Assessment Plan for Juvenile Sea Turtles in *Sargassum* Communities Potentially Exposed to MC 252 Discharge

Approval of this work plan is for the purposes of obtaining data for the Natural Resource Damage Assessment (NRDA). Each party reserves its rights to produce its own independent interpretations and analyses of any data collected pursuant to this work plan.

The trustees have developed a preliminary conceptual model of the DWH release, potential pathways and routes of exposure, and potential receptors. This preliminary model has informed the trustees' decision to pursue the studies outlined in the work plan. By signing this work plan and agreeing to fund the work outlined, BP is not endorsing the model articulated in the work plan.

APPROVED:

Jennifer Boyce — 12/2/10
NOAA Trustee Representative: — Date

Greg Masson — 12/7/10
DOI Trustee Representative: — Date

FOR ROLAND GUIDRY — 1/5/11
Louisiana Trustee Representative: — Date

12-3-10
BP Representative: — Date

Assessment Plan for Juvenile Sea Turtles in *Sargassum* Communities Potentially Exposed to MC 252 Discharge

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For the

Mississippi Canyon 252 Trustees

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Summary

This document presents an assessment plan (Plan) for juvenile sea turtles in *Sargassum*. The Plan specifically addresses the following topics:

I. **Approach and rationale.** This section describes the overall purpose of and need for a *Sargassum* sampling plan. Since time is of essence, this plan is drafted as a study to be initiated in 2010 and continued into 2011 to focus on juvenile sea turtles in *Sargassum*.

II. **Data needs and sources.** This section provides an overview of the types of data that will be needed to complete the assessment of *Sargassum* and of juvenile turtles associated with these *Sargassum* communities.

III. **Health and Safety.** This section summarizes health and safety protocols that are relevant to this effort. It includes a number of procedures by reference, all of which should be carefully reviewed and adhered to by all team members.

IV. **Site selection strategy.** This section describes a proposed approach to identify sites for evaluation.

V. **Site procedures.** This section provides guidance on what to do with the samples and data gathered during the course of the day. This section makes frequent reference to protocols within this document and also to NRDA-wide procedures that are incorporated by reference. Field team members should make sure they understand and adhere to all procedures, whether included here directly or by reference.

VI. **Detailed Standard Operating Protocols (SOPs).** This section sets forth the standard operating procedures (SOPs) proposed for use during the study. It includes specific datasheets/forms to be completed by researchers and/or references appropriate case-wide protocols and forms.

I. Approach and rationale

Floating *Sargassum* is a key oceanic habitat that may have been impacted by the release of MC 252 oil and dispersants (hereafter referred to as "MC 252 oil"). *Sargassum* patches in the Gulf of Mexico are formed by the convergence and aggregation of two species of brown algae: *Sargassum natans* and *S. fluitans*. The Gulf of Mexico region may be the second most productive *Sargassum* system in the world (Gower and King 2008). The pelagic brown algae is an oasis in the open ocean that supports an assemblage of marine fish and invertebrates.

Because *Sargassum* patches (which may be mats, clumps, or convergence lines) are found in the neuston (floating surface layer of organisms), these habitats and associated fauna were and may still be potentially at risk of exposure to surface oil, sheens, and chemical dispersants introduced as a result of the MC 252 discharge. Although shipboard observation of *Sargassum* patches can be traced back centuries, little is known about the life history and ecology of floating *Sargassum* patches. Until recently, it was assumed that *Sargassum* originated in the Central North Atlantic Ocean and was advected to the Northern Gulf of Mexico (nGOM) by surface winds and ocean currents (SAFMC 2002). Recently, scientists examining satellite imagery have questioned this theory and proposed that the opposite pattern occurs, i.e. *Sargassum* originates in the nGOM and is advected to the North Atlantic (Gower and King 2008). Given that floating *Sargassum* plants may live for two years or more and the nGOM may be a nursery for the algae, the effects of the MC 252 oil may potentially extend beyond the nGOM.

Sargassum natans is far more abundant than *S. fluitans*, comprising up to 90% of the total global drift macroalgae. Limited quantities of several other benthic species, including *S. filipendula, S. hystrix, S. polycertium, S. platycarpum,* and *S. pteropleuron*, detached from coastal areas during storms, are also frequently encountered adrift. However, the drifting fragments of these benthic species soon perish (SAFMC 2002). The pelagic species are golden to brownish in color and typically 20 to 80 cm in diameter. *Sargassum* has a complex morphology in which the thallus branches into stripe-bearing leaf-like appendages (fronds) and gas-bladders resembling berries (pneumatocysts) (see Figure 1). Gametes are produced on special branches called "receptacles." These, in turn, have pits termed "conceptacles" in which the ova or sperm are produced. Propagation is achieved predominantly via vegetative fragmentation. As *Sargassum* ages, the plant darkens, the fronds become heavily encrusted with a variety of life forms, and eventually, density exceeds the buoyancy provided by the *Sargassum's* gas bladders, and the algae begins to sink.

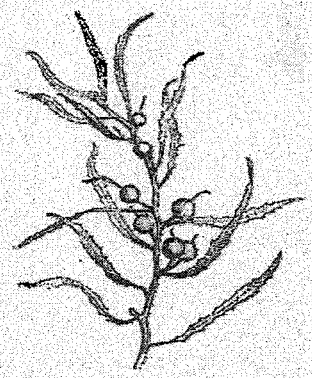

Figure 1. Diagram of *Sargassum natans*.

Floating *Sargassum* patches are an important habitat for a variety of invertebrate and vertebrate species. In particular, *Sargassum* patches are a key nursery habitat for four of the species of sea turtles that inhabit the Gulf of Mexico: loggerhead (*Caretta caretta*), green

(*Chelonia mydas*), Kemp's ridley (*Lepidochelys kempii),* and hawksbill (*Eretmochelys imbricata*). As *Sargassum* clumps and mats are concentrated in the nGOM, these neustonic habitats and associated fauna may have been potentially exposed to surface oil, sheens, and chemical dispersants introduced as a result of the MC 252 discharge. It is anticipated that the overall evaluation of *Sargassum* will include invertebrates and fish of several life stages, however this plan is designed to only address juvenile sea turtles and *Sargassum*.

The main objectives of this study plan are to:

(1) Determine the areal extent and distribution of *Sargassum* in the north-central and eastern Gulf of Mexico, and its spatial relationship to previously observed surface oil and dispersants associated with the MC 252 discharge via aerial surveys; and

(2) Document the density, condition, diet, and potential MC 252 oil exposure of pelagic neonate sea turtles associated with floating *Sargassum* in the north-central and eastern Gulf of Mexico, and along the southeast coast of Florida.

Timeline

The trustees and BP Exploration & Production, Inc. ("BP") intend to conduct, and BP agrees to fund, 8 sampling events extending into 2011, and it is anticipated that up to 2 of these sampling events will be completed during 2010. The timing, frequency, type, and locations of turtle surveys to be completed in 2011 will be based on the observed conditions of *Sargassum* in the spring and early summer of 2011, as well as the seasonal distribution and movements of *Sargassum* across the study area. In addition, the results of the 2010 sampling efforts will be used to evaluate whether any changes in approach are warranted for the 2011 surveys. Any changes in approach will be documented in an addendum to this plan and agreed upon by BP and the trustees. The trustees will submit a budget for the sampling events to be conducted in 2011 as an addendum to this plan.

Study Area

Principal study components of this proposal currently focus on areas potentially impacted by MC 252 oil east of the Mississippi River Delta and extend to locations along the Florida Panhandle, and to areas off the shore of Florida where pelagic, neonate sea turtles occur. As noted above, scientists have recently proposed that *Sargassum* originates in the nGOM and is then advected to the North Atlantic (Gower and King 2008). Given this new understanding of *Sargassum's* possible pattern of movement, *Sargassum* that potentially came in contact with MC 252 oil may move through the Florida Keys, and toward the Atlantic coast of Florida via the northern Loop Current (which moves through the GOM and into the Atlantic Ocean). For this reason, the study area for turtles is expanded to the eastern GOM (off Sarasota County, FL) and along the southeast coast of Florida (off Brevard County, FL). The Brevard County, FL area may be oceanographically closer to the northern Loop Current than the Sarasota area, making it an appropriate area to examine for *Sargassum* patches that may have originated in the nGOM. Even if a *Sargassum* patch may no longer be showing visual signs of MC 252 oil exposure,

Sargassum patches and associated fauna, including post-hatchling sea turtles, encountered in these areas may still have been exposed to and potentially injured by MC 252 oil.

This turtle study targets these two areas in Florida because their densely nested beaches maximize the probability of encountering post-hatchling sea turtles. Brevard County has the highest density of loggerhead sea turtle nesting in the Western hemisphere, and Sarasota County has the highest density of sea turtle nesting on the gulf coast of Florida. Choosing sites in Sarasota and Brevard County is based on conservative assumptions about where sequestered MC 252 oil might have occurred for post-hatchlings to potentially ingest before or after becoming a part of a *Sargassum* patch. Failure to survey both sites may exclude observations of potentially exposed post-hatchling sea turtles.

The purpose of the Plan is to collect data to evaluate potential injury based on a surface floating community's potential risk of MC 252 oil exposure. The study design is intended to be sufficiently robust to support possible future empirical or modeling-based injury assessment approaches.

II. Data Needs and Sources

A. Aerial estimates of *Sargassum* distribution (Objective 1).

Aerial surveys are commonly used to assess the abundance of surface-occurring marine fauna (Craig and Reynolds 2004; Houghton et al. 2006). *Sargassum* aggregations are easily seen from the air during calm weather. Aerial surveys will be used to determine the location of *Sargassum* patches in standardized survey grids. A systematic sample of equally spaced parallel transect lines (or strip transects) will be adopted and flown to determine the location of *Sargassum* patches (see section VI for details). Figure 2 is included as an illustration of the type of transects being proposed for the current study. It depicts an example of a series of the type of transects this study will employ that are being flown weekly in the northeastern GOM from the Chandeleur Islands to the Alabama/Florida state line with the support of a National Science Foundation (NSF) sponsored grant (S. Powers, U. South Alabama, unpublished data).

This aerial survey is designed to include eight equally spaced transects that cover a total of 2000 square nautical miles (NM^2). A total of four grids have been identified to represent a range of potential oiling conditions (Figure 3). These four survey grids are located in the GOM extending between Louisiana and the east coast of Florida, specifically off of Venice, LA; Pensacola, FL; Sarasota, FL along the southwest coast of Florida, and offshore of Brevard County, FL along the southeast coast of Florida. *Sargassum* patches found off of Venice, LA are anticipated to have had a higher likelihood of encountering MC 252 oil than those found off of Sarasota and Brevard County, FL. *Sargassum* patches found off Pensacola are anticipated to fall between the others in terms of potential for having encountered MC 252 oil. However, a quantitative measure of MC 252 oil exposure will be determined during each sampling event based on visual evidence at sea and contaminant analyses of turtle carapace wipes and analytical data generated from collected plant material and turtle biological samples.

Sargassum Locations

To direct ship-based sampling efforts, aerial grid surveys will be flown the day prior to the day of ship-based sampling. To the extent possible, aerial observers will photograph all *Sargassum* patches in the grid (e.g., see Figure 4), and the distance off transect to each target will be estimated using a digital inclinometer. Off transect distances and aerial line transect methodology will be used to estimate total number (or density) of potential targets in the study grid. Off transect distances in combination with the altitude of the aircraft and angle at which the patch was photographed will be used to estimate the sizes of all *Sargassum* patches that are potential targets for boat-based sampling. Using estimated density and average target size, the total extent (hectares) of *Sargassum* in the grid will be estimated.

Data necessary to estimate sightability (probability of detection) of *Sargassum* patches from the air will be collected on all flights. These data will consist of detection events made by two independent observers, a data recorder, and the associated off-transect distance associated with each sighted target. Each observer will focus on his/her side of the aircraft, and a data recorder will serve as an additional observer to assess the probability of detecting *Sargassum* patches. When the data recorder has an opportunity to look for *Sargassum* targets on a specific side of the plane, the recorder and the regular observer on that same side of the aircraft will not communicate a target sighting until both have had ample opportunity to detect it. The number of targets observed by the data recorder and also observed by the regular observer will form the basis of an estimate of sightability. Estimates of abundance and density of *Sargassum* will then be corrected for reduced distance-sightability and inherent observer sightability using standard distance sampling analyses.

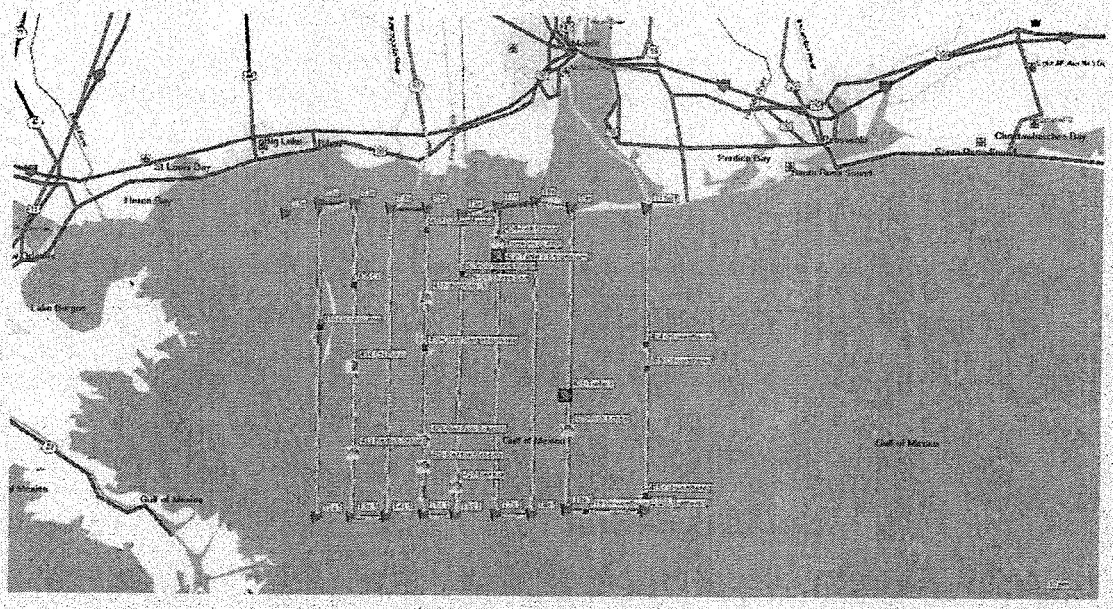

Figure 2. Aerial surveys flown on June 10, 2010. Similar systematic surveys will provide information on *Sargassum* distribution as well as other fauna (source S.P. Powers unpublished data).

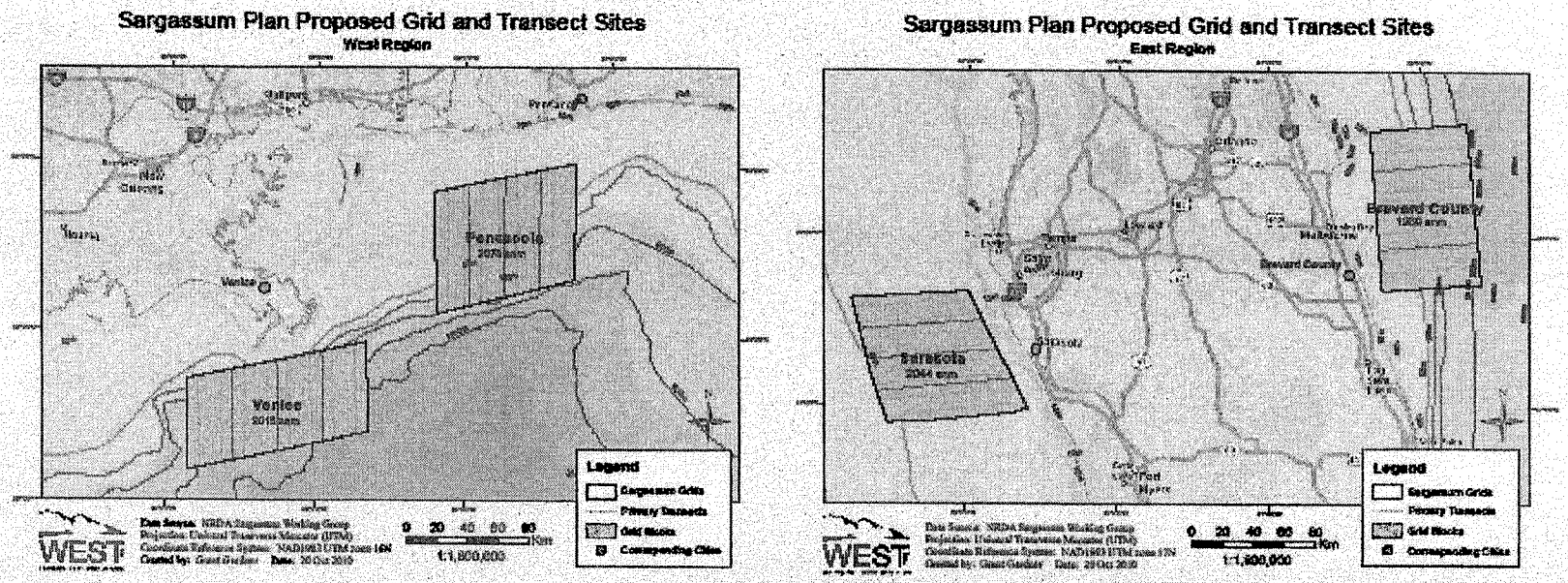

Figure 3 Four Turtle Sampling Grids (a) West Region: Venice, LA; Pensacola, FL; (b) East Region: Sarasota, FL and Brevard County, FL..

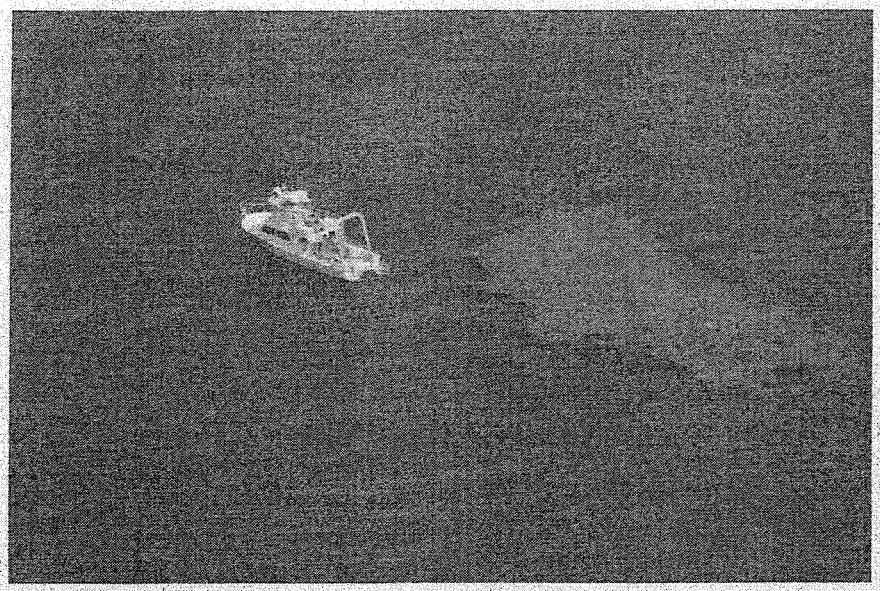

Figure 4. Ship-based sampling of *Sargassum* mats identified by aerial surveys.

B. Sea Turtle Surveys (Objective 2)

Aerial identification of *Sargassum* is a means of locating juvenile turtles (see (1) below). Turtle surveys will be conducted in four survey grids located offshore of Venice, LA; and Pensacola, Sarasota, and Brevard County, FL. See section VI for site selection details. This Plan does not specifically include assessment of large sea turtles (>35 cm) or marine mammals which are being studied through other NRDA plans. The sampling program is designed to obtain samples at three types or classes of *Sargassum* patches: mats, clumps, and convergent lines. Following the aerial surveys, a number of potential sampling targets will be identified and subsequently classified as mats, clumps, or convergent lines of *Sargassum*. Within the aforementioned testing sites, the following will be accomplished:

(1) Sea Turtle Surveys

On 28 April 2010, the NOAA Southeast Fisheries Science Center (SEFSC) initiated a series of aerial surveys to assess the marine mammal and sea turtle species occurring within aquatic areas that could be affected by MC 252 oil. These survey observations likely detect only those sea turtles that have carapace length greater than 35 cm. The aerial survey data collected to date has demonstrated the presence of 3 of the 5 sea turtle species known to inhabit the GOM: loggerhead, Kemp's ridley, and leatherback sea turtles. The spill region, however, is known to contain juvenile, pelagic-stage sea turtles of four species: loggerhead sea turtles, green turtles, Kemp's ridley turtles, and hawksbill turtles (Witherington and Hirama 2006 & 2010, FWC

2008). Most of the young turtles are 25 cm or smaller in carapace length and are not easily visible from aircraft. However, these turtles are associated with pelagic *Sargassum* patches, and spend the majority of their time at the surface (FWC 2008). Therefore, aerial identification of *Sargassum* is a reliable means of locating juvenile turtles. During the summer hatching season on Gulf and Atlantic beaches (July through November), *Sargassum* patches in shelf waters typically contain post-hatchling loggerheads (Witherington 2002), and post-hatchling green turtles (FWC 2008).

On 17 May 2010, the Florida Fish and Wildlife Commission (FWC), in conjunction with other government agencies within the Unified Command, initiated the capture of oiled sea turtles inhabiting pelagic *Sargassum* patches near the *Deepwater Horizon* wellhead. As of 10 July 2010, 138 pelagic juveniles had been captured, representing four species—Kemp's ridley, green turtle, loggerhead, and hawksbill (listed in order of prevalence).

This Plan component is designed to augment the aerial and on-shore sea turtle surveys by conducting at-sea capture of sea turtles to estimate turtle density (see Site Procedures section) over large areas. The turtles targeted are pelagic juveniles and post-hatchlings. Following aerial surveys, all *Sargasum* patches observed in a grid will be classified as mats, clumps, or convergent lines and a target area within the grid will be identified for sampling. At-sea sampling of turtles will occur from a ship running along one or more transects through the targeted *Sargassum*. The subject transect will follow or parallel the long axis of the selected *Sargassum* patches found within the target area. Observers located on the ship will record positions of all turtles observed along the transect line and each turtle's perpendicular distance from the transect. These observations will be analyzed in one of several ways, such as by the use of Distance 6.0, a program (Thomas et al. 2010) for calculating detectability, effective transect strip width, and turtle density using the distances recorded by observers (see Section V - Site Procedures). Turtles observed along the transect centerline will be collected using long-handled dip-nets after the distance off transect at which the turtle was sighted is recorded. Dietary sampling and detection of external and ingested petroleum, if any, will be performed by competent individuals trained in turtle handling techniques. The research team will possess all applicable and required state and federal permits to implement this Plan.

If any member of a threatened or endangered species shows signs of recent oiling (s)he will be transported immediately to port and an appropriate rehabilitation facility. Arrangements for transportation, and with such facilities for each port, will be completed before each sampling event.

(2) Contaminant analyses

A suite of contaminant analyses will be performed on samples from turtle biological samples and plants collected during the study. Specifically, two replicate samples of tissue (75 g each) will be collected from *Sargassum* plants at each patch sampled and preserved at -20°C for subsequent contaminant analyses. *Sargassum* tissue will be analyzed for hydrocarbons (including PAHs), weathered oil components, and other compounds that may help identify the source of any petroleum products. Forensic fingerprint analysis will be conducted on any oiled *Sargassum* collected, unless such an analysis is not technically feasible. Turtle biological

samples will consist of carapace swabs, esophageal lavage, and fecal sampling. Analyses of these samples will be addressed by a separate plan.

III. Health and Safety

- The team leader and field crew parties shall have completed all applicable health and safety training as directed by NOAA or state agency oil spill policy.

- All field team members must complete the NOAA safety training and documentation requirements as set forth in "Safety Requirements for All Personnel Working on NOAA-led NRDA teams for MS Canyon 252 Incident" (NOAA Safety Documentation Requirements.doc).

- All field team members should read all of the documents in the Safety directory on the case's ftp site [redacted] Exception: if a specific team's site collection activities do not include use of either a boat or an aircraft, then familiarity with the safety documents for these vehicles is not required.

- Each field team must submit a plan, not later than the night prior to going into the field. This plan must specify:
  - The team leader;
  - Names of all team members;
  - The sampling location(s)
  - What kind of sampling they are doing;
  - Expected arrival time at sampling area (daily);
  - Expected departure from sampling area (daily);
  - Team deployment date;
  - Team return date.

  This information may be reported in one of two ways:
  1. By filling out the Excel spreadsheet "Team Member Information Form – Excel.xls"[i] and send it to [redacted] Please use one tab for each team.
  2. If this spreadsheet cannot be submitted electronically, the information can be reported by telephone using this number: [redacted]

- Field teams must adhere to all procedures set forth in the MC 252 Site Safety Plan ("NRDA MC 252 Site Safety Plan_5.13.10.pdf").[ii]

[i] This file is available on the case's ftp site: [redacted]
[ii] This file is available on the case's ftp site: [redacted]

IV. Site Selection Strategy

An important characteristic of sites selected for sampling as proposed in this work plan is that they encompass a continuum of potential oiling exposure levels for subsequent analysis, and it is anticipated that the following approach will accomplish this. Therefore, in selecting the location of survey grids, it was desirable to include regions that, when examined as a whole, might compose a gradient of potential oiling. Thus, for planning purposes, it is assumed that *Sargassum* patches found off Venice, LA will have a higher likelihood of encountering MC 252 oil than those patches found off of Sarasota and Brevard County, FL. Pensacola, FL is anticipated to fall between these sites in potential for having encountered MC 252 oil. A measure of MC 252 oil exposure will be determined for each sampling event based on both visual evidence at sea and contaminant analyses of collected material.

The day prior to planned boat sampling trips, aerial surveys of the subject grids will be conducted. Aerial grid surveys will be conducted for each of the four areas: Venice, LA; and Pensacola, Sarasota, and Brevard County, FL. During aerial surveys, fixed transect lines will be flown over the grid and sufficient data (e.g., off transect distances, size class, type, etc.) will be collected to allow estimation of *Sargassum* patch density. All sighted patches will be classified and typed as either mats, clumps (isolated, small aggregations of algae floating at the surface not aggregated into distinct lines or mats), or convergence lines. Following aerial surveys, the observed *Sargassum* patches will be plotted on a set of four survey blocks superimposed on the grid (see Figure 3). For each of the survey blocks within the grid, the number of types of *Sargassum* patches found (i.e., mats, clumps, and convergence lines) will be computed. For example, if two types of *Sargassum* patches were spotted in a particular survey block, the count for that block would be 2. Possible counts are 3, 2, 1, and 0. The list of 4 survey blocks for the grid will be sorted by number of *Sargassum* types present. To maximize efficiency of sampling in the field, boats will target those blocks with the most sighted types and suitable patches of *Sargassum*. If two or more blocks tie for the highest numbers, one block from those with the same number will be chosen at random.

This information will be given to the planning staff so the ship-based surveys the following day can be directed to the selected sampling grid and the chosen block. Ship-based surveys will begin at the center point of the pre-selected block. The aircraft will join the effort and will rendezvous with the ship at the designated center point. The aircraft will then proceed to work in coordination with the ship and direct it to *Sargassum* patches for sampling. Working in coordination generally means the aircraft will direct the ship to the *Sargassum* patch that it deems nearest the current position of the ship and that is of sufficient size to allow sampling. If all three types of patches are not available to sample within a grid, the field team may choose to sample more than one patch of the same type of *Sargassum*.

Two surveys within each grid will occur during 2010, weather permitting. This 2010 sampling will be terminated when the *Sargassum* abundance is determined to be too low for cost-effective data collection or when sampling conditions become seasonally unfavorable. Based on an evaluation of the 2010 sampling efforts, it will be determine whether any changes in approach are warranted for surveys that will be re-initiated in 2011. The total number of

Sargassum patches sampled during 2010 is anticipated to be up to 24 (=1 patch/class × 3 classes/grid × 4 grids × 2 sampling events).

V. Site Procedures

This Plan has three sampling elements: (1) aerial survey assessment of distribution of *Sargassum* (2) collection of *Sargassum* plants for contaminant analyses, and (3) sea turtle capture and release in order to assess condition, diet, and potential MC 252 oil exposure. The metrics associated with these sampling elements 1-3 are detailed below in Table 1. Table 1 also summarizes the number of samples anticipated to be collected during the eight agreed upon sampling events extending into 2011.

Table 1: Summary of metrics and number of samples anticipated to be collected in 2010 and 2011

Study Component	Metric	Method	Replicates	# of patches sampled*	# of samples
Areal estimates	Coverage	Aerial surveys	Eight transects in each of the four grids and vessel guidance on the day of the survey	Dependent on field conditions	N/A
Contaminant Analyses	Concentration	Collection of plants	75 g of *Sargassum* plants at each patch in each grid - up to 6 samples per grid (generally two per *Sargassum* patch) Turtle samples - esophageal lavage, fecal samples, carapace swabs	up to 96	up to 192 (=3 patches x 4 grids x 8 events x 2 sampling replicates) *Sargassum* samples.

					~1440 Turtles, assuming an average of 5 turtles in each patch (480 turtles) and 3 different samples per turtle
Sea Turtles	Density and size frequency	Dip net collection and visual counts for species and oiling	Species identification, oiling observations, medicals, tagging	up to 96	~480 Turtles, assuming average of 5 turtles in each patch
Turtle and *Sargassum* sampling will be conducted at 4 grids, with 3 *Sargassum* classes targeted in each. The full study will include 8 sampling events at each of the 4 grids, a total of 96 *Sargassum* patches will be sampled for each arm of the study (8 x 3 x 4). Note that the initial (2010) sampling will take place as weather and sea conditions permit through November.					

VI. SOPs†

†Forms will be compiled by the PIs of the turtle arm

A. Aerial Surveys for Sargassum abundance

Typically, an aircraft will survey one of the grids shown in Figure 3 the day before each boat-based survey within a grid is initiated. Each grid will consist of eight linear transects spaced at equal intervals (~20 NM); this pattern will cover approximately1600 NM^2. Observers in the survey aircraft will photograph *Sargassum* accumulations, record information sufficient to estimate initial sighting distance off the transect being flown (e.g., inclinometer reading, altitude, and GPS waypoint), and assign each patch to one of three qualitative classes—scattered clumps, mats, or convergence lines.

B. *Sargassum Sampling*

Following the aerial surveys, ships will proceed to the center point of the block within the grid selected based on the results of the aerial survey observations (a process described above in Section IV -- Site Selection Strategy). The day after the aerial survey, the plane and ship will attempt to rendezvous at the designated center point and proceed to work in coordination to

identify and sample three *Sargassum* patches, ideally one of each type – mats, clumps, and convergence lines. At each of the three *Sargassum* patches, ship-based observers will record dimensions or perimeter coordinates of the patch(es). Scattered clumps will be measured in diameter by recording GPS tracks along two bearings at right angles to each other. Mats will be measured using the method described above or using a digital inclinometer and known observer height. Length and width of convergence lines will be obtained using a GPS-measured track. The weight of *Sargassum* sampled, its condition (extent to which it is weathered), and potential MC 252 oiling evidence will be recorded. Up to 6 samples of *Sargassum* (75 g each) will be collected from each grid. Samples will be stored in aluminum foil on ice for no more than 48 hours after sample collection, at which point they must be frozen at -20°C for analysis at a later date.

C. Sea Turtles

Sea turtle surveys will be conducted offshore in four sampling grids—Venice, LA; Pensacola, Sarasota, and Brevard County, FL. Each of these locations has a record of pelagic juvenile sea turtle captures. Surveys will be conducted using trained observers.

Following the aerial surveys, ships conducting the turtle survey work will proceed to the center point of the block within the grid selected based on the results of the aerial survey observations (as described above in Section IV -- Site Selection Strategy). The turtle survey ships will work in coordination with aircraft.

At-sea sampling of turtles within a grid will occur from a ship conducting a visual search along one or more lines that transects each target identified by air support. Each line transect will be parallel to the long axis of the target *Sargassum* patch, with the search direction (e.g., to the right or to the left of the vessel position from where the target is first encountered) determined by a coin toss. Transect lines through scattered *Sargassum* will pass through the densest patches (assessed visually by trained observers). For each turtle encountered, observers will record the position of the turtle along the transect line and each turtle's perpendicular distance from the transect line. These data will be analyzed by one of several methods, such as using a model that incorporates these distances (the program Distance 6.0) to calculate detectability, effective transect strip width, and turtle density (Thomas et al. 2010).

Observed turtles will be captured using long-handled dip nets. Turtles will be captured, measured, examined, tagged (PIT and flipper tags), and released. Examinations will include external swabs for detection of MC 252 oil, an oral examination (and swabs, if necessary) for tar, and an esophageal lavage followed by collection of feces, taking advantage of the gastrocolic response to lavage. Diet items will be identified and any suspected MC 252 oil will be sampled. Swab, lavage and fecal samples will be collected using methods that include measures to prevent sample contamination. If any captured turtles are not vigorous or are within visually MC 252 oiled habitat, they will be captured, measured, examined, and immediately transported to the closest rehabilitation facility in accordance with procedures established prior to each sampling trip. The capture and handling of all turtles will be conducted by competent and trained

biologists in compliance with the research team's state and federal permits authorizing the research activities

For planning purposes, up to two days are allowed to complete the boat-based turtle sampling activities at up to three *Sargassum* patches within a grid. One additional day (per grid) will be required to accommodate aerial surveys of the grids. All of the sea turtle surveys will be conducted by InWater Research Group, Inc with ENTRIX representatives on the boat to assist in the *Sargassum* collection and turtle observations/counts.

Data Handling and Sharing

MC 252 NRDA chain-of-custody procedures will be observed at all times for all NRDA samples. All samples will be transferred with appropriate chain-of-custody forms.

All field and laboratory data will be collected, managed and stored in accordance with written SOPs. The appropriate training on particular equipment or in the conduct of specific field studies for all personnel involved with the project shall be documented and those records shall be kept on file for the duration of this project.

Each laboratory shall simultaneously deliver raw data, including all necessary metadata, generated as part of this work plan as a Laboratory Analytical Data Package (LADP) to the trustee Data Management Team (DMT), the Louisiana Oil Spill Coordinator's Office (LOSCO) on behalf of the State of Louisiana and to BP (or ENTRIX on behalf of BP). The electronic data deliverable (EDD) spreadsheet with pre-validated analytical results, which is a component of the complete LADP, will also be delivered to the secure FTP drop box maintained by the trustees' Data Management Team (DMT). Any preliminary data distributed to the DMT shall also be distributed to LOSCO and to BP (or ENTRIX on behalf of BP). Thereafter, the DMT will validate and perform quality assurance/quality control (QA/QC) procedures on the LADP consistent with the authorized Analytical Quality Assurance Plan, after which time the validated/QA/QC'd data shall be made available simultaneously to all trustees and BP (or ENTRIX on behalf of BP). Any questions raised on the validated/QA/QC results shall be handled per the procedures in the Analytical Quality Assurance Plan and the issue and results shall be distributed to all parties. In the interest of maintaining one consistent data set for use by all parties, only the validated/QA/QC'd data set released by the DMT shall be considered the consensus data set. In the interest of maintaining one consistent data set for use by all parties, only the validated/QA/QC'd data set released by the DMT shall be considered the consensus data set. In order to ensure reliability of the consensus data and full review by the parties, no party shall publish consensus data until 7 days after such data has been made available to the parties. Also, the LADP shall not be released by the DMT, LOSCO, BP or ENTRIX prior to validation/QA/QC absent a showing of critical operational need. Should any party show a critical operational need for data prior to validation/QA/QC, any released data will be clearly marked

"preliminary/unvalidated" and will be made available equally to all trustees and to BP (or ENTRIX on behalf of BP).

This plan will be implemented consistent with existing trustee regulations and policies. All applicable state and federal permits will be obtained prior to conducting work. All analytical and non-analytical data will be provided to BP/ENTRIX within a reasonable timeframe. All samples collected pursuant to this plan will be submitted to an NRDA-approved laboratory.

Lead Investigators for Sea Turtle Component:

Dr. Blair Witherington: Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute [redacted]

Dr. Jonathan Gorham: InWater Research Group, Inc., [redacted]

Dr. Michael Bresette: InWater Research Group, Inc. [redacted]

Description of Duties for Lead Investigators

Name	Role
Dr. Blair Witherington Florida Fish and Wildlife Conservation Commission	Lead Investigator for Sea Turtle Component. Responsible for training field staff, development of data-collection protocols.
Dr. Jonathan Gorham InWater Research Group, Inc.	Co-Investigator for Sea Turtle Component. Responsible for procuring equipment, data collection, analyses, and leading report preparation.
Dr. Michael Bresette InWater Research Group, Inc.	Co-Investigator for Sea Turtle Component. Responsible for procuring equipment, data collection, analyses, and leading report preparation.

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Estimated 2010 Budget

Aerial Surveys – Turtles	Unit Cost per month	# months	Total cost
Charter Aircraft	$123,424	1	$123,424
Subtotal			**$123,424**

Inwater Research Budget

Ship Based Surveys – Turtles

Equipment	
Weighing/measuring equipment, subject restraining table	$950
PIT tags and electronic reader (25 tags@$750; 1 reader @$250)	$1,000
Veterinary lavage pumps and tubing, speculum	$350
Sample jars and preservative	$150
Data paper, office supplies	$125
Oil gauze-sampling supplies	$50
Satellite phone minutes	$125
Vessel expenses:	
Chartered vessels (16 days - allowing up to 2 days per grid [including contingency for bad weather] x 4 grids x 2 events @$3,500/day)	$56,000
Equipment Subtotal	**$58,750**

Personnel expenses

4 ports, 4 months each, 2 field-weeks each month and port:
32 field weeks plus prep time

	Rate	hours/month	# months	Total cost
First Crew				
Chief Scientist - [redacted]	[redacted]	[redacted]	[redacted]	$21,090
Research staff - [redacted]	[redacted]	[redacted]	[redacted]	$25,138
Second Crew				
Chief Scientist - [redacted]	[redacted]	[redacted]	[redacted]	$21,090
Research staff - [redacted]	[redacted]	[redacted]	[redacted]	$25,138
Data Analysis and Report Preparation				
Chief Scientist	[redacted]	[redacted]	[redacted]	$1,506
Personnel Subtotal				**$93,962**

Travel

	Rate	Days/Miles	People	Total
Sarasota, FL				
Lodging	$86.00	7	6	$3,612
Meals	$56.00	7	6	$2,352

Mileage	$0.50	750	1	$375
Subtotal				**$6,339**
Sebastian, FL				
Lodging	$99.00	7	6	$4,158
Meals	$51.00	7	6	$2,142
Mileage	$0.50	750	1	$375
Subtotal				**$6,675**
Orange Beach, AL				
Lodging	$101.00	7	6	$4,242
Meals	$51.00	7	6	$2,142
Mileage	$0.50	750	1	$375
Subtotal				**$6,759**
Venice, LA				
Lodging	$131.00	7	6	$5,502
Meals	$71.00	7	6	$2,982
Mileage	$0.50	750	1	$375
Subtotal				**$8,859**
Travel Subtotal				**$28,632**
Total for Ship Based Surveys - Turtles				**$304,768**

The Parties acknowledge that this budget is an estimate and that actual costs may prove to be higher. BP's commitment to fund the costs of this work includes any additional reasonable costs within the scope of this work plan that may arise. The trustees will make a good faith effort to notify BP in advance of any such increased costs.