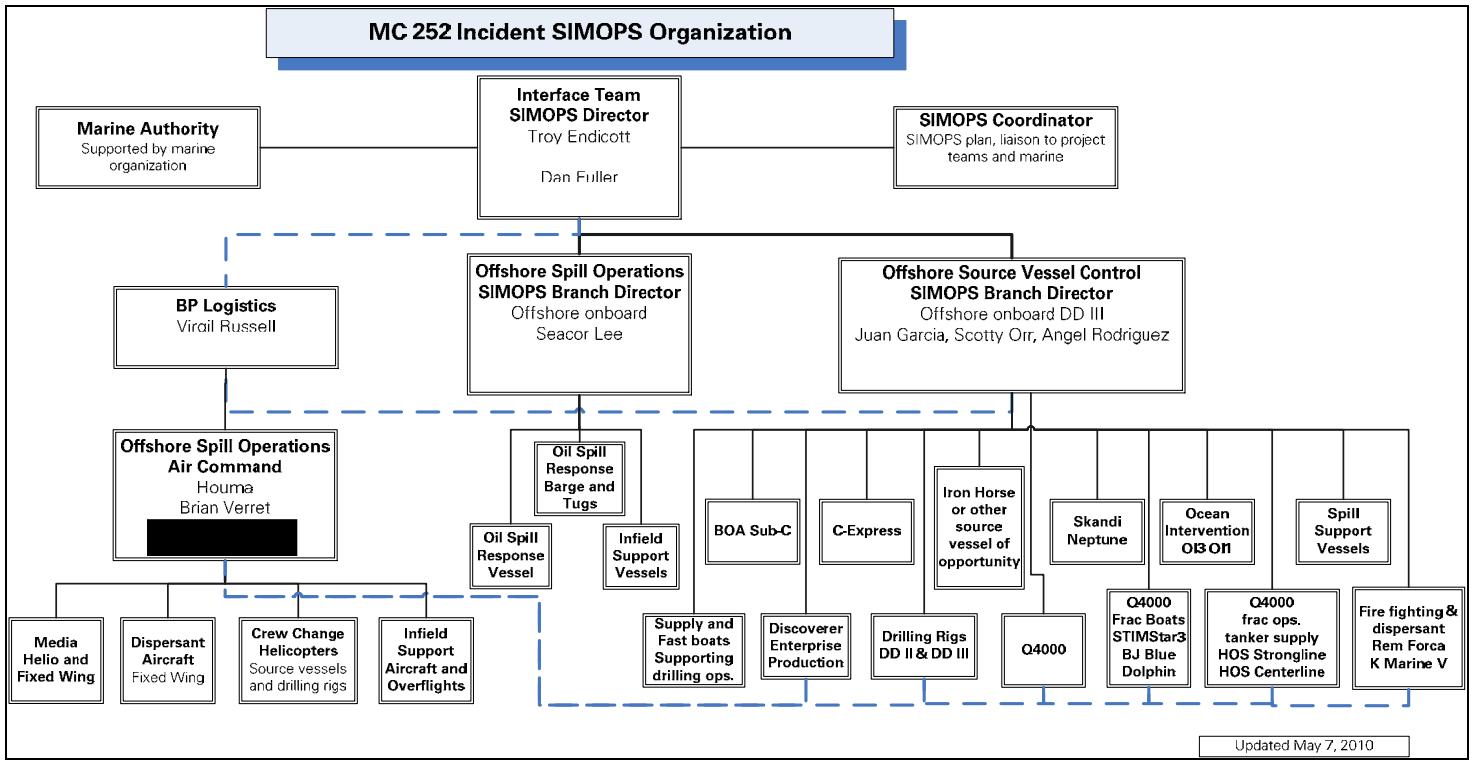
Offshore Spill Operations Air command – Overall responsibility for coordinating and scheduling all aircrafts including fixed wing, crew change helicopters, dispersant deployments, over flights, recons and spotter planes. Position resides in Houma.

Vessel Person in Charge (VPIC) – Is the BP Vessel Rep. onboard. Can also be the OIM or the Well Site Leader. The VPIC is responsible for all Health, Safety, Security and Spill (HSSE) incidents. All incidents will be reported using the Notification scheme contained within the plan.

SIMOPS Coordinator – Is the Houston liaison between the offshore operations and the SIMOPS team. The position chairs the daily SIMOPS calls.

Note: Any person involved in a SIMOPS event has the authority and obligation to discontinue and shut down the SIMOPS event in the case of safety or operational concerns.

Figure 1: SIMOPS Organization



SIMOPS events will be coordinated through daily SIMOPS call as per Section 2.5, page 14 and through the Offshore Source Vessel Control SIMOPS Branch Director.

1.3.1 Onshore SIMOPS Director Responsibility

- Be the overall coordinator of SIMOPS activities at MC-252 Incident.
- Ensure SIMOPS events comply with HSSE guidelines.
- Identify need of SIMOPS HazIDs and SIMOPS reviews prior to a SIMOPS event.
- Assess potential schedule impact and associated risks from upcoming SIMOPS events.
- Liaison and resolve SIMOPS issues, scheduling and technical conflicts with Houston leadership.
- Identify critical path and determine which operation has priority.
- Assess risks of single and multiple operations and SIMOPS events.

- Facilitate and resolves any SIMOPS conflicts with the teams.
- Coordinates and resolves SIMOPS issues between the DD II, DD III, Discoverer Enterprise. Q4000, Marine Activities and Aviation.

1.3.2 Offshore Vessel Source Control SIMOPS Branch Director Responsibility

- Be the overall coordinator of the execution of SIMOPS activities in the fleet of source vessels.
- Area of responsibility is in the Macondo well area and the debris field out to appr. 1,000-m from site.
- Direct vessels as per the daily operating plan.
- Identify resource needs.
- Liaison with the source vessels.
- Ensure vessel activities comply with HSSE guidelines.
- Assess potential schedule impact and associated risks and convey to the SIMOPS Director.

1.3.3 Offshore Spill Operations SIMOPS Branch Director Responsibility

- Be the overall coordinator of the execution of SIMOPS activities in the spill clean up operation.
- Direct vessels as per the daily operating plan.
- Identify resource needs.
- Liaison with the vessels in the cleanup fleet.
- Ensure spill cleanup SIMOPS events comply with HSSE guidelines.
- Assess potential schedule impact and associated risks and convey to the SIMOPS Director.
- Work with vessel Captain on all SIMOPS and HSSE.

1.3.4 Vessel Representative (Vessel Person In Charge – VPIC)

Source control vessels and possibly some of the spill cleanup vessels will have a BP vessel representative onboard. The DDII, the DD III and the Discoverer Enterprise will have an additional Well Site Leader dedicated to SIMOPS coordination. The vessel representative's responsibility is to:

- Implement specific programs concerning ROV, salvage, search and clean-up.
- Ensure HSSE and safety guidelines are followed onboard the vessel and in vessel ops.
- Provide guidance for the specific operation.
- Comply with operating procedures and applicable MC-252 Incident SIMOPS requirements.
- Work with vessel OIM or Captain on SIMOPS issues.
- Call-in on the daily SIMOPS call.

1.3.5 SIMOPS Coordinator

The SIMOPS Coordinator is assigned to the SIMOPS and the Marine Team to support the organization on all field SIMOPS matters. The position is a liaison between the SIMOPS team and the groups working projects and well control solutions. The position resides onshore.

The SIMOPS coordinator's responsibilities are:

- Leads the daily SIMOPS call.
- Assists in conflict resolutions.
- Work with the project teams to ensure SIMOPS issues are understood and can be integrated into the plan.
- Assist the Incident SIMOPS Director in implementing the SIMOPS Plan.

1.4 VOC and LEL Environment

The HSSE group has issued recommendations for maximum exposure and recommended actions should vessels and rigs be exposed to hydrocarbon fumes. The VOC and LEL levels are summarized in Table 1, page 12 and give guidance on maximum exposure levels and recommended actions. Further information is found in "Mississippi Canyon 252 Offshore Air Monitoring Plan for Source Control and Skimming Operations."

The document "Mississippi Canyon 252 Offshore Air Monitoring Plan for Source Control and Skimming Operations" must be available to all crew members and be fully understood.

The firefighting vessels Rem Forza, K Marine V are dedicated to firefighting and fume suppression. The Adriatic and HOS Super H are dedicated to fume suppression only. The vessels must be used to the fullest extent. Having them on standby while ships and rigs are exposed to sheen and fumes is not an option. The vessel priorities will be worked through the Offshore Source Control SIMOPS Director onboard the DD III.

WSOC (Well Specific Operating Criteria) for air quality for the DD II, DD III, Discoverer Enterprise, Q4000, construction and support vessels are shown in Figure 12, page 47 through **Figure 16**, page 53. The figures address what actions the vessels have to take at elevated VOC and LEL levels.

Table 1: Action Levels For Elevated VOC and LEL Levels

OIM Air Monitoring Plan Summary/Posting

bp

Chemical	Action Level	Monitoring Condition	Recommended Action
Volatile Organic Compounds (VOC)	50 ppm	Continuous levels for > 15 minutes	• Deploy Fire Watch Vessels to control VOCs
	100 ppm	Continuous levels for > 15 minutes	• Increase airflow with portable industrial fans • Non-essential personnel should relocate to an area of lower concentration (i.e., move to different location on the vessel or move to the living quarters or galley) • Don respirators as necessary to continue working in the area • Re-orient vessel into wind • Deploy fire watch vessels
Benzene	0.5 ppm	At least 3 samples over a period of 15 minutes	
Hydrogen Sulfide (H_2S)	5 ppm	Continuous levels for > 15 minutes	
Carbon monoxide	25 ppm	Continuous levels for > 15 minutes	
Flammable, %LEL	10%	Continuous levels confirmed by 2 or more monitors for 15 minutes	• Initiate action appropriate to the activity set in accordance with Well Specific Operating Guidelines in MC252 Source Control Simops Procedures
Flammable, %LEL	40%	Instantaneous reading confirmed by 2 or more monitors	• Move off location

Contact IMT Industrial Hygiene at 281-366-6916 if you have questions 5/10/2010

1.5 HazID Assessing Operations in a Contaminated Environment

Each major operation will have an appropriate HazID conducted prior to execution of the operation. Moving ROV and construction support vessels in the field does not require a HazID. Vessel movements are coordinated by the Offshore SIMOPS Source Vessel Coordinator. The updated HazID action items are found in Figure 9, page 41 through Figure 11, page 45. Action items are closed out prior to executing the associated operation.

2 Field Communications and Emergencies

2.1 Crisis Management

The Gulf of Mexico Deepwater Development (GoM DWD) Emergency Response Plan Guidelines are initiated should any emergency occur during a SIMOPS event. The SIMOPS event will be terminated or postponed until the emergency is cleared.

Any emergency onboard the Discoverer Enterprise, the DD II, the DDIII, the Q4000 and associated ROV and construction vessels will be reported immediately to the other vessels and the Offshore SIMOPS Branch Director to ensure necessary precautions can be taken.

2.2 Severe Weather Contingency Plan

See GoM IMS Vol. III – Severe Weather Contingency Plan (see References in Section 7, page 55).

The Crisis Center at WL-4 handles the management of severe weather planning and gives field evacuation guidance.

2.3 Emergency Evacuation Plan

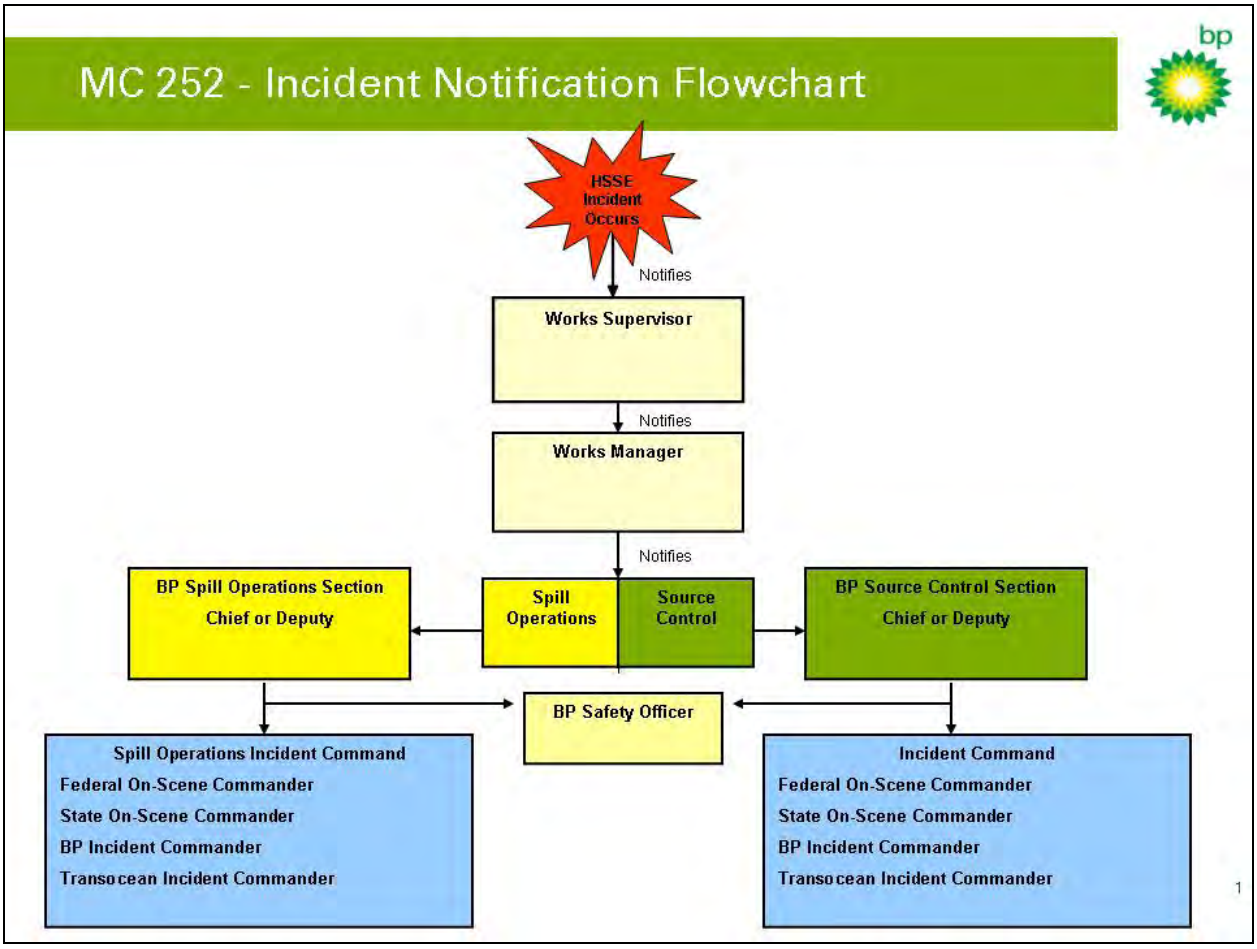
See GoM DWD Emergency Evacuation Plan (see References in Section 7, page 55).

2.4 Incident Notification

The Incident Notification Chart shown in Figure 3, page 14 is the main routing of incident notifications on the project.

It is recognized, however, that the MC-252 Incident operation is complex and that there is a possibility of incidents being reported through different channels.

Figure 2: Incident Notification Chart



2.5 Daily SIMOPS Conference Call

The Houston based SIMOPS Coordinator chairs the SIMOPS conference call. The call is held twice daily at **0830-hrs**. and at **2030-hrs**.

The following groups and personnel call in to the SIMOPS call:

1. SIMOPS Source Vessel Director onboard DD III.
2. SIMOPS Cleanup Vessel Director onboard lead cleanup vessel.
3. Each source control vessel (ROV and construction support vessels).
4. Houma IC.
5. Houston IC.
6. Houston Source Control Section lead.
7. Houston Ops. Section Lead.

8. Discoverer Enterprise, DD II, DD III, Q4000 (OIM or Captain).
9. DDII and DD III Well Site Leader (SIMOPS rep.).
10. BP vessel rep. and Captain on source control vessel(s) performing SIMOPS at site.
11. Impact Weather and Horizon Marine (only if met-ocean conditions dictate).
12. Shore-based personnel as required
13. USCG as required.

Work boats, fast boats and cleanup vessels are not required to participate.

The purpose of the daily SIMOPS conference call is to:

- Provide daily SIMOPS support to all incident groups.
- Get the latest met-ocean and environmental updates.
- Ensure all project groups and activity centers are fully aware of ongoing and upcoming field activities and SIMOPS events.
- Review SIMOPS schedule issues.
- Review VHF and acoustics communication needs and clashing issues.
- Ensure the SIMOPS events are planned and executed according to the program with no impact to HSSE and minimum impact to other operations.
- Give a 24-hr. look-ahead.

Table 2 below shows the details of the conference call center.

Participants call the Toll-free or the Toll numbers and then the Pass-code to get into the conference call.

Table 2: Conference Call Center

Dial-In Numbers and Pass Codes	Toll-Free number from inside USA:	
	Participant pass code:	

Each operation issues a daily SIMOPS report to the SIMOPS Director that is reviewed prior to the SIMOPS call. The report is a short synopsis of last 24-hours and the coming 24-hours utilizing Incident Action Plan (IAP).

The SIMOPS call agenda is:

- Met-ocean update (wind, waves and currents).
- Sheen, plume, VOC (volatile organic compound), LEL (lower explosive limit) and marine debris update.
- Vessel Summary
  - Lead spill clean-up vessel – Area of operation, sheen and plume update.
  - Discoverer Enterprise – Current operations, SIMOPS events, next activity, special issues.
  - DD III – Current operations, SIMOPS events, next activity, special issues.
  - DD II – Current operations, SIMOPS events, next activity, special issues.
  - ROV, Construction and Intervention vessels – Current operations, SIMOPS events, next activity, special issues.
  - Fire fighting vessels – Current operations, SIMOPS events, next activity, special issues.
  - Barge and tugs – Update on current operations and plans for next 24-hrs.

- SIMOPS issues, communications and VHF use.
- Scheduling, conflicts and concerns.
- Upcoming fire and emergency drills.

2.6 SIMOPS Communication Guideline

Well-planned and established communications are keys to the successful execution of the MC-252 Incident SIMOPS. The SIMOPS Branch Directors must communicate with the respective Vessel representatives / OIMs / Captains prior to the start of any SIMOPS activity and during the SIMOPS event as conditions require. Core field vessels are: DD II, DD III, Discoverer Enterprise and Q4000.

Remember: "Good SIMOPS is all in the communications."

2.7 Field Communications

2.7.1 Hailing Channel

Vessels approaching the field will hail according to the communications plan shown in Figure 4, page 31. Channel selection, following the initial hailing is agreed upon with the respective installation. The table is a guideline and lists the agreed VHF and UHF channels. It is anticipated that radio noise and high usage may require selection of other channels at times.

Radio use and frequency selection will be part of the daily SIMOPS call.

2.7.2 Radio

Vessels and aircraft, under contract to BP, are equipped with BP radios in addition to the contractor's communication equipment.

Operators of vessels involved in SIMOPS activities must agree upon *primary* and *secondary* radio communication frequencies prior to the start of any SIMOPS activity.

Note: Conduct radio check and confirm operability prior to start of any SIMOPS event.

2.7.3 Emergency Communications

For emergency response communication procedures and contact information, reference the "GoM DWD Emergency Response Plan" (see Section 7, page 55).

3 Acoustic Frequency Management and Position Referencing

The Acoustic Frequency Management Plan is summarized, page 18. The plan is continuously being updated based on vessel arrivals, departures and requirements.

Please note the following:

1. It is essential that all vessels with dual head HiPAP systems configure the system to track all transponders from a single head (all transponders tracked from the same head).
2. There is absolutely no selection of HiPAP or wide band channels not shown in Table 3, page 18.

3.1 Enabling and Disabling of Transponders and Responders

The Dynamic Positioning Operator (DPO) onboard the DD II, the DD III, the Discoverer Enterprise and the Q4000 are responsible for the management and safe use of the acoustic frequencies in the field.

No acoustics will be turned on or off without the concurrence of the DPOs onboard the DDII, the DD III, Discoverer Enterprise and the Q4000.

Warning:	**Do not change allocated acoustic channels without the concurrence of the DD II, the DD III, Discoverer Enterprise and the Q4000 DPOs. The main requirement of the Acoustic Management Plan is to prevent frequency clashing and risk interference or loss of acoustic position referencing for the core fleet of vessels.**

Note that any noise issues degrading the acoustic position reference system *MUST* be reported to the OIM and the Well Site Leader. Under no circumstances should the acoustic system be disabled because of degraded signal to noise ratio. The acoustic system may be taken out of solution if degraded while fixing the problem. Disabling the acoustic system will bring the vessel from DP Class II to a DP Class I.

Table 3: MC-252 Acoustic Allocation Summary

DD II DP	**DP** b41 DP b42 DP b43 DP b45 DP b46 DP b67 DP LIC	**DD II**	**ROV System** b24 Tracking b64 Tracking b84 Tracking	**DO NOT USE** **b12** **b13** **b15** **b17** **b21** **b23** **b25** **b26**
DD III DP	**DP** b31 DP b32 DP b35 DP b37 DP b73 DP b76 DP LIC	**DD III**	**ROV System** b28 Tracking b48 Tracking b68 Tracking	**b51** **b52** **b53** **b57** **b61** **b62** **b63** **b65**
Discoverer Enterprise DP array: Sonardyne wideband Family 14, CIS. 00 Ch. 1409, 1410, 1411, 1412, 1413				**b71** **b72** **b75** **b81** **b82** **b83** **b85** **b86**
BOA SUB C	b18 Tracking b38 Tracking b58 Tracking b78 Tracking	**IRON HORSE**	b27 Tracking b47 Tracking b87 Tracking	The acoustic allocations for all construction vessels are found in Figure 10, page 34, Figure 11, page 35 and Figure 12, page 35. **It is imperative that the plan is adhered to and that there are no changes without preapproval.** The DD II and DD III ROV channels may be utilized by others if not required by the DD II or DD III operation.
VIKING POSEIDON	b16 Tracking b36 Tracking b56 Tracking	**SKANDI NEPTUNE**	b14 Tracking b34 Tracking b54 Tracking b74 Tracking	
OI-3	**Wideband Family 12 (see below)** Address 1201, CIS 1 ROV 1 Address 1202, CIS 2 ROV 1 Cage Address 1203, CIS 3 ROV 2 Address 1204, CIS 7 ROV 2 Cage	**Acoustic frequency management plan summary**		CIS = Common Interrogation Signal
C-Express	**Wideband Family 15 (see below)** Address 1512, CIS 4 ROV Address 1513, CIS 5 ROV Backup Address 1514, CIS 6 ROV TMS			
Q4000 DP array: Sonardyne wideband Family 4, CIS 08. Ch. 405, 406, 407, 408 Q4000 Wideband Sub Minis 4113, 3706, 3308. Interrogate on tone CIF, reply on IRS 913, 506, and 108 Coffer Dam Inclinometer Compatts set to address 313 and 401, CIS 09 via ROVNAV Pressure monitoring Compatts set to address 301, 302 and 303, CIS 09 via ROVNAV Riser Monitoring Compatt set to address 307, CIS 09 via ROVNAV				
Field Wide LBL Array: Sonardyne Wideband Family 13				

3.2 Safe Distance

The Frequency Management Plan assumes there is no safe distance where acoustics will not interfere, especially with the short distance between vessels. The plan produced a set of compatible channel allocations and guidelines that will allow each vessel to operate freely without concern as to the effect on other vessels nearby.

3.3 Echo Sounder Turnoff

Any vessels entering the MC-252 Incident area must turn off the echo sounders within 5-nm of arriving in the MC-252 Incident field. This is to ensure echo sounders do not create noise in the water column and interfere acoustically with any of the vessels using acoustic communications. Do not turn on echo sounders until the vessel is outside this 5-nm limit.

Caution:	**Compliance with the echo sounder turnoff while in the MC-252 Incident field is mandatory.**

It is the responsibility of each MC-252 Incident group contracting vessels, the Logistics Group and the Fourchon Base to notify and inform the MC-252 Incident vessels of the Echo Sounder turnoff requirements.

3.4 Acoustic Frequency Coordination

3.4.1 Coordination of Acoustic Activities

All information, regarding the coordination of the MC-252 Incident Acoustic Frequency Management Plan, is directed to the respective rig's Team Leader, Jonathan Davis, Ian Dootson and Geir Karlsen (see phone list for contact details).

3.5 Acoustic Equipment Use Notifications

Source vessels will work in close proximity to the Discoverer Enterprise and the DD III. These vessels must follow the Frequency Management Plan and the acoustic guidelines before enabling acoustic equipment.

3.5.1 Acoustic Field Operations

For acoustic operations at MC-252 Incident, vessels will inform the DDII, the DD III, Discoverer Enterprise and the Q4000 Bridge of arrival in the field. The following must take place prior to commencement of acoustic operations:

- Confirm field arrival and departure.
- Confirm all frequencies in use by the vessels in the field (see Table 3, page 18) showing frequency allocations.

- Confirm pre-approved acoustic channel allocations for the upcoming operation.
- Advise core vessels of minimum proximity requirements.
- Advise core vessel DPOs when channels are enabled and disabled.
- Advise core vessel DPOs of source vessel channel selections.
- Be prepared to immediately disable acoustic channels in case of degradation of the core vessels acoustic position reference systems.
- Core vessels to advise of degradation from added acoustics in the water column.

Caution:	**No vessel shall deploy transponders without first contacting the DD II, DD III, Discoverer Enterprise and Q4000 DPO and receiving confirmation as to channels in use. Any vessels using acoustics will be in continuous communications concerning acoustic noise and frequency clashing.**

3.6 Fan Beam

Fan Beam is a position reference system used while vessels are in proximity. Workboats and supply boats, as well as vessels carrying out subsea construction, utilize Fan Beam. The system's maximum range is 2,000-m with an accuracy of ±10 cm during optimum conditions. The system uses a laser beam and is, therefore, weather sensitive. The practical range for Fan Beam is in the range of 200-m to 400-m.

The key to a successful operation of the Fan Beam position reference system is to ensure the system is maintained, fully operational and in Green status and that the Fan Beam is set up according to the manufacturer's specifications.

Particular attention is required to the system setup. The gating parameters must be set correctly to ensure the intended target is followed. This may have been a problem in the past. There are known instances where the laser beam has locked onto a moving object onboard the adjacent vessel. The moving object may have been someone in coveralls with reflective tape.

Note: Any vessel working the MC-252 Incident area and using Fan Beam as a relative position reference system, must confirm that the system is operational according to manufacturer's specifications before the system is allowed to be used to station keep off the DD II, DD III, Discoverer Enterprise, the Q4000 and the source vessels.

The Fan Beam User Guide v. 4.1 is listed as a reference in this document. *The user, however, shall always check with the manufacturer to ensure the correct and latest version of the user guide is utilized for setting up the Fan Beam systems on the particular vessel*.

Vessels have Fan Beam laser units installed at different heights. Adjustments may be required in the height of the prisms or reflector tubes installed on the adjacent vessel.

The vessel having prism or reflector tube installed should determine correct prism height and location based on communications with the respective user of Fan Beam systems. Table 4, page 21 lists the Fan Beam height for some vessels which may be used at MC-252 Incident. Fan Beam heights generally range from 45-ft. to above 100-ft. depending on the size and configuration of the vessel.

Table 4: Fan Beam Height

MC-252 Incident Vessels	Fan Beam Height Above Sea Level	MC-252 Incident Vessels	Fan Beam Height Above Sea Level	Ideal Reflector Height above Sea Level
Amy Chouest	40-ft.	C-Freedom (CyScan)	47-ft.	The reflector height is determined by the application and distance between vessels and is generally set at Fan Beam height -0 +17-ft.
BOA Deep-C	95-ft.	C-Hero	45-ft.	
BOA Sub-C (RADius)	105-ft.	C-Pacer	47-ft.	
C-Captain	45-ft.	Dante (CyScan)	65-ft.	
C-Carrier	45-ft.	Kobe Chouest	50-ft.	
Celena Chouest (CyScan)	54-ft.	L-Legacy	50-ft.	
C-Commander	45-ft.	OI1	56-ft.	
C-Courageous	42-ft.	OI3	72-ft.	
C-Enforcer	72-ft.	Pat Tilman	45-ft.	
C-Express	44-ft.	Skandi Neptune	75-ft.	
C-Fighter	52-ft.	Schlumberger DeepSTIM II	44-ft.	
		Viking Poseidon	82-ft.	

Table 5 below lists the MC-252 Incident vessels using Position Reference systems.

Table 5: Vessels using Position Reference Systems

MC-252 Incident Vessels	Available Position Reference System	Notes
Discoverer Enterprise	DGPS, Acoustics (Sonardyne wideband digital)	DP Class II+
DD III	DGPS, Acoustics (HiPAP)	DP Class II+
DD II	DGPS, Acoustics (HiPAP)	DP Class II+
Q4000	DGPS, Sonardyne wideband digital	DP Class II+
Source control vessels	DGPS, Fan Beam and RADius. Acoustics for tracking and surveying	DP Class I and II Some vessels may not have been assessed for DP class
Spill clean-up vessels		Not assessed for DP class

3.7 RADius Position Reference System

The RADius position reference system measures relative distance between two adjacent vessels using the Doppler principle. The adjacent vessel is equipped with RADius transponder(s). The system has a range of approximately 1,100-m and is not affected by activities onboard the adjacent vessel. A transponder system consisting of a small box is installed onboard the host vessel (i.e., DD II, DD III, Discoverer Enterprise. Q4000). The system requires a 120-volt power source. Range accuracy is 0.25-m.

Note: Any vessel, working the MC-252 Incident area and using RADius as a relative position reference system, must confirm that the system is operational according to manufacturer's specifications before the system is utilized.

4 SIMOPS Events

4.1 SIMOPS Events

The SIMOPS plan contains multiple events and interfaces between the DDII at relief well location RxD and DD III at relief well location RxC.

4.1.1 Planned SIMOPS Activities

Planned SIMOPS events covered by this plan are all operations within 5-nm of MC 252. **The major SIMOPS events are**:

1. DDII at relief well location RxD (see **Figure 6**, page 35).
2. DD III at relief well location RxC (see **Figure 6**, page 35).
3. Discoverer Enterprise at riser leak location gathering hydrocarbons from cofferdam, insertion tool, top hat, hot tap or other means (see **Figure 7**, page 37).
    a. Run riser in "safe zone" and move in to riser leak location.
    b. Massachusetts barge or tanker operation lightering off the Discoverer Enterprise.
    c. Skandi Neptune coiled tubing injection during flow back to Discoverer Enterprise and Q4000 top kill operation.
4. Q4000 semisubmersible top kill (see **Figure 7**, page 37).
    a. Two frac boats and supply tankers pumping at high rate.
    b. Source control vessel(s) with ROV monitoring during flow-back and top kill operation.
5. Riser hot tap operation.
6. Riser cutting operation.
7. LMRP removal operation.
8. LMRP and riser running operation.
9. Source control vessel activity inside the Discoverer Enterprise, DDII, DDIII and Q4000 500-m exclusion zones.
10. Spill cleanup vessel activity inside the Discoverer Enterprise, DDII, DDIII, Q4000 and source vessels 500-m exclusion zones.
11. Salvage operations and seabed recovery using source control vessels.

Notes:

1. **The Discoverer Enterprise may be over the riser leak location or over a hot tap location further away along the riser. This does not change the overall scope of work or the SIMOPS plan.**
2. **There is no requirement to develop a separate SIMOPS procedure for any of the MC-252 SIMOPS events.**
3. **This revision of the SIMOPS plan covers the planned SIMOPS events. The SIMOPS Plan may be revised should new project require major marine change to operations or vessel configurations.**
4. **Detailed project operating procedures specifically developed in conjunction with and referring to the MC-252 SIMOPS plan are required.**
5. **Operations are supported by associated HazIDs.**

Table 6: SIMOPS Preplanning General Checklist

Activity	Well Site Leader/PIC	OIM/Captain	DPO	SIMOPS Source Vessel Branch Director
Vessel within 500-m of DD II, DD III, Discoverer Enterprise and Q4000.	To be informed.	Approve.	Prepare most favorable heading. Ensure communications to vessel are as planned.	To be informed.
In close proximity to, alongside or equipment hooked up to DD II, DD III, Discoverer Enterprise and Q4000	To be informed.	Approve through Permit to Work (PTW) process.	Ensure communications to vessel are as planned.	To be informed.
Station-keeping alongside.	To be informed of changes in met-ocean conditions and any required heading change of DD II, DD III, Discoverer Enterprise and Q4000	To be informed of met-ocean conditions and any heading change of DD II, DD III, Discoverer Enterprise and Q4000	Works according to WSOC. Communicate with vessel in SIMOPS on all DP matters.	To be informed.
Fan Beam prism or reflective tube installation.	To be informed of station-keeping readiness.	To determine correct height based on vessel alongside.	Ensure fully operational	No action
Degradation in station-keeping ability of vessel(s).	To decide on further action together with OIM.	DPO to assess and decide on action according to WSOC.		To be informed.
SIMOPS with other ops.	To be informed.	To approve.	Requirements as above.	To approve

4.2 Emergencies during SIMOPS Events

Emergencies onboard one of the vessels involved in SIMOPS impact the ability to proceed with SIMOPS. The SIMOPS planning should specifically address emergencies during SIMOPS events, mitigations and restrictions associated with such emergencies.

Use the following guidelines to shut down or postpone the SIMOPS event, which may reduce the ability of personnel to respond effectively to an emergency:

- Sheen, plume or surface debris that could impact the SIMOPS event or result in elevated VOC and LEL levels above recommended limits (see Section 1.4, page 11).
- Any condition the OIM, Captain or the BP Well Site Leader determines to exist or develop and which would compromise safety of crews, equipment or vessels during the SIMOPS execution.
- Any event where acoustics communications are interfering with station-keeping of any vessel.
- Any fire requires vessels to suspend activities except those required to handle the event.
- Any hull emergency requires vessels to suspend activities except those that are required to handle the event.
- Any loss of firewater pumps requires vessel to suspend all activities at a secure point.
- Any loss of communication requires vessels to suspend all activities at a secure point.
- Any met-ocean event that could jeopardize station-keeping or operations during the SIMOPS event.
- Any event that takes a vessel out of readiness condition such as power, cooling and fuel systems, power management system, position reference systems and DP system.

4.2.1 Fire and Emergency Drills

Any fire and emergency drill must be communicated to the fleet should these be required during multiple vessel operations. Any upcoming drills should be discussed during the daily SIMOPS call to ensure adjacent vessels are fully aware of the upcoming drill.

4.3 SIMOPS Approval

The complexity of the SIMOPS activity determines the level of approval required for the work plan. Use the following procedure as a guideline:

- The SIMOPS Director has the overall responsibility for determining SIMOPS priorities and give necessary approvals following review with Branch Directors and Air Command.
- The SIMOPS Branch Directors approve SIMOPS events within their fleet after review with the SIMOPS Director and the respective vessels.
- The vessel OIM/Captain approves SIMOPS events associated with the respective vessel.
- The BP Well Site Leader or vessel rep. with input from the respective OIMs and Branch Directors determine the level of authority required to approve a safe work plan for a more complex activity inside the DD II, DD III, Discoverer Enterprise and Q4000 500-m zones.
- A SIMOPS event requires an associated marine HazID and close out of action items.

5 Dropped Objects Prevention

5.1 Drilling Vessels

Any dropped object is to be reported through regular channels. There are no infrastructure concerns at the respective well sites. There are a number of pipelines and wellheads in the area, so dropped object prevention must have the same focus as when working in any of BP's assets.

5.2 Source Vessels and Marine Clean-up Vessels

Any dropped object must be reported as per the Incident Notification Chart. The DD II, DD III, Discoverer Enterprise and Q4000 Bridge should be notified as well of any dropped object incident.

Caution:	**Vessels inside the MC-252 Incident field MUST promptly report a dropped object incident to the DD II, DD III, Discoverer Enterprise and Q4000 Bridge and the source control vessels.**

6 Area Vessel Control and Aviation

The key to vessel control is through good communications. The daily SIMOPS calls are the main venues to inform of upcoming vessel activities, requirements and conflicts.

6.1 Surface Conditions

Marine debris and hydrocarbons will to a large extent determine activities at the MC-252 incident site. A continuous assessment is being made as to DD II, DD III, Discoverer Enterprise and Q4000 operability while being exposed to a surface sheen or the plume. Daily updates on sheen and plume developments together with marine debris updates are provided to ensure appropriate marine decisions can be made. Section 1.4, page 11 discuses recommendations should elevated VOC and LEL levels be experienced.

6.1.1 Sheen and Plume

It is likely that the DD II, DD III, Discoverer Enterprise and Q4000 will be exposed to a sheen or the plume. This depends on met-ocean conditions and the volume of hydrocarbon (HC) being released. The Bridge of the DD II, DD III, Discoverer Enterprise and Q4000 will stay in communications with the spill clean-up vessels and be notified of any changes in weather patterns that may result in HC reaching the sites.

6.1.2 Marine Debris

Discovery of marine debris will be broadcasted to the fleet by the first observer. Recovery will be handled by the appropriate team as required.

6.2 Vessel Arrival at MC-252 Incident Site

Surface and marine debris conditions determine how vessels arrive at the MC-252 Incident site.

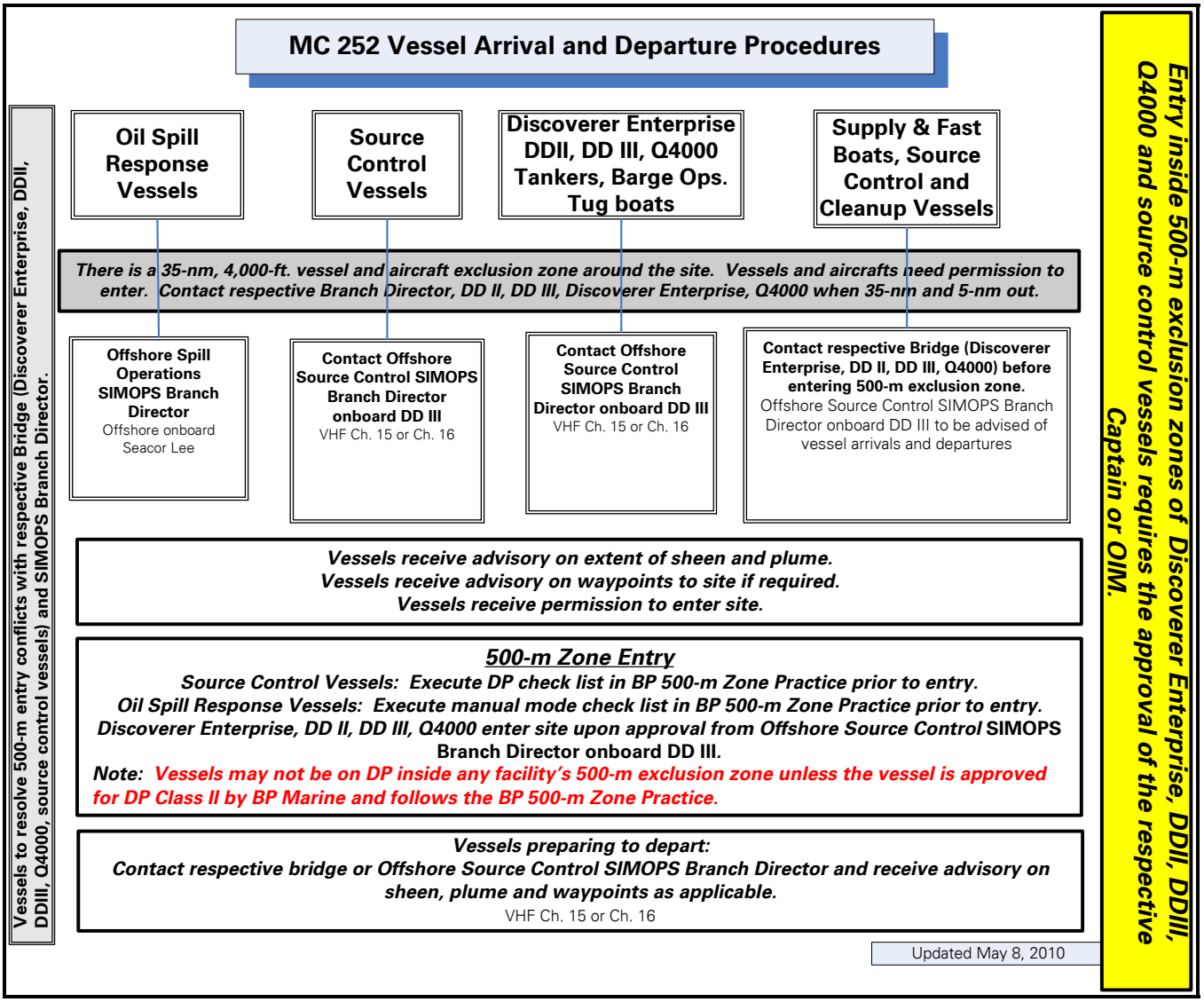
6.2.1 Arrival and Departure Procedures at MC-252 Incident

Vessel arrival and departure will follow the procedures set up in Figure 3, page 28. The number of vessels on DP and connected to the seabed either trough drilling risers or ROVs requires careful planning of vessel movements.

6.3 Heading Change and Notice to Fleet

Any heading change during the top kill and flow-back operation must be communicated to any vessel that could be affected by the change. The top kill and flow-back operation could have up to ten (10) vessels inside the 500-m zone of the site. Maintaining good communications are, therefore, essential.

Figure 3: Vessel Arrival and Departure Procedures



6.4 Core Fleet

The DD II, DD III, Discoverer Enterprise and Q4000 are considered the core fleet.

The Discoverer Enterprise and the DD II will arrive from the SW or as determined by sheen, VOC and LEL levels. Vessels will move on to location once receiving approval through the respective Team Leader. Figure 5, page 33 shows regional map and dedicated standby areas. **Figure 8**, page 39 shows recommended escape directions should vessels have to depart in an emergency. Vessels with riser systems will depart towards deeper water.

6.4.1 Staging Area

There is a dedicated Staging area in MC-339 as shown in Figure 5, page 33. Preparations to start operations may be carried out at this location until approval is received for moving to the well location or to one of the dedicated standby areas.

6.4.2 Standby Area

Two standby areas are dedicated as seen in Figure 5, page 33. The use of the standby areas is managed by the SIMOPS Source Vessel Director located onboard the DD III.

6.5 Source Control Vessels

The DD II, DD III, Discoverer Enterprise and Q4000 500-m exclusion zones will be adhered to. Entry into any of these zones requires the respective vessel's OIM approval.

Please note that the DDII and the DD III 500-m exclusion zones overlap. Any passage between the two rigs will, therefore, require DD II and DD III OIM approvals.

6.6 Oil Spill Response Vessels

Oil spill response vessels will be directed through the Incident Management Command via the SIMOPS Branch Director and are expected to interact with the DD II, DD III, Discoverer Enterprise and Q4000.

It is essential that the DD II, DD III, Discoverer Enterprise and the Q4000 are notified of any clean-up vessel activity in the vicinity of the well operations and especially inside the rigs 500-m exclusion zones.

Note: The DD II, DD III, Discoverer Enterprise and Q4000 500-m exclusion zones will be adhered to. Entry into any of these zones requires the respective vessel's approval. Please note that the DD II and the DD III 500-m exclusion zones overlap. Any passage between the two rigs will, therefore, require the DD II and the DD III OIM approval.

6.7 Firefighting Vessels

The Rem Forca and the K Marine V are dedicated firefighting vessels to be used for dispersant applications and firefighting. The Rem Forca is dedicated to the Discoverer Enterprise support. The K Marine V will be working water cannons and dispersants in the DD III and the DD II areas. The vessels will be directed through the Source Vessel SIMOPS Branch Director onboard the DD III.

6.8 VHF Hailing Channels

All vessels approaching the DD II, DD III, Discoverer Enterprise and Q4000 will use VHF channels as shown in Figure 4, page 31 to call up the DD II, DD III, Discoverer Enterprise and Q4000 Bridge.

6.9 Working Channels

Once the targeted rig or vessel is hailed, the channel is switched to an agreed frequency.

6.10 GoM 500-Meter Zone Practice

Any vessel entering the 500-m exclusion zone of any MC-252 Incident vessel shall comply with the requirements in the 500-m Zone Practice. The document is issued by the BP Marine Vessel Operations group.

The nature of the MC-252 Incident operation, however, requires flexibility in how vessels interact. It is anticipated that the Captains on the Source Control vessels and the Spill clean-up vessels review proximity requirements between vessels and have an agreement in place concerning procedures and safeties.

Entry into the DD II, DD III, Discoverer Enterprise and Q4000 500-m exclusion zones, however, takes place according to the 500-m Zone Practice.

Caution:	**Critical vessel repairs and maintenance shall be performed either before or after the SIMOPS event. No critical vessel repairs will be performed during the SIMOPS event or inside the DD II, DD III, Discoverer Enterprise and Q4000 500-m zone (see details in the 500-m Zone Practice). A critical repair is defined as repair that could lead to single point failure and loss of station or vessel integrity.**

6.11 Aviation

The air command in Houma is an integrated part of the MC 252 operation. The operation is run as a separate entity from the Houma Air Command. The following types of air activities are expected:

1. Helicopter crew flights to drilling rigs and source control vessels.
2. Spotter planes and fixed wing surveillance
3. Areal spray of dispersants (four aircrafts in one dispersant sortie, four to five sorties per day).
4. Over-flights of fixed wing and helicopters.
5. Drone surveillance.
6. Press and media.

The MC-252 area has a restricted airspace (TFR – Temporary flight restriction) of 35-nm from site up to a 4,000-ft. elevation. Flights inside this zone are controlled by the USCG cutter Harriet Lane or other USCG vessel on site. The air command in Houma plans all flights to the site and reports through the SIMOPS Director as shown in Figure 1, page 9.

6.11.1 Helicopter Fueling

Helicopter fueling operations will mainly take place onshore. The aviation group will arrange emergency fueling onboard offshore facilities if needed. It is emphasized, however, that using the core fleet as fueling stations other than for dedicated flights reduces the efficiency of the operations because of shut-down of cranes and deck activities.

Figure 4: MC-252 Communications Plan VHF and UHF

MC 252 VHF and UHF Communications Plan

Drilling Rigs and Construction Vessels																					
Location	DEN	DEN ROV	DDII	DDII ROV	DDIII	DD III ROV	Q4000	Q4000 ROV	Skandi Neptune	BOA Sub-C	BOA Deep-C	OI1	OI3	Viking Poseidon	HOS Iron Horse	K Marine V	Rem Forza	C-Express	BJ Blue Dolphin	Halliburton STIMStar III	HOS Centerline	HOS Strongline	Other field support vessels
Email	OIM.DEN@deepwater.com	NA	OIM-PIC.DevelopmentDriller2@deepwater.com	NA	OIM.DD3@deepwater.com	NA	g4k_captain@helixesq.com	NA	captain@neptune.dof.no	captain@boasubc.no	offshore-supervisorbdc@boa.no	oi1master@oceaneering.com	captain@interventionislandoffshore.com	master.viking-poseidon@eidesvik.no	ironhorsecapt@hornbeckoffshore.com	chaunceyn@williamsfire.com No Bridge e-mail	captain.forza@rem-maritime.no	mv.c-express@chouest.com	mv.bj.blue.dolphin@chouest.com		centerline@hornbeckoffshore.com	stronglinecapt@hornbeckoffshore.com	
Hailing general	[redacted]																						
Bridge to Bridge																							
Bridge to boat																							
Port crane																							
Starboard crane																							
Crane to boat																							
Bulk and liq. transfer																							
ROV																							
Spare VHF channels																							
UHF																							
Helicopter																							
Knuckle boom																							
Medic																							
Harvey Thunder tug																							
Notes:	[redacted]																						