

**MC252 Deepwater Horizon Oil Spill  
ADCP-Measured Currents Monitoring Plan  
Amended February 26, 2011**

**February 2011 ADCP Maintenance Mission  
HARP Recovery and Maintenance Plan**

**Originated as a requirement by:**

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**Amended plan by:**

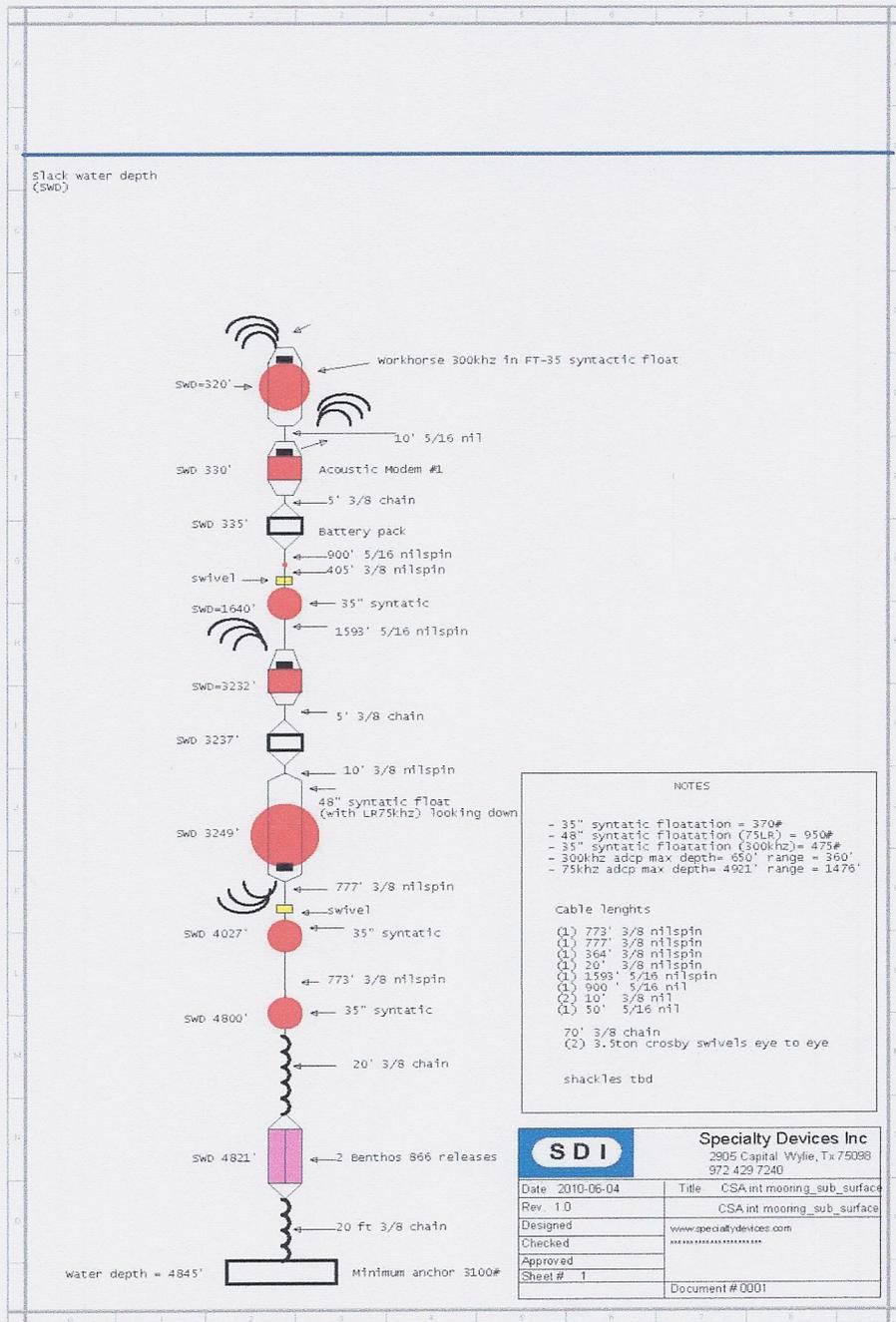
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**Background and Scope of Work**

In June, 2010, an Acoustic Doppler Current Profiler (ADCP) array was installed close to the MC252 well site to provide current direction and speeds at selected depths of the water column in the vicinity of the wellhead oil release area to: (a) improve NRDA water sampling location selections and, (b) refine data inputs into fate and transport models. On 12 June 2010 an ADCP array mooring was deployed at Latitude [REDACTED] Longitude [REDACTED] in a water depth of 1,485 m (approximately [REDACTED] miles west of the MC252 well site).

The ADCP array (Figure 1) includes the following components: two (2) ADCP profilers, two (2) Acoustic Releases (ACR), a series of Acoustic Modems (AMs), and a surface buoy that provides real-time data via satellite link. The two ADCP profilers each include a 75 kHz RDI-Teledyne Long Ranger ADCP mounted at a depth of 997 m facing downward to collect data from the bottom 488 m of the water column and a 300 kHz RDI Workhorse ADCP mounted at a depth of 104 m facing upward to collect data to within approximately 3 m of the surface. The ADCPs are interfaced to the AMs, which provide communications from the ADCPs to the surface buoy and enable the ADCPs to upload data to the surface buoy at regularly scheduled intervals. The acoustic releases are used to remotely release the array from the anchor for recovery. The array components (ADCP, ACR, AM, and Surface Buoy) are powered by battery packs, which require servicing on a 90 – 100 day interval. The February 2011 maintenance mission is described and budgeted in this workplan.

An additional task will be conducted during this February 2011 ADCP maintenance mission to maximize the use of NRDA fleet vessel time while offshore and to support other endeavors related to the DWH incident. This task is to retrieve, service, and redeploy the High-frequency Acoustic Recording Package (HARP) system, an acoustic package installed on the seafloor near the ADCP array and used to monitor marine mammal vocalization. Servicing of the HARP system was also incorporated in the December 2010 ADCP maintenance mission.



**Figure 1 – Schematic illustration of ADCP Array (Surface Buoy not shown)**

This amendment covers the budgetary costs for the ADCP maintenance task, the HARP recovery and deployment task, and ADCP data management from March through June 2011.

### **Purpose**

The initial ADCP single mooring study plan was approved and implemented in June 2010. Following the initial array installation, two amended work plans were developed and approved authorizing the installation of the real-time buoy and the conduction of quarterly maintenance missions. These amended tasks were successfully conducted in September and December of 2010. The following mission is required to repair components of the array and conduct regularly scheduled maintenance (scheduled for February 2011) and extend data collection and management for the period of March 2011 thru June 2011.

In January 2011, data telemetry from the ADCP array indicated a loss of data transmission from the 75 kHz ADCP and a subsequent battery drain on the system. These malfunctions indicate a cable break or water ingress. The repairs are required to ensure instrument and data integrity for both the 300 kHz and 75 kHz ADCPs in the array. During mooring recovery and redeployment, the M/V Wes Bordelon will be used as the main work vessel to recover, repair, and reinstall the ADCP array. A second vessel, the M/V Bunny Bordelon, will be used as a support vessel to assist the main work vessel.

During this February 2011 ADCP maintenance mission, the High-frequency Acoustic Recording Package (HARP) system near the array will also be retrieved, serviced, and redeployed (as was conducted in the December 2010 ADCP mission). The HARP system is an acoustic passive monitoring package installed on the seafloor near the ADCP array as part of the study entitled: "Passive acoustic monitoring for marine mammals in response to the Deepwater Horizon oil spill in the Gulf of Mexico." This study is being conducted under contract to BP by principal investigator John Hildebrand of Scripps Institution of Oceanography to record marine mammal vocalization.

This plan describes the methods that will be used to retrieve and redeploy the ADCP array.

### **Data Management**

All electronic data collected during the maintenance cruise will be saved to an on-board computer and migrated to a dedicated external hard drive of sufficient capacity. The data will be controlled and managed under project protocols, including Chain-of-Custody tracking of the external hard drive and the electronic data it contains. At the end of the maintenance cruise, the external hard drive will be immediately duplicated in full by the NOAA Data Manager, and the original external hard drive will be retained by the trustees along with appropriate documentation. The duplicate hard drive will be retained by Cardno ENTRIX for their records.

If previously-collected data from the ADCP array has not been provided, Cardno ENTRIX shall provide to the Trustees a copy of the raw data, including all necessary metadata, collected by the ADCP array. Cardno ENTRIX makes no representation as to the accuracy, usability, or validity of the raw data provided to the Trustees because the data has not been subject to QA/QC review.

Additionally, following the cruise activity in which the system will be repaired and serviced, daily transmission of the ADCP-collected data will be resumed. The telemetered data logger

packets are sent hourly as a binary file via iridium satellite link to a CSA email address. These individual binary files for a given 24-hour period will be combined by CSA into a large data file for monthly distribution via DVD to both Trustees and Cardno ENTRIX. Note that telemetered data from each ADCP is received via satellite on an hourly basis; the data is broadcast at 15 minutes past each hour for the 300kHz ADCP and at 45 minutes past the hour for the 75kHz meter. These data transmittals can be interrupted due to sea state and atmospheric conditions and can be limited to a minimum of one hour or longer based on weather conditions on site. Therefore the telemetered data can have data gaps. However, the raw data is not compromised internally and the full data set will be collected and provided when the ADCP meter is downloaded either via acoustic modem or during the quarterly ADCP maintenance cruises. The data collected via telemetry can be viewed and processed with the data gaps but the data will be for draft and visual use only and will be identified as such when presented to specified data managers. The full set of raw data collected via acoustic modem or during the quarterly ADCP maintenance cruises will be provided to Cardno ENTRIX and the Trustees as described above.

## **ADCP Array Recovery and Redeployment**

### ***Vessel Mobilization and Mission***

The vessels being utilized for this project will be the M/V Wes Bordelon for principal operations and the M/V Bunny Bordelon for support. The M/V Wes Bordelon will be the main recovery and redeployment platform. The mission of the M/V Bunny Bordelon will be to act as a safety vessel during the array recovery operation and a chase boat during the redeployment of the array mooring.

During recovery operations, the M/V Bunny Bordelon will stand off at a predetermined distance and bearing (to be determined based on wind and current direction). The M/V Bunny Bordelon will be prepared to aid in the recovery of the array or take over the actual recovery in the event of M/V Wes Bordelon engine or mechanical failure. During the recovery and redeployment of the mooring, the M/V Bunny Bordelon will follow the array as it is deployed from the stern of the M/V Wes Bordelon and help maintain a two (2) nautical mile (Nm) Closest Point of Approach (CPA) and intercept any vessels not responding to radio contact attempts.

Mobilization will be conducted in two phases. The first phase involves installation of the following equipment and systems required for the recovery and deployment of the ADCP array mooring:

- Winch and hydraulic power unit (HPU)
- Air winch
- Compressors
- Generator
- Installation of navigation system
- Miscellaneous hand tools and supplies

The second phase of the vessel mobilization involves the loading and preparation of the various offshore spar telemetry buoy and array mooring components aboard the M/V Wes Bordelon.

Preparation activities will include organizing and securing array components as well as final testing of telemetry communications protocols prior to departing the dock.

During the vessel mobilization phase of the operation, CSA senior staff will communicate with SIMOPS personnel to establish operational parameters and communications protocols required during the recovery and subsequent deployment of the ADCP array mooring. Additionally, protocols and limitations will be established relative to the various frequencies, which will be utilized during the various phases of the ADCP array mooring recovery and deployment.

#### ***ADCP Array Mooring Recovery Sequence***

- 1) Safety brief and recovery plan with ship crew and previously established communications protocols with SIMOPS.
- 2) Approach ADCP array mooring, no closer than 200m. All recovery gear and hardware will be prepared and ready for array recovery.
- 3) Confirm with SIMOPS that the recovery vessels are in the vicinity of the mooring and are preparing to release the ACRs and recover the array.
- 4) Trigger Acoustic Releases (ACRs). At this point the uppermost ADCP/float will reach the surface within 30-40 seconds, with the second buoy reaching the surface approximately 1 minute later. Based on the location of the second buoy relative to the location of the first buoy, the recovery team will be able to ascertain the safest approach to the first buoy for recovery.
- 5) The recovery vessel will approach the first buoy (stern to) and a weighted tow line will be attached to the buoy and then immediately the recovery vessel will make way away from the Incident Site. SIMOPS will be informed of the direction the recovery vessel will tow the array and the anticipated position where the recovery vessel will stop and switch the tow line to the opposite end of the array (the array is recovered by spooling from bottom to top).
- 6) Once the tow line is switched to the bottom end of the array the recovery vessel will begin the actual recovery of the array while making way at idle speed. During this process the M/V Bunny Bordelon will maintain a two (2) mile CPA.
- 7) It is estimated that it will take approximately 24 hours to service the instruments and to re-install the satellite telemetry and spar buoy.

#### ***ADCP Array Deployment Sequence***

- 1) Safety brief and deployment plan with ship crew and previously established communications protocols with SIMOPS. Communications with SIMOPS will be maintained throughout this phase of the operation. The M/V Bunny Bordelon will act as chase/safety vessel and assist in maintaining a two (2) mile CPA.

- 2) Conduct bathymetry survey to confirm consistent water depth within a 100 meter radius of the planned ADCP mooring site adjust deployment site coordinates if necessary.
- 3) Assess ship drift (determine current direction and velocity).
- 4) Plot starting point (this distance will vary depending on current direction & speed) which could be as much a 5 nautical miles from the deployment site.
- 5) Transit to start position.
- 6) Begin deployment (deploy top float for 300 kHz ADCP).
- 7) Continue at a maximum speed of 2.5 knots toward the target, paying out cable.
- 8) Place ship engines in and out of gear to minimize cable tension while paying out cable and deploying floats.
- 9) After all floats and cable deployed, secure mooring for towing (add safety lines and ensure releases are stretched out over the stern).
- 10) Continue to tow array towards deployment site.
- 11) At 5 minutes to deployment site, remove all extra tow lines, leaving one slip line.
- 12) Tow past target to allow for pull back of mooring in water column (pre-determined length).
- 13) Deploy anchors.
- 14) Mark position.
- 15) After mooring reaches the bottom, triangulate position using acoustic releases (accurate deployment position and depth) and SDI supplied software.

#### ***Acoustic Instruments, Estimated Duration, and Frequencies***

Note: SIMOPS will be notified prior to initiation of any acoustic activity

- Furuno depth sounder – 30 min at 15 kHz (redeployment only)
- Acoustic releases – 1 min at 12 kHz – 14 kHz (recovery only)
- Set up and test of 300 kHz ADCP – 1 hr at 18 kHz – 24 kHz (redeployment only)
- Set up and test of 75 kHz ADCP – 1 hr at 18 kHz – 24 kHz (redeployment only)

#### ***Additional Safety Notes***

- Only essential personnel will be allowed on deck.

- Navigation will be coordinate with the bridge (speed of vessel, course etc).
- Communications will be in place for deck, navigation, and bridge.
- Standard safety items, hard hat, work vests, steel toe boots.
- Areas on deck that will be deemed off limits are clearly marked (safety brief)

### **HARP Recovery, Servicing, and Redeployment**

A Scripps Institution of Oceanography technician will accompany the February 2011 ADCP maintenance mission in order to provide direction and support for the HARP retrieval, servicing (including battery change), and redeployment.

### **Anticipated Schedule (2011)**

Friday 25 - 28 February

- Begin Mobilization

Monday 28 February

- Complete Mob and Depart

Tuesday 1 March

- Begin ADCP array recovery
- 1900 Complete array recovery and proceed to HARPS Station
- 2200 Complete HARPS Recovery

Wed 2 March

- 0600 Servicing and modification complete of the ADCP and HARPS
- 1200 Initiate re-deployment, re-install of ADCP and HARPS arrays
- 2000 System testing

Thursday 3 March

- Complete the Installations
- Head back to Port

Friday 4 March

- 0900 arrive at Houma and demob

Saturday 5 March

- Complete vessel demob

**Estimated Costs**

Budget Chart #1.

Field Survey Costs	Hrs/Days/Trips	Day/Hr Rate	Total
<b>NOAA Labor (days):</b>			
1 Data Manager	█	█	\$7,500
<b>TOTAL</b>			<b>\$7,500</b>

Budget Chart #2.

ADCP Maintenance Missions - Cost Table	Units	Unit Cost \$	Quantity	Total
Mobilization Costs	Quarterly	\$100,800	1	\$100,800
Vessel Costs (incl estimated fuel)	Quarterly	\$308,860	1	\$308,860
CSA Fleet Mgmt / Shore Support	Quarterly	\$16,800	1	\$16,800
<b>Total Estimated Cost</b>				<b>\$426,460</b>

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**Approvals**

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

BP Approval:

<u>Joyce Miley</u>	<u>Joyce Miley</u>	<u>28 Feb 2011</u>
Printed Name	Signature	Date

Federal Trustee Approval:

<u>Tom Moore</u>	<u>Tom Moore</u>	<u>2/28/11</u>
Printed Name	Signature	Date