UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NOAA Marine and Aviation Operations
Marine Operations Center
439 W. York Street
Norfolk, VA 23510-1114

APR 10 2015

MEMORANDUM FOR: Master Donn Pratt, NOAA
Commanding Officer, NOAA Ship *Gordon Gunter*

FROM: FOR Captain Anne K. Lynch, NOAA
Commanding Officer, NOAA Marine Operations Center-Atlantic

SUBJECT: Project Instruction for GU-15-02
Deployment and Recovery of Acoustic Moorings (Transit Leg);
N. Right Whale Survey & Biology

Attached is the final Project Instruction for GU-15-02, Deployment and Recovery of Acoustic Moorings (Transit Leg); N. Right Whale Survey & Biology, which is scheduled aboard NOAA Ship *Gordon Gunter* during the period of April 14 to May 26, 2015. Of the 39 DAS scheduled for this project, 39 DAS are funded by a Line Office allocation. This project is estimated to exhibit a Medium Operational Tempo. Acknowledge receipt of these instructions via e-mail to **OpsMgr.MOA@noaa.gov** at Marine Operations Center-Atlantic.

cc:
MOA1

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northeast Fisheries Science Center
166 Water Street
Woods Hole, MA 02543-1026

APR 10, 2015

Final Project Instructions

Date Submitted: March 17, 2015

Platform: NOAA Ship *Gordon Gunter*

Project Number: GU - 15-02

Project Title: Deployment and Recovery of Acoustic Moorings (Transit leg); N. Right Whale Survey & Biology (legs 1 & 2)

Project Dates: April 14 – May 26, 2015

Approved by: Russell W. Brown for Dated: 3/18/2015
William A. Karp, Ph.D.
Science and Research Director
Northeast Fisheries Science Center

Approved by: Dated: 4/10/15
Captain Anne K. Lynch, NOAA
Commanding Officer
Marine Operations Center – Atlantic

I. Overview

A. Brief Summary and Project Period

B. Days at Sea (DAS)

Of the 39 DAS scheduled for this project, ~~39~~ 0 DAS are funded by an OMAO allocation, 39 ~~0~~ DAS are funded by a Line Office Allocation, _0_ DAS are Program Funded, and _0_ DAS are Other Agency funded. This project is estimated to exhibit a Medium Operational Tempo

C. Operating Area:

During the transit leg, acoustic moorings will be deployed and recovered along the eastern seaboard (Figure 2). During Legs 1 & 2, the operation area will include shelf and shelf-edge waters from Massachusetts eastward into Canadian waters out to Georges Basin and northeastward as far as Browns Bank. The primary survey area will be the Great South Channel and Georges Bank (Figure 1).

D. Summary of Objectives:

During the transit leg, the primary objectives are to deploy four acoustic moorings and recover two moorings. See Appendices for details. During the survey legs 1 & 2, the primary objectives in order of priority are to: 1) Collect photo ID and biopsy samples of baleen whales. Primary target species is North Atlantic right whales. 2) Apply dermal tags to right and sei whales. 3) Conduct oceanographic sampling in proximity to tagged whales. 4) Conduct visual surveys in proximity to autonomous underwater vehicles equipped with passive acoustic instruments. 5) Conduct zooplankton sampling to examine prey sources. 6) Collect right whale fecal samples for hormone analysis. 7) Deployment of sonobuoys near aggregations of right and sei whales. 8) Retrieve acoustic mooring form Browns Bank if it was not recovered during transit leg.

E. Participating Institutions:

Integrated Statistics, Woods Hole, MA

Northeast Fisheries Science Center (NEFSC), Protected Species Branch, Woods Hole, MA

Woods Hole Oceanographic Institution

F. Personnel/Science Party: name, title, gender, affiliation, and nationality

Name (Last, First)	Title	Date Aboard	Date Disembark	Gender	Affiliation	Nationality
Duley, Peter	Chief Scientist	05/01/15	05/26/15	M	NMFS, NEFSC, Woods Hole, MA	U.S.A
Cole, Tim	Marine Mammal specialist	05/01/15	05/12/15	M	NMFS, NEFSC, Woods Hole, MA	U.S.A
Tremblay, Chris	Marine Mammal specialist	05/01/15	05/26/15	M	Integrated Statistics, Woods Hole, MA	U.S.A
	Marine Mammal specialist	05/01/15	05/12/15	F	Integrated Statistics, Woods Hole, MA	U.S.A
Yin, Suzanne	Marine Mammal specialist	05/01/15	05/26/15	F	WHOI, Woods Hole, MA	U.S.A
Johnson, Hansen	Marine Mammal specialist	05/01/15	05/26/15	M	WHOI Woods Hole, MA	U.S.A
Panicker, Divya*	Marine Mammal specialist	05/01/15	05/26/15	F	WHOI, Woods Hole, MA	Citizen of India
Fortune, Sarah*	Marine Mammal specialist	05/01/15	05/26/15	F	WHOI, Woods Hole, MA	Canadian Citizen
Matzen, Eric	Marine Mammal specialist	4/13/15 05/15/15	4/27/15 05/26/15	M	Integrated Statistics, Woods Hole, MA	U.S.A
Accardo, Corey	Marine Mammal specialist	05/15/15	05/26/15	F	Integrated Statistics Woods Hole, MA	U.S.A
Baumgartner, Mark	Marine Mammal specialist	05/01/15	05/26/15	M	WHOI, Woods Hole, MA	U.S.A
Conger, Lisa	Marine Mammal Specialist	05/15/15	05/26/15	F	NMFS, NEFSC Woods Hole, MA	U.S.A

Gatzke, Jenn	Marine Mammal specialist	05/15/15	05/26/15	F	Integrated Statistics Woods Hole, MA	U.S.A
Ganley, Laura	Marine Mammal Specialist	05/01/15	05/12/15	F	Integrated Statistics Woods Hole, MA	U.S.A
Beblowski, Barb	Marine Mammal Specialist	05/01/15	05/12/15	F	Integrated Statistics Woods Hole, MA	U.S.A
Gurnee, Julianne	Marine Mammal Specialist	05/01/15	05/12/15	F	Integrated Statistics Woods Hole,MA	U.S.A
Siddiqui, Sabena	Marine Mammal Specialist	05/15/15	05/26/15	F	Integrated Statistics Woods Hole,MA	U.S.A
Dilliard,Kelly	Teacher at sea	05/15/15	05/26/15		NOAA, Teacher at sea program	U.S.A

*Peter Duley will serve as escort for the foreign nationals listed above

G. Administrative

1. Points of Contacts:

Email Contact: The following should be included as recipients of the daily e-mail message:

Peter.Corkeron@noaa.gov {Large Whale program leader}
Michael.Simpkins@noaa.gov {Protected Species Branch Chief}
Fred.Serchuk@noaa.gov {Acting READ Chief}
Bill.Karp@noaa.gov {Science and Research Director}
Russell.Brown@noaa.gov {Deputy Science and Research Director}
Nathan.Keith@noaa.gov {NEFSC Vessel Coordinator}
Ops.Gordon.Gunter@noaa.gov {Operations Officer – *Gordon Gunter*}
CO.Gordon.Gunter@noaa.gov {Commanding Officer – *Gordon Gunter*}
Michael.S.Abbott@noaa.gov {NEFSC Port Captain}

2. Diplomatic Clearances

This project involves Marine Scientific Research in waters under the jurisdiction of Canada. Diplomatic clearance has been requested by the NEFSC.

3. Licenses and Permits

This project will be conducted under the Marine Mammal Protected Species Permits: #17355 and 16388 (U.S.) AND Foreign Fishing Vessel License: xxx (Canada) {applied for} AND Species at Risk Act permit: # xxx (Canada) {applied for} through The Ministry of Fisheries and Oceans (Canada).

II. Operations

The Chief Scientist is responsible for ensuring the scientific staff are trained in planned operations and are knowledgeable of project objectives and priorities. The Commanding Officer is responsible for ensuring all operations conform to the ship's accepted practices and procedures.

A. Project Itinerary: During the transit from Pascagoula to ~~Woods Hole~~ Newport, RI, the ship will deploy four acoustic moorings, and recover 2 mooorings. The rest of the cruise will take two 12 day legs with port calls in ~~Woods Hole MA.,~~ and Newport RI.

B. Staging and de staging

April 11-13: Load acoustic moorings onto ship in Pascagoula. Embark scientific personnel who will accompany the ship during the transit.

April 14 – 27: Deploy and recover six acoustic moorings while en route between Pascagoula and ~~Woods Hole~~ Newport, RI. See Appendices for details.

April 28 - 30: Off-load two acoustic moorings; load scientific gear for Legs 1 & 2.

May 1: Load any remaining scientific gear, embark scientific personnel and depart ~~Woods Hole Oceanographic dock in Woods Hole MA.~~ Newport, RI.

May 1 - 12: Survey line transects between Great South Channel/Georges Bank/Gulf of Maine as appropriate.

May 12: Dock at NSN. Disembark scientific personnel.

May 15: Embark scientific personnel and depart NSN.

May 15 - 26: Survey line transects between Great South Channel/Georges Bank/Gulf of Maine as appropriate.

May 26: Return to Newport, RI. Disembark scientific personnel, and off-load Scientific equipment and samples.

B. **Operations to be conducted:**

During the transit, operations will be conducted at sites of six acoustic moorings, between the Blake Plateau and Brown's Bank, Canada. Four acoustic moorings will be deployed and two acoustic moorings will be recovered. The locations of these moorings are shown in Figure 2. Mooring diagrams and positions can be found in Appendices 1 & 2. Detailed deployment and recovery instructions can befound in Appendix 3. Eric Matzen, from the NEFSC, will accompany the ship to assist in all deployments and recoveries.

For Legs 1 & 2, primary cruise activities are described below and include: (1) Collecting biopsies and photographs of large whales from a RHIB on all good weather days that whales are present. (2) Apply dermal tags to right and sei whales from a RHIB on all good weather days that whales are present. (3) Deploy vertical profiling package from NOAA Ship *Gordon Gunter* in the trailing path of tagged whales for the duration of the tagging period (24-72 hr). (4) Conduct visual surveys in proximity to autonomous vehicles equipped with passive acoustic instrumentation. (5) Conduct zooplankton tows near whales from the ship and the RHIB. (6) Collect sei and right whale fecal samples for hormone analysis. (7) Deployment of sonobuoys around aggregations of right and sei whales. (8) Retrieval of 1 acoustic mooring located on Browns Bank if that was not conducted during transit leg.

Prior to departure from Woods Hole (and for the duration of the cruise), the chief scientist will consult with the Northeast Fisheries Science Center (NEFSC) aerial survey team to determine locations of concentrations of North Atlantic right whales to be targeted. The WHOI will also have oceanographic gliders in place in the Great South Channel which will aid in our effort to find the target species. If no right whale sightings are available from the aerial survey team, or the gliders *Gordon Gunter* will run a series of transect lines in order to locate concentrations of North Atlantic right whales. In general, small boat operations will be conducted on good weather days when sea state allows, but some good days and many days of moderate sea conditions will be used to conduct visual surveys in proximity to the gliders. Conditions permitting, the vessel will conduct small boat operations when sightings of North Atlantic right whales occur. At the request of the chief scientist and at the Commanding Officer's discretion, the RHIBs will be deployed in order to maximize efforts in good conditions. One RHIB (18'-90hp provided by NEFSC) will focus on photographic identification and biopsy sampling. The other RHIB (15'-70hp provided by Woods Hole Oceanographic Institute (WHOI)) will focus on dermal tagging.

Cruise activities may change from hour-to-hour or day-to-day depending on the sea state, weather, availability of whales, and previous accomplishments. The Chief Scientist and Commanding Officer will discuss the upcoming day's anticipated activities and the conditions under which the day's science plans will change. For example, survey operations may be conducted during the first part of the day, but if the wind and seas calm down and whales have been encountered, the Chief Scientist may request to cease survey operations and deploy the RHIBs to conduct photo-identification, biopsy and tagging operations.

Right whale photo-identification and biopsy: The 18' NEFSC RHIB will be deployed on all fair weather days when right whales are encountered. The NEFSC RHIB will focus on photo identification and biopsy sampling of previously un-sampled right whales and possibly other baleen whales. The NEFSC RHIB will carry a coxswain, photographer, darter and data recorder.

Biopsy sampling will be done with a crossbow which has a 150lbs draw weight. The bolts have a modified tip for extracting a skin and blubber sample. All samples will be processed once scientists are back aboard *Gordon. Gunter*. Skin samples will be fixed in dimethylsulfoxide (DMSO) and blubber samples will be frozen. The NEFSC RHIB will work within a distance of *Gordon. Gunter*, previously agreed upon by the chief scientist and the Commanding Officer. The biopsy effort will be conducted under ESA/MMPA permit #17355issued to NOAA NEFSC.

Right whale dermal tagging: The 15' WHOI RHIB will be deployed on all fair weather days when right whales or sei whales are encountered and when there is no tag currently on a whale. The WHOI RHIB will focus on applying a dermal tag to right or sei whales. The WHOI RHIB will carry a coxswain and a tagger. The tag will be applied on the back of the whale between 1.5 m posterior to the blowholes and 1 m anterior to the peduncle from a distance of 5-10 m using a compressed air launcher. Once the tag is secured to a whale, the WHOI RHIB will be retrieved and the *Gordon. Gunter* will commence oceanographic sampling. The tag is designed to report its GPS location every 10-20 minutes to the *Gordon. Gunter* via an ARGOS satellite-receiving antenna mounted high on the ship's mast. A computer will be set up on or near the bridge that will allow bridge personnel to monitor the location of the tagged whale in real time. Oceanographic sampling will be conducted at stations along the whale's track. The tagging effort will be conducted under ESA/MMPA permit # 16388 issued to Dr. Mark Baumgartner.

Oceanographic sampling: A vertical profiling instrument package (CTD) fitted with equipment to examine prey source and water conditions will be deployed from the *Gordon Gunter* every 15-20 minutes at locations provided by the dermal tag. These operations will continue round-the-clock for the duration that the tag is on the whale: 24-72 hours.

Visual surveys near autonomous vehicles: Two autonomous vehicles (a Slocum electric glider and a wave glider) will be surveying the Great South Channel before, during, and after the cruise. Both gliders are equipped with technology to detect, classify, and report the calls of baleen whales (right, fin, sei, and humpback whales) in near real time. The gliders will be operated by WHOI (Baumgartner). On several occasions during the cruise, the gliders and the *Gordon. Gunter* will rendezvous in an area with whales, and the gliders will hold position together for 24-48 hours. During this same time and during daylight hours, the *Gordon. Gunter* will maintain a position 2 nautical miles "up sun" of the gliders (i.e., with the sun to the stern and the gliders off the bow). 15-minute visual scans will be conducted on the half hour by the marine mammal team. During the scan, the ship's bow will be pointed toward the gliders so that the observers can view a roughly 2-mile radius area around the gliders. After each 15-minute scan, the ship will reposition itself to (1) maintain a 2-mile distance from the gliders, (2) keep the sun to the stern, and (2) keep the bow pointed at the gliders. The position of the autonomous vehicles will be accessible by internet at least every 2 hours to facilitate repositioning the *Gordon Gunter*.

Zooplankton sampling: Zooplankton samples will be collected at times around aggregations of sei and right whale using double or single ring nets outfitted with 150 micron mesh nets. Sampling will occur both from the *G. Gunter* and from the NEFSC RHIB. During photo-identification and biopsy effort, the RHIB will opportunistically collect zooplankton samples in the vicinity of surface feeding sei whales. The RHIB will deploy a small cone net approximately

10 feet off the stern and tow just below the surface for approximately 5 minutes. Samples will be transferred to jars while on the RHIB. All samples will be preserved in a 5% formaldehyde-seawater solution. Formaldehyde will be stored in the fume hood in the chemistry lab of *Gordon Gunter.*

Fecal sampling: During photo-identification and biopsy effort, right and sei whale fecal samples will be opportunistically collected from the NEFSC RHIB using a dip net. Sample jars will be stored in the scientific freezer aboard the *Gordon Gunter.*

Sonabouy deployment near aggregations of right and sei whales: Sonobuoys could be deployed and monitored near aggregations of large whales from the ship. Transmissions from the buoys would be relayed directly to the ship through vhf antenna mounted of the mast. In weather conditions where small boat operations are possible, sonobuoys would be deployed near aggregations of whales from the rhib and photo id and biopsy operations could continue. In both cases (ship deployment and deployment from the rhib) after a recording session is complete, sonobuoys will be retrieved if possible.

Retrieval of the autonomous acoustic hydrophone mooring: Recovery of the mooring is scheduled to take place during the transit leg. However, recovery could take place during Legs 1 or 2 if it is not possible to get to the site during the transit leg. This operation will take place on days when small boats cannot be launched for large whale work. The autonomous acoustic hydrophone mooring will need to be retrieved using the ship's crane and net reel (see figure 5 for the configuration of the autonomous acoustic mooring). Attached in the appendices are specific details on the mooring configuration provided by the principle investigators of the Ocean Noise Reference Station Network (ONRSN) Holger Klink and Robert P. Dziak. Established safety protocols regarding deployment and retrieval of gear from the deck of the *Gordon Gunter* will be followed.

Vessel Sensor and Logging Requirements: *Gordon Gunter's* SCS system is a PC-based server, which continuously collects and distributes scientific data from various navigational, oceanographic, meteorological, and sampling sensors throughout the cruise. Date and time for data collections from computers, instrumentation, and log sheet recordings will be synchronized using the vessel's GPS master clock. The NEFSC is responsible for setting up hardware and software, and the NEFSC and *Gordon. Gunter's* Survey and Electronics Technicians are responsible for ensuring
data collection and storage.

The ship's Scientific Computer System (SCS) will be required for logging data on a routine basis and data requirements will be coordinated with the Commanding Officer and Survey Technician at the beginning of the cruise.

D. Dive Plan

Dives are not planned for this project

E. Applicable Restrictions:

Conditions which preclude normal operations: Poor weather could limit small boat operations; however flying bridge observations and photo id work would still be carried out.

F. Protected Resources

North Atlantic right whale protection: The vessel is requested to adhere to right whale protection regulations. Information on Seasonal Management Area (SMA) and Dynamic Management Area (DMA) regulations and information for protecting right whales from collisions with vessels are provided through the NOAA Protected Resources website (http://www.nmfs.noaa.gov/pr/shipstrike/), Right Whale Sighting Advisory System (SAS) website (http://www.nefsc.noaa.gov/psb/surveys/), the U.S. Coast Guard's "Notices To Mariners" and NOAA weather radio. . Mariners are urged to use caution and proceed at safe speeds in areas where right whales occur. U.S. Law (50 CFR 224.105) prohibits operating vessels 65 feet (19.8 meters) or greater in excess of 10 knots in Seasonal Management Areas (SMAs) along the U.S. east coast. Mariners are also requested to route around voluntary speed restriction zones, Dynamic Management Areas (DMAs) or transit through them at 10 knots or less. Approaching within 500 yards of right whales is prohibited, unless the Chief Scientist is in possession of an ESA/MMPA permit allowing such approaches. For cruise GU15-02, the *Gordon Gunter* will be approaching most right whales closer than 500 yards. The chief scientist is a co-investigator on ESA/MMPA permit # 779-1633-02, the biopsy effort will be conducted under permit #17355 and the tagging effort will be conducted under ESA/MMPA permit #16388.

Whale sightings: Sightings of right whales, or dead or entangled whales of any species, are extremely valuable and reports are urgently requested. Please report all right whale sightings north of the Virginia-North Carolina border to 866-755-6622; right whale sightings south of that border should be reported to 877-WHALE HELP. Right whale sightings in any location may be reported to the U.S. Coast Guard via VHF channel 16. Protocols for reporting sightings are described in the Guide to Reporting Whale Sightings placard. The placard is available online (http://www.nefsc.noaa.gov/psb/surveys/documents/20120919_Report_a_Right_Whale.pdf) and laminated copies will be provided by the Protected Species Branch upon request. It is requested that this placard be kept on the bridge for quick reference and to facilitate rapid reporting (via satellite phone if necessary). Opportunistic sightings of other marine mammal species that are live and well may be reported using the Platforms of Opportunity (POP) forms and protocols .Please refer to information regarding the WhaleALERT application . For information on reporting a dead whale .

Endangered Species Act and Marine Mammal Protection Act reporting requirements: This reporting is required and is in addition to the reports in the above two sections. If the ship has an interaction with a sturgeon, whale, dolphin, porpoise, marine turtle, or seal (e.g., collision with a whale or bycatch of a sea turtle), the NMFS Greater Atlantic Regional Fisheries Office must be notified within 24 hours of the interaction. If an interaction with any of those species occurs or if the vessel's company notices an animal that is entangled, injured, in distress, or dead, they should contact the Northeast Regional Office's 24-hour hotline at 866-755-6622 to report the incident and receive further instructions. All e-mail correspondences should be made to the following e-mail address: incidential.take@noaa.gov . Please indicate in the subject line which protected species was encountered. If the take involves a marine mammal or sea turtle that is alive, injured and in need of assistance or monitoring, please call the NOAA Northeast Region marine animal hotline at: tel:866-755-6622. The chief scientist will be notified before reports are made.

Marine turtle bycatch: All marine turtles taken incidental to fishing activities must 1) be handled and resuscitated according to established procedures, 2) be clearly photographed (multiple views if possible, including at least one photograph of the head scutes), 3) be identified to the species level, 4) have width and length (carapace notch to notch, and notch to tip) measured in centimeters, 5) have supporting data recorded including GPS or Loran coordinates recorded describing the location of the interaction; time of interaction; date of interaction; condition of the animal upon retrieval (alive uninjured, alive injured, fresh dead, decomposed, comatose or unresponsive); the condition of the animal upon return to the water; GPS or Loran coordinates of the location at which it was released; and a description of the care or handling provided. Live animals shall then be returned to the sea. Dead animals shall, if feasible, be frozen and returned to the Woods Hole Laboratory.

Marine mammal bycatch: All marine mammals taken incidental to fishing activities must 1) be clearly photographed (multiple views if possible, including at least one photograph of the head, 2) be identified to the species level, 3) have body length (snout to tail (seals), beak to the notch in the fluke/tail (whales, dolphins and porpoises)), measured in centimeters, 4) have supporting data recorded including GPS or Loran coordinates recorded describing the location of the interaction; time of interaction; date of interaction; condition of the animal upon retrieval (alive uninjured, alive injured, fresh dead, decomposed, comatose or unresponsive). Live animals shall then be returned to the sea. Dead animals shall, if feasible, be frozen and returned to the Woods Hole Laboratory.

Stellwagen Bank: Any artifacts brought aboard the vessel due to fishing in the Stellwagen Bank National Marine Sanctuary must be immediately returned, as near as possible, to the location of interception. An artifact is defined as anything of man-made origin with the exception of modern fishing gear. Stations located within Stellwagen Bank will be identified prior to the cruise and reported to the chief scientist.

III. Equipment

A. Equipment and Capabilities provided by the ship (itemized)

Jettison fuel tank for small boat ops 1 Gordon Gunter

Painter with stainless steel release clips 2 Gordon Gunter

B. Equipment and Capabilities provided by the scientists (itemized)

ITEM	QUANITY	PROVIDED BY
HARP ACOUSTIC MOORINGS (see Figure 4)	3	Scripps/ NMFS, NEFSC
PMEL ACOUSTIC MOORING (see Figure 3)	1	NMFS, NEFSC, Woods Hole, MA
Equipment for recovery of two acoustic moorings	ample	NMFS, NEFSC, Woods Hole, MA
Rigid hull inflatable boat-18' -90hp- gasoline, cradle, lifting harness, other associated gear & safety equipment	1	NMFS, NEFSC, Woods Hole, MA
Biopsy systems (3 crossbows, bolts, modified tips)	3	NMFS, NEFSC, Woods Hole, MA
Big eye binoculars	2	NMFS, NEFSC, Woods Hole, MA
Stands for big eyes	2	NMFS, NEFSC, Woods Hole, MA
Chairs of flying bridge observers	3	NMFS, NEFSC, Woods Hole, MA
Biopsy sampling supplies	ample	NMFS, NEFSC, Woods Hole, MA
DMSO-dimethyl sulfoxide	30/ 2oz. tubes	NMFS, NEFSC, Woods Hole, MA
Photographic equipment	Ample	NMFS, NEFSC, Woods Hole, MA
Life vests and exposure suits	Ample	NMFS, NEFSC, Woods Hole, MA
Laptop computers/data recorders	2	NMFS, NEFSC, Woods Hole, MA
Sighting and biopsy logs	ample	NMFS, NEFSC, Woods Hole, MA
Handheld binoculars	3	NMFS, NEFSC, Woods Hole, MA
Dip net & bucket for fecal sampling	1	NMFS, NEFSC, Woods Hole, MA
Fecal sampling jars and data sheets	ample	NMFS, NEFSC, Woods Hole, MA

Rigid hull inflatable boat-15' -70hp-gasoline, cradle, lifting harness, other associated gear & safety equipment	1	WHOI, Woods Hole, MA
Vertical profiling instrument package with CTD, optical plankton counter, and video plankton recorder (weight = 450 lbs).	1	WHOI, Woods Hole, MA
Dermal attachment tags	3	WHOI, Woods Hole, MA
Modified compressed-air line thrower, modified for launching dermal attachment tags	1	WHOI, Woods Hole, MA
Compressed-air tanks	2	WHOI, Woods Hole, MA
Single and Double 75 cm diameter ring net	1 each	WHOI, Woods Hole, MA
Plankton sampling gear: sieves, 1-quart jars	ample	WHOI, Woods Hole, MA
Microscope with light source	1	WHOI, Woods Hole, MA
Digital camera	1	WHOI, Woods Hole, MA
Laptop computers	4	WHOI, Woods Hole, MA
GPS antennae and ARGOS tracking antennae	1 each	WHOI, Woods Hole, MA
SBE 37 temperature/depth instrument for use on ring nets (~1 ft long)	1	WHOI, Woods Hole, MA
Formaldehyde, 37%	4 liter container	WHOI, Woods Hole, MA
Morad HD antenna mounted on mast for sonobuoy ops	1	NMFS,NEFSC,Woods Hole,MA
50 foot sections of RG8 low- loss coax cable to reach from the mast into the lab	2	NMFS, NEFSC, Woods Hole, MA
Antenna splitter/switch	1	NMFS, NEFSC, Woods Hole, MA
10 db Antenna Pre-amp	2	NMFS, NEFSC, Woods Hole, MA

WinRadio receiver	1	NMFS, NEFSC, Woods Hole, MA
Sonobuoy laptop	1	NMFS, NEFSC, Woods Hole, MA
Fireface external soundcard	1	
Q53F Sonobuoys	20	NMFS, NEFSC, Woods Hole, MA

IV. Hazardous Materials

A. Policy and Compliance

The Chief Scientist is responsible for complying with FEC 07 Hazardous Materials and Hazardous Waste Management Requirements for Visiting Scientific Parties (or the OMAO procedure that supersedes it). By Federal regulations and NOAA Marine and Aviation Operations policy, the ship may not sail without a complete inventory of all hazardous materials by name and quantity, MSDS, appropriate spill cleanup materials (neutralizing agents, buffers, or absorbents) in amounts adequate to address spills of a size equal to the amount of chemical brought aboard, and chemical safety and spill response procedures. Documentation regarding those requirements will be provided by the Chief of Operations, Marine Operations Center, upon request.

Per OMAO procedure, the scientific party will include with their project instructions and provide to the CO of the respective ship 30 days before departure:

- List of chemicals by name with anticipated quantity
- List of spill response materials, including neutralizing agents, buffers, and absorbents
- Chemical safety and spill response procedures, such as excerpts of the program's Chemical Hygiene Plan or SOPs relevant for shipboard laboratories
- For bulk quantities of chemicals in excess of 50 gallons total or in containers larger than 10 gallons each, notify ship's Operations Officer regarding quantity, packaging and chemical to verify safe stowage is available as soon as chemical quantities are known.

Upon embarkation and prior to loading hazardous materials aboard the vessel, the scientific party will provide to the CO or their designee:

- An inventory list showing actual amount of hazardous material brought aboard
- An MSDS for each material
- Confirmation that neutralizing agents and spill equipment were brought aboard sufficient to contain and cleanup all of the hazardous material brought aboard by the program
- Confirmation that chemical safety and spill response procedures were brought aboard

Upon departure from the ship, scientific parties will provide the CO or their designee an inventory showing that all chemicals were removed from the vessel. The CO's designee will maintain a log to track scientific party hazardous materials. MSDS will be made available to the ship's complement, in compliance with Hazard Communication Laws.

Scientific parties are expected to manage and respond to spills of scientific hazardous materials. Overboard discharge of hazardous materials is not permitted aboard NOAA ships.

B. Inventory

Common Name of Material	**Qty**	**Notes**	**Trained Individual**	**Spill control**
DMSO-dimethyl sulfoxide	30/ 2oz. tubes	Tubes will be kept sealed in a box under the fume hood	Peter Duley	F
Formaldehyde solution (37%)	1 4 liter container	Alkalinity, Stored in ship chem. lkr	Mark Baumgartner	F
Clorox bleach	1 gallon	Stored under the fume hood	Peter Duley	A
Fuel	100 gal	For small boats	Peter Duley	

C. Chemical safety and spill response procedures

A: ACID

- Wear appropriate protective equipment and clothing during clean-up. Keep upwind. Keep out of low areas.
- Ventilate closed spaces before entering them.
- Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible.
- **Large Spills**: Dike far ahead of spill for later disposal. Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal.
- **Small Spills**: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination.
- Never return spills in original containers for re-use.
- Neutralize spill area and washings with soda ash or lime. Collect in a non-combustible container for prompt disposal.
- J. T. Baker NEUTRASORB® acid neutralizers are recommended for spills of this product.

M: Mercury

- Spills: Pick up and place in a suitable container for reclamation or disposal in a method that does not generate dust. Sprinkle area with sulfur or calcium polysulfide to suppress mercury. Use Mercury Spill Kit if need be.

F: Formalin/Formaldehyde

- Ventilate area of leak or spill. Remove all sources of ignition.

- Wear appropriate personal protective equipment.
- Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible.
- Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container.
- Do not use combustible materials, such as saw dust.

Inventory of Spill Kit supplies

Product Name	Amount	Chemicals it is useful against	Amount it can clean up
Spill-X-FP	1.68 kg	Formaldehyde	10 gallons

D. Radioactive Materials

No Radioactive Isotopes are planned for this project.

E. Inventory (itemized) of Radioactive Materials – N/A

V. Additional Projects

A. Supplementary ("Piggyback") Projects

No Supplementary Projects are planned.

B. NOAA Fleet Ancillary Projects

No NOAA Fleet Ancillary Projects are planned.

VI. Disposition of Data and Reports

Disposition of data gathered aboard NOAA ships will conform to NAO 216-101 *Ocean Data Acquisitions* and NAO 212-15 *Management of Environmental Data and Information.* To guide the implementation of these NAOs, NOAA's Environmental Data Management Committee (EDMC) provides the *NOAA Data Documentation Procedural Directive* (data documentation) and *NOAA Data Management Planning Procedural Directive* (preparation of Data Management Plans). OMAO is developing procedures and allocating resources to manage OMAO data and Programs are encouraged to do the same for their Project data.

A. Data Classifications: *Under Development*

a. OMAO Data

b. Program Data

B. Responsibilities: *Under Development*

VII. Meetings, Vessel Familiarization, and Project Evaluations

A. Pre-Project Meeting: The Chief Scientist and Commanding Officer will conduct a meeting of pertinent members of the scientific party and ship's crew to discuss required equipment, planned operations, concerns, and establish mitigation strategies for all concerns. This meeting shall be conducted before the beginning of the project with sufficient time to allow for preparation of the ship and project personnel. The ship's Operations Officer usually is delegated to assist the Chief Scientist in arranging this meeting.

B. Vessel Familiarization Meeting: The Commanding Officer is responsible for ensuring scientific personnel are familiarized with applicable sections of the standing orders and vessel protocols, e.g., meals, watches, etiquette, drills, etc. A vessel familiarization meeting shall be conducted in the first 24 hours of the project's start and is normally presented by the ship's Operations Officer.

C. Post-Project Meeting: The Commanding Officer is responsible for conducted a meeting no earlier than 24 hrs before or 7 days after the completion of a project to discuss the overall success and short comings of the project. Concerns regarding safety, efficiency, and suggestions for future improvements shall be discussed and mitigations for future projects will be documented for future use. This meeting shall be attended by the ship's officers, applicable crew, the Chief Scientist, and members of the scientific party and is normally arranged by the Operations Officer and Chief Scientist.

D. Project Evaluation Report: Within seven days of the completion of the project, a Customer Satisfaction Survey is to be completed by the Chief Scientist. The form is available at http://www.omao.noaa.gov/fleeteval.html, and provides a "Submit" button at the end of the form. Submitted form data is deposited into a spreadsheet used by OMAO management to analyze the information. Though the complete form is not shared with the

ships, specific concerns and praises are followed up on while not divulging the identity of the evaluator.

VIII. Miscellaneous

A. Meals and Berthing

The ship will provide meals for the scientists listed above. Meals will be served 3 times daily beginning one hour before scheduled departure, extending throughout the project, and ending two hours after the termination of the project. Since the watch schedule is split between day and night, the night watch may often miss daytime meals and will require adequate food and beverages (for example a variety of sandwich items, cheeses, fruit, milk, juices) during what are not typically meal hours. Special dietary requirements for scientific participants will be made available to the ship's command at least seven days prior to the project.

Berthing requirements, including number and gender of the scientific party, will be provided to the ship by the Chief Scientist. The Chief Scientist and Commanding Officer will work together on a detailed berthing plan to accommodate the gender mix of the scientific party taking into consideration the current make-up of the ship's complement. The Chief Scientist is responsible for ensuring the scientific berthing spaces are left in the condition in which they were received; for stripping bedding and linen return; and for the return of any room keys which were issued. The Chief Scientist is also responsible for the cleanliness of the laboratory spaces and the storage areas utilized by the scientific party, both during the project and at its conclusion prior to departing the ship.

All NOAA scientists will have proper travel orders when assigned to any NOAA ship. The Chief Scientist will ensure that all non NOAA or non Federal scientists aboard also have proper orders. It is the responsibility of the Chief Scientist to ensure that the entire scientific party has a mechanism in place to provide lodging and food and to be reimbursed for these costs in the event that the ship becomes uninhabitable and/or the galley is closed during any part of the scheduled project.

All persons boarding NOAA vessels give implied consent to comply with all safety and security policies and regulations which are administered by the Commanding Officer. All spaces and equipment on the vessel are subject to inspection or search at any time. All personnel must comply with OMAO's Drug and Alcohol Policy dated May 17, 2000 which forbids the possession and/or use of illegal drugs and alcohol aboard NOAA Vessels.

B. Medical Forms and Emergency Contacts

The NOAA Health Services Questionnaire (NHSQ, NF 57-10-01 (3-14)) must be completed in advance by each participating scientist. The NHSQ can be obtained from the Chief Scientist or the NOAA website http://www.corporateservices.noaa.gov/noaaforms/eforms/nf57-10-01.pdf.

All NHSQs submitted after March 1, 2014 must be accompanied by NOAA Form (NF) 57-10-02 Tuberculosis Screening Document in compliance with OMAO Policy 1008 (Tuberculosis Protection Program).

The completed form should be sent to the Regional Director of Health Services at the applicable Marine Operations Center.The NHSQ and Tuberculosis Screening Documents should reach the health services office no later than 4 weeks prior to the start of the project to allow time for the participant to obtain and submit additional information that health services might require before clearance to sail can be granted. Please contact MOC Health Services with any questions regarding eligibility or completion of either form. . Ensure to fully complete each form and indicate the ship or ships the participant will be sailing on. The participant will receive an email notice when medically cleared to sail if a legible email address is provided on the NHSQ.

The participant can mail, fax, or email the forms to the contact information below. Participants should take precautions to protect their Personally Identifiable Information (PII) and medical information and ensure all correspondence adheres to DOC guidance (http://ocio.os.doc.gov/ITPolicyandPrograms/IT_Privacy/PROD01_008240).

The only secure email process approved by NOAA is Accellion Secure File Transfer which requires the sender to setup an account. Accellion's Web Users Guide is a valuable aid in using this service, however to reduce cost the DOC contract doesn't provide for automatically issuing full functioning accounts. To receive access to a "Send Tab", after your Accellion account has been established send an email from the associated email account to accellionAlerts@doc.gov requesting access to the "Send Tab" function. They will notify you via email usually within 1 business day of your approval. The 'Send Tab" function will be accessible for 30 days.

Contact information:
Regional Director of Health Services
Marine Operations Center – Atlantic
439 W. York Street
Norfolk, VA 23510
Telephone 757-441-6320
Fax 757-441-3760
E-mail

Prior to departure, the Chief Scientist must provide an electronic listing of emergency contacts to the Executive Officer for all members of the scientific party, with the following information: contact name, address, relationship to member, and telephone number.

C. Shipboard Safety

Hard hats are required when working with suspended loads. Work vests are required when working near open railings and during small boat launch and recovery operations. Hard hats and work vests will be provided by the ship when required.

Wearing open-toed footwear or shoes that do not completely enclose the foot (such as sandals or clogs) outside of private berthing areas is not permitted. At the discretion of the ship CO, safety shoes (i.e. steel or composite toe protection) may be required to participate in any work dealing with suspended loads, including CTD deployment and recovery. The ship does not provide safety-toed shoes/boots. The ship's Operations Officer should be consulted by the Chief Scientist to ensure members of the scientific party report aboard with the proper attire.

Certified Boat Operators: Under NAO217-103 MANAGEMENT OF NOAA SMALL BOATS, certified small boat operators must have current CPR and First Aid certification as well as a Small Boat Safety course and Fast Rescue Boat certification which includes classroom and on water components. Photocopies of the small boat operators required documentation must be provided to the Master of the vessel prior to any cruise which conducts small boat operations. Boat Operators included on this cruise are: Duley, Matzen, Cole, Conger, and Yin. Coxswains will not work beyond the 12 hours per day as permitted under the STCW guidelines.

D. Communications

A progress report on operations prepared by the Chief Scientist may be relayed to the program office. Sometimes it is necessary for the Chief Scientist to communicate with another vessel, aircraft, or shore facility. Through various means of communications, the ship can usually accommodate the Chief Scientist. Special radio voice communications requirements should be listed in the project instructions. The ship's primary means of communication with the Marine Operations Center is via e-mail and the Very Small Aperture Terminal (VSAT) link. Standard VSAT bandwidth at 128kbs is shared by all vessels staff and the science team at no charge. Increased bandwidth in 30 day increments is available on the VSAT systems at increased cost to the scientific party. If increased bandwidth is being considered, program accounting is required and it must be arranged at least 30 days in advance.

E. IT Security

Any computer that will be hooked into the ship's network must comply with the *OMAO Fleet IT Security Policy* 1.1 (November 4, 2005) prior to establishing a direct connection to the NOAA WAN. Requirements include, but are not limited to:

(1) Installation of the latest virus definition (.DAT) file on all systems and performance of a virus scan on each system.
(2) Installation of the latest critical operating system security patches.
(3) No external public Internet Service Provider (ISP) connections.

Completion of the above requirements prior to boarding the ship is required.

Non-NOAA personnel using the ship's computers or connecting their own computers to the ship's network must complete NOAA's IT Security Awareness Course within 3 days of embarking.

Data Management: All whale sightings and survey effort will be recorded electronically. Data logging computers will be linked to ship's computer system for real-time locations. All effort and sightings data will be submitted to NEFSC DMS for incorporation into Oracle database system. Samples and data collected for specific individuals, agencies or organizations will be processed the same.

F. Foreign National Guests Access to OMAO Facilities and Platforms

All foreign national access to the vessel shall be in accordance with NAO 207-12 and RADM De Bow's March 16, 2006 memo (http://deemedexports.noaa.gov). National Marine Fisheries Service personnel will use the Foreign National Registration System (FNRS) to submit requests for access to NOAA facilities and ships. The Departmental Sponsor/NOAA (DSN) is responsible for obtaining clearances and export licenses and for providing escorts required by the NAO. DSNs should consult with their designated Line Office Deemed Export point of contact to assist with the process.

Full compliance with NAO 207-12 is required.

Responsibilities of the Chief Scientist:

1. Provide the Commanding Officer with the e-mail generated by the Servicing Security Office granting approval for the foreign national guest's visit. (For NMFS-sponsored guests, this e-mail will be transmitted by FNRS.) This e-mail will identify the guest's DSN and will serve as evidence that the requirements of NAO 207-12 have been complied with.
2. Escorts – The Chief Scientist is responsible to provide escorts to comply with NAO 207-12 Section 5.10, or as required by the vessel's DOC/OSY Regional Security Officer.
3. Ensure all non-foreign national members of the scientific party receive the briefing on Espionage Indicators (NAO 207-12 Appendix A) at least annually or as required by the Servicing Security Office.
4. Export Control - Ensure that approved controls are in place for any technologies that are subject to Export Administration Regulations (EAR).

The Commanding Officer and the Chief Scientist will work together to implement any access controls necessary to ensure no unlicensed export occurs of any controlled technology onboard regardless of ownership.

Responsibilities of the Commanding Officer:

1. Ensure only those foreign nationals with DOC/OSY clearance are granted access.
2. Deny access to OMAO platforms and facilities by foreign nationals from countries controlled for anti-terrorism (AT) reasons and individuals from Cuba or Iran without written approval from the Director of the Office of Marine and Aviation Operations and compliance with export and sanction regulations.

3. Ensure foreign national access is permitted only if unlicensed deemed export is not likely to occur.
4. Ensure receipt from the Chief Scientist or the DSN of the FNRS or Servicing Security Office e-mail granting approval for the foreign national guest's visit.
5. Ensure Foreign Port Officials, e.g., Pilots, immigration officials, receive escorted access in accordance with maritime custom to facilitate the vessel's visit to foreign ports.
6. Export Control - 8 weeks in advance of the project, provide the Chief Scientist with a current inventory of OMAO controlled technology onboard the vessel and a copy of the vessel Technology Access Control Plan (TACP). Also notify the Chief Scientist of any OMAO-sponsored foreign nationals that will be onboard while program equipment is aboard so that the Chief Scientist can take steps to prevent unlicensed export of Program controlled technology. The Commanding Officer and the Chief Scientist will work together to implement any access controls necessary to ensure no unlicensed export occurs of any controlled technology onboard regardless of ownership.
7. Ensure all OMAO personnel onboard receive the briefing on Espionage Indicators (NAO 207-12 Appendix A) at least annually or as required by the Servicing Security Office.

Responsibilities of the Foreign National Sponsor:

1. Export Control - The foreign national's sponsor is responsible for obtaining any required export licenses and complying with any conditions of those licenses prior to the foreign national being provided access to the controlled technology onboard regardless of the technology's ownership.
2. The DSN of the foreign national shall assign an on-board Program individual, who will be responsible for the foreign national while on board. The identified individual must be a U.S. citizen and a NOAA or DOC employee. According to DOC/OSY, this requirement cannot be altered.
3. Ensure completion and submission of Appendix C (Certification of Conditions and Responsibilities for a Foreign National

VIII. Appendices :

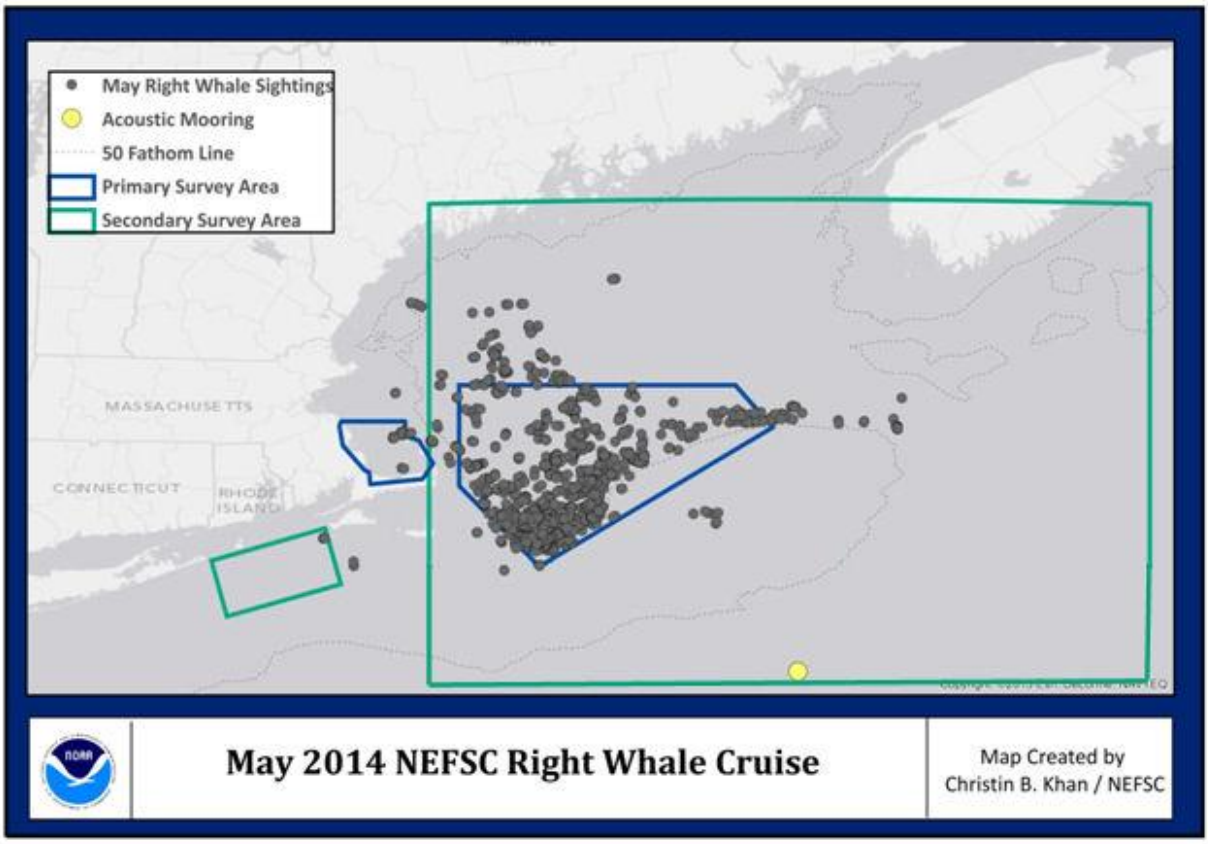
1. Figures, maps, tables, images, etc.

2. Station/Waypoint List (coordinates in Latitude, Longitude: degree-minutes)

3. Details regarding deployment/recoveries of 5 acoustic moorings

APPENDIX I: FIGURES

Figure 1: Study area for Northern Right Whale Survey, cruise GU-15-02 with May right whale sightings across 2006 - 2013 shown

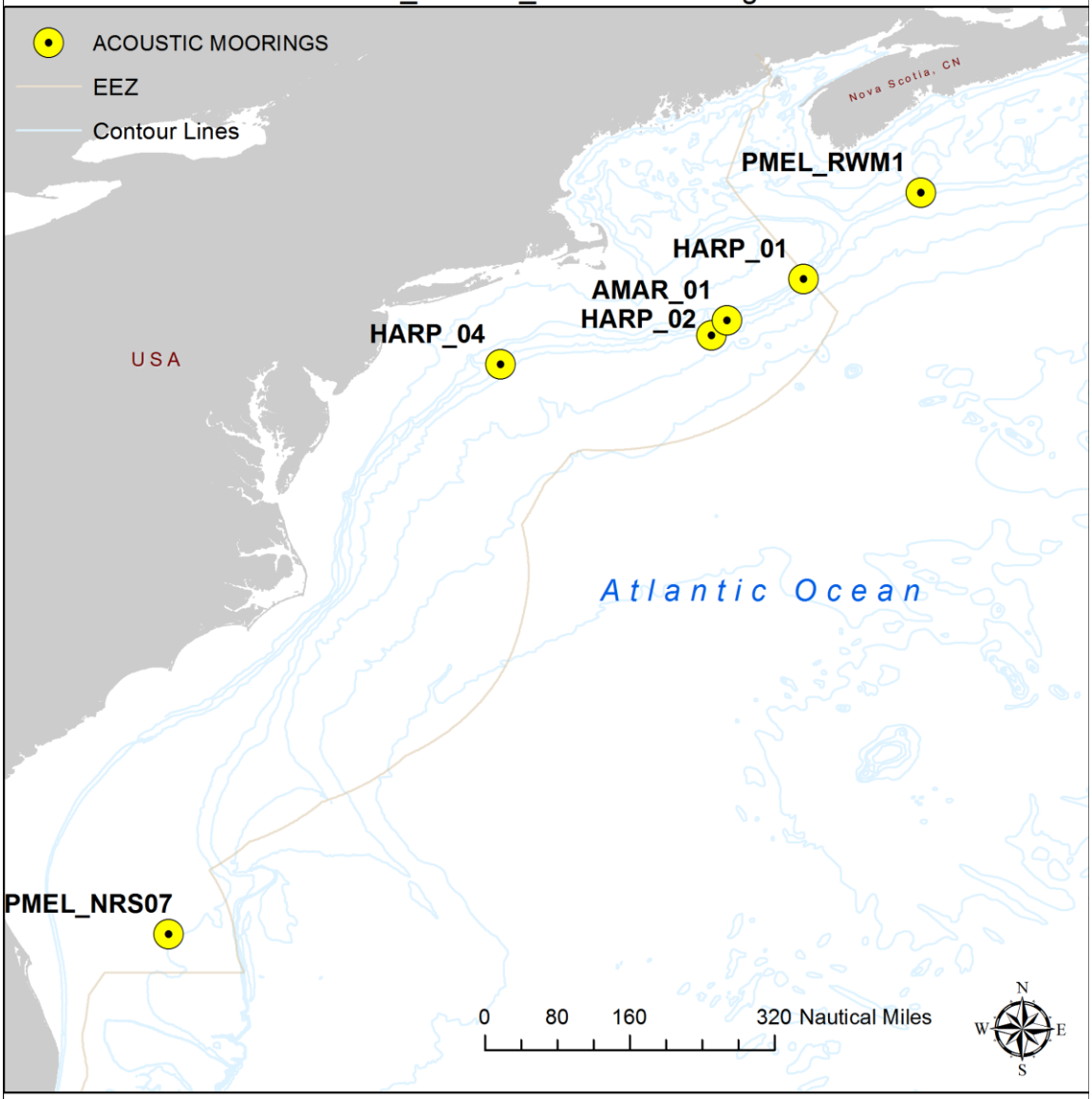


Cruise Title:

GG15-02 Transit Leg 14-27 April 2015:
Acoustic Mooring Deployment and Recovery

Cruise Plan ID:

GG1502_NEFSC_AcousticMoorings



LOCATION FORMAT: DECIMAL MINUTES

PMEL NRS07:	29 00.000 N	078 00.000 W	(Blake Plateau)	Deployment
HARP 04:	39 29.449 N	071 53.410 W	(Hudson Canyon)	Deployment
HARP 02:	40 01.539 N	068 00.278 W	(Oceanographer Canyon)	Deployment
AMAR 01:	40 17.697 N	067 43.184 W	(Lydonia Canyon)	Recovery
HARP 01:	41 03.886 N	066 18.370 W	(Georges Bank)	Deployment
PMEL RWM1:	42 39.006 N	064 08.994 W	(Brown's Bank)	Recovery

Figure 3: PMEL NRS_07 Acoustic Mooring Diagram, to be deployed at site PMEL_NRS07.

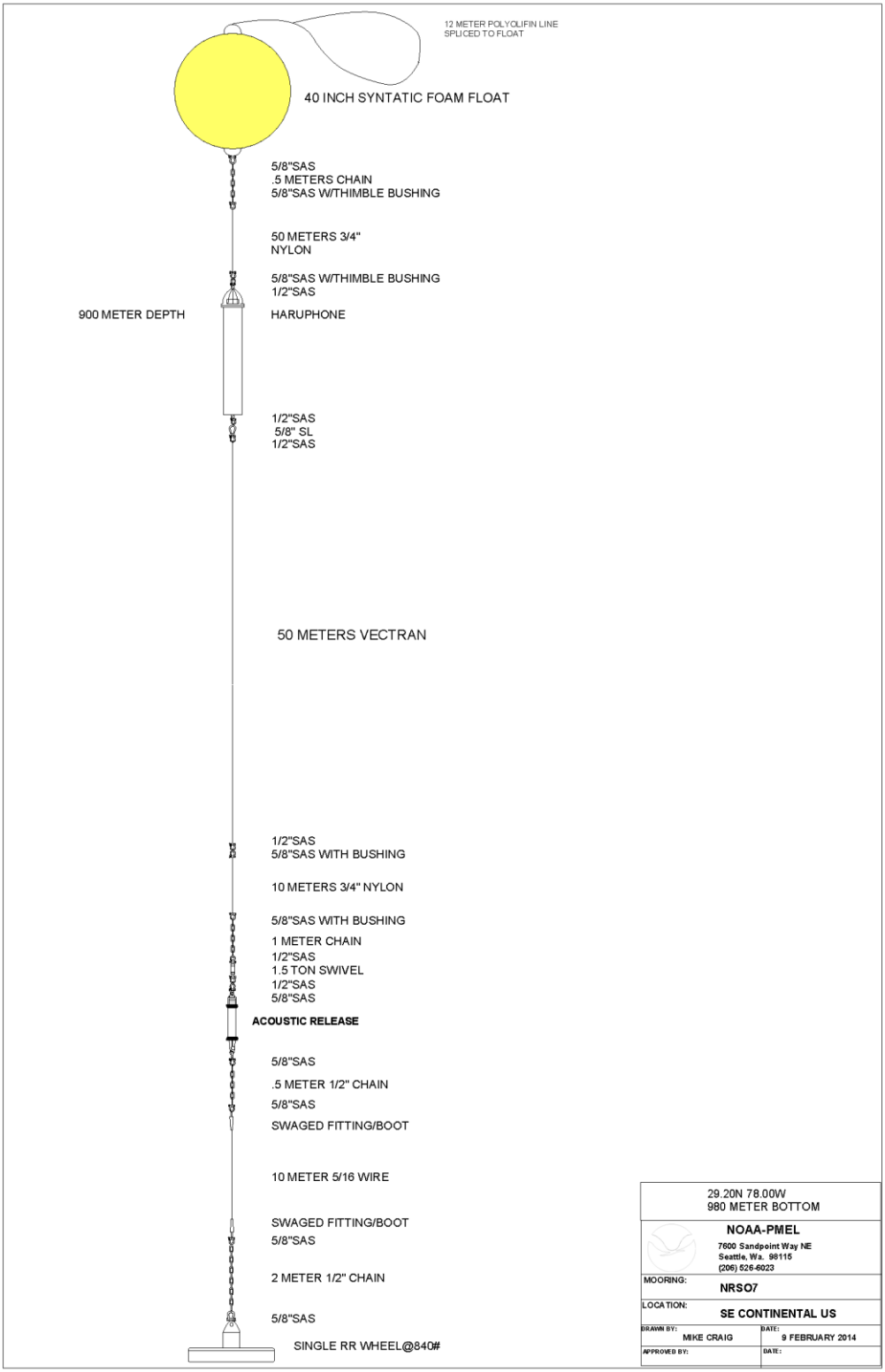


Figure 4: HARP Acoustic Mooring Diagram. Three moorings of this type will be deployed at sites HARP_03, HARP_02, HARP_01 (see Figure 2 for sites).

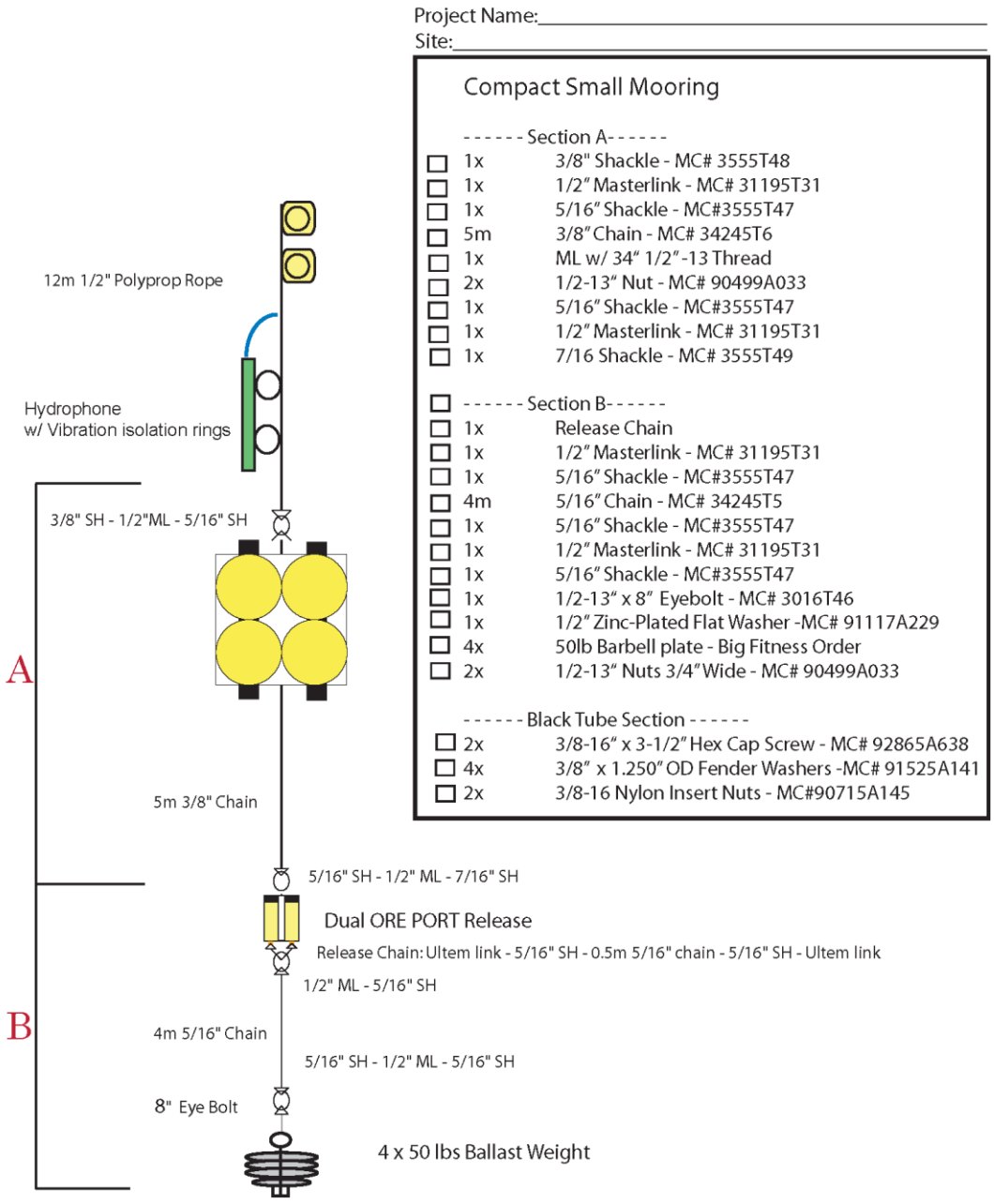


Figure 5: PMEL RWM01 Mooring Diagram. Mooring to be recovered.

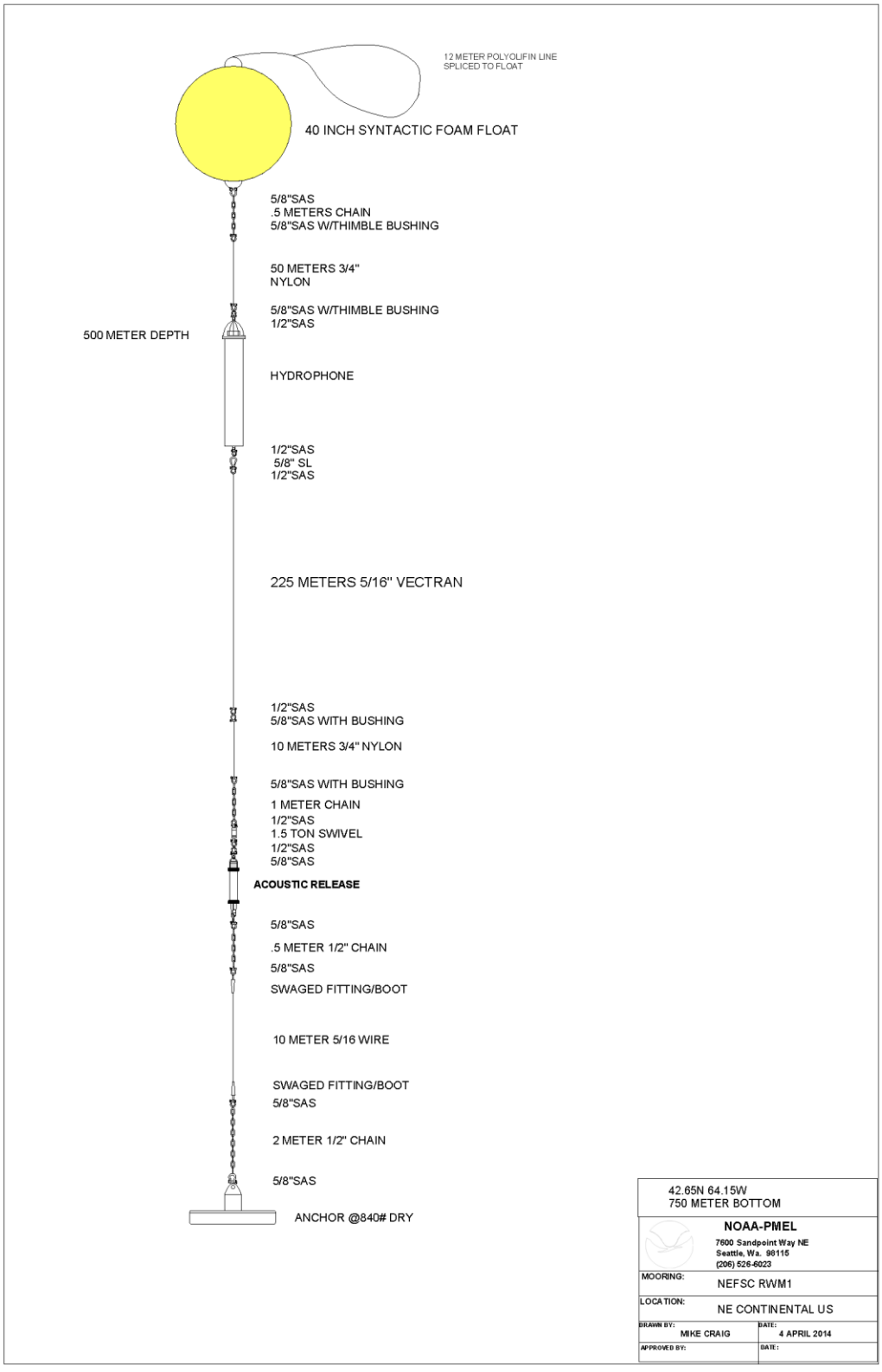
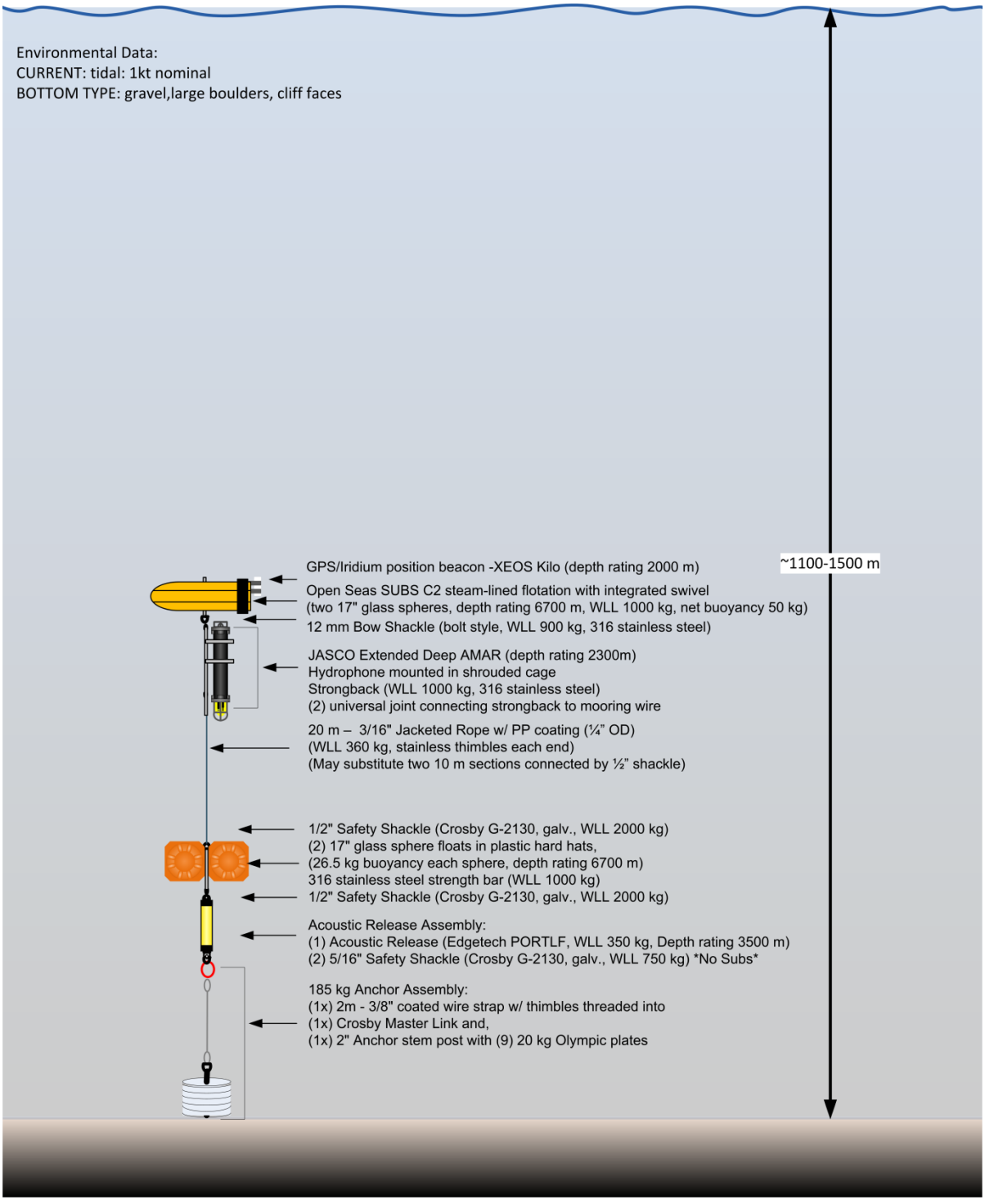


Figure 6: AMAR_01 Mooring Diagram. Mooring to be recovered.



APPENDIX II: TABLES

Table 1: Stations for acoustic recorder deployments and recoveries. See Figure 2 for positions in decimal minutes.

STATION	Procedure	Mooring	Latitude	Longitude	General_Location	Depth
PMEL_07	DEPLOYMENT	PMEL	29	-78	Blake Plateau	980m
HARP_03	DEPLOYMENT	HARP	39.82922	-69.9810	S. Nantucket	1000m
HARP_02	DEPLOYMENT	HARP	40.26327	-67.9862	Oceanographer Canyon	1000m
AMAR_01	RECOVERY	AMAR	40.29495	-67.7197	Lydonia Canyon	800m
HARP_01	DEPLOYMENT	HARP	41.04449	-66.3486	Georges Bank	1000m
PMEL_RWM1	RECOVERY	PMEL	42.6501	-64.1499	Browns Bank	750m

APPENDIX III: ACOUSTIC MOORING DEPLOYMENT & RECOVERY INSTRUCTIONS.

Please direct any questions on these procedures to Eric Matzen (eric.matzen@noaa.gov)

DEPLOYMENT PROCEDURES: PMEL_NRS_07

Anchor Drop Point

When deploying a hydrophone mooring, you must first determine the approximate location where you want the final anchor position to be. After determining where the target anchor location is, you must then determine the approximate anchor drop point. Due to the design of the mooring, we deploy the float first and stream the mooring out behind the ship. Since the floatation has more drag than the anchor has, when the anchor is dropped, it does not descend straight down to the bottom. Instead, the anchor swings back toward the float while the float is heading (at ~ 5kts) toward the anchor. This results in the anchor landing on the bottom quite a ways behind where it was dropped. This "fall back" of the anchor follows a predictable rate. The anchor will end up ~1/7 the mooring line length behind the drop point. So if you have a mooring with 4200m of line on it, you need to drop the anchor 600m PAST the target anchor position. The anchor will swing back to the target location. The amount of "fallback" is not purely a function of line length, line tension is a factor as well. If the ship is approaching the drop point slowly with the line slack or with little tension, the fallback will be less than if the line is under moderate tension. The amount of fallback is generally between $1/7^{th}$ and $1/10^{th}$ of the mooring line length.

Starting position of the ship

With an experienced crew (one that has done at least one hydrophone mooring) it is safe to estimate 45-90 minutes deployment time for at 3000m to 4200m mooring. On the first deployment I like to estimate 90-120 minutes deployment time.

The speed the ship deploys at is subject to modification in the field, however, I like to start out at 2.5 to 3 kts after I've deployed the float. The speed of deployment is important for a couple of reasons, one it allows you to estimate how far down range to begin the deployment, since you know the duration of the deployment, speed of the ship, and the anchor drop point. Another important aspect of the deployment speed translates to the distance over ground covered during the deployment (crucial to avoid missing your drop point). Our mooring is designed to be low drag mooring to reduce strumming noise, the drawback to this design is that without some drag, the mooring line does not deploy swiftly and smoothly unless the ship is going fast enough. This is counter-intuitive, but the faster the ship deploys at (speed through water) the shorter the distance both through the water and over the ground covered during the deployment. The reason for this is simple though not necessarily obvious, since the mooring has little drag, at slow deployment speeds, the float simply follows along after the ship. The difference is dramatic, if you deploy a 4000m mooring at < 2kts it will take ~2 to 2.5 hours and the distance over ground may be as much as 5 NM or more. If you deploy the same 4000m mooring at 4-5 kts, the deployment time will be ~ 45 minutes (or less) and the cover 3 to 4 NM (or less) over ground.

There are other considerations to mooring speed, however it is important the mooring be deployed under tension to eliminate potential tangling of the mooring line with itself. As a general rule of thumb, deploy as fast as can be done safely, with a maximum speed of 5 kts.

Mooring Set-up
(refer to mooring diagram included)

Pre-deployment
The mooring can be treated as two moorings, the top and the bottom, and can be built independently of each other. If possible get the anchor moved into position on the fantail, beneath the A-frame before operations begin. This eliminates having to use the crane during the deployment operation and allows the tech to begin building the bottom of the mooring while the 3000-4200m mooring line is being deployed.

Building the top of the mooring
On the top loop of the float, splice the 10m polyolifin line and attach a 5/8" shackle to the top of the float (not the line), this will be used as the attachment point for the quick release used to deploy the float.

On the bottom loop of the float, attach a 1/2m section of chain using a 5/8" shackle (pin through the chain, not the float).

Attach 40m piece of ¾" nylon with a thimble bushing, to the bottom of the 1/2m chain using another 5/8" shackle. The pin goes through the nylon not the chain.

Flake the 40m piece of line out on the deck so it can go overboard without tangling.

When the ship is within 20 minutes of beginning the deployment, bring the hydrophone out of the lab and attach the 40m ¾" nylon to the top of the hydrophone. This attachment is done using a 5/8" shackle connected to the nylon, with a thimble bushing, hooked with a ½" shackle to the top of the hydrophone.

Inspect all nylon isolator bushings and shackles and verify they are in place.

Insert cotter pins to all shackles (use new cotter pins, never re-use the pins that come in the shackle, they are cheap galvanized and we use stainless steel pins).

Preparing to deploy
When using an A-frame, capstain/winch configuration

If the ship only has one method of lifting the mooring, and or only one block in the A-frame, you will need to do a "double pick-up".

> This involves feeding the ship's lifting line through the block and attaching it to the float via a quick release. While the ship is at all stop, lower the float into the water and release it. While the 40m ¾" nylon line is slowly going overboard, feed the jacketed vectron through the block and attack it to the bottom of the hydrophone using a ½" shackle attached to a 5/8" sling link, or"pear-ring", and another ½" shackle to the 'phone. The

5/8" sling link is critical for stopping off the mooring on the subsequent recovery operation.

Lift the hydrophone off the deck with the Vectron line through the block on the A-frame

Have the bridge bring the ship up to deployment speed, start at 2 kt, as the ship accelerates, the 40m nylon line will begin paying off the deck into the water as it is pulled off by the drag from the float. When the line is pulled tight, begin paying out the jacketed Vectron and the 'phone will go into the water as smoothly as possible.

If the ship has two methods of lifting and two blocks attached to the A-frame, set-up similar to previously described.

Run the Vectron line through one block and attach it to the bottom of the hydrophoneand run the ship's "lifting line" through the other block to the quick release attached to the top of the float. This is the preferred method since the mooring is attached to the ship at all times during the deployment and there is no transferal of lines under strain to deal with.

Lift the float with the lifting line, then lift the hydrophone with the Vectron attached to the bottom of the hydrophone. Then lower the float into the water, release it, allow the 40m ¾" nylon to deploy and when the line comes under tension, lower the 'phone into the water.

If the ship has a crane/snatchblock and a capstain the mooring can easily be deployed over the side. After lifting the float over the side and booming out ~5-6m the mooring can be deployed through a snatch block on the crane. This method requires the capstain to provide the lifting while the crane is used similar to the a-frame or as a support for the block the line is going through. This method is preferred when working on the R/V Atlantis, since the A-frame is dedicated to Alvin no mooring work is allowed to use the A-frame.
If the capstain is unavailable, NOAA/PMEL has a portable 440v windlass we can mount so we can utilize the crane for over the side mooring deployments.
The mooring deployment procedure is the same as above except we use the crane/capstain rather than the A-frame/capstain combo.

While the mooring line is being deployed by the deck force/assistant build the bottom of the mooring.

Building the bottom of the mooring

Preparing the Acoustic Release for deployment.

EG&G/Edgetech 8242;	Attach the detachable link, cock the release using the cocking tool included with the release
Benthos 865a;	Attach the detachable link and ARM the release. If not armed it won't release next year…

Attach a 2m chain to the 800lb anchor using a 5/8" shackle.

Attach a 5/8” shackle to the middle of the 2m chain, this is where you will attach the quick release to for lifting the anchor into the water.

Attach the upper end of the 2m chain to the detachable link on the acoustic release using a 5/8” shackle.

Attach a 5/8” shackle to the top of the acoustic release looped through a ½” shackle attached to the 1 1/2 ton swivel, (writing on the side of the swivel should be upright after the mooring is deployed).

Lay another ½” shackle near the top of the swivel it will be used to make the final connection between the bottom of the mooring line and the top of the swivel.

When you are nearing the end of the last piece of Yalex mooring line, attach the 10m ¾” nylon piece, with thimble bushings, to the bottom of the Yalex line using a 5/8” / ½” shackle combination.

Attach the 1m chain to the bottom of the 10m ¾” nylon using a 5/8” shackle, attach the other end of the chain to the ship’s “lifting line”.

The lifting line must be strong enough to support all dynamic forces generated by the 800 lb anchor, 80 lb release and tension on the line.

At this point have the ship slow to 2 kts through the water.

Attach a drop line to the 1m chain. The drop line must be long enough to reach the deck from the A-frame block the mooring line is being deployed through with enough left over to grab onto and haul in on. 8-12m is probably sufficient.

As you deploy the last of the mooring line, the 10m ¾” nylon, you will observe the drop line hanging free from the 1m chain, After the drop line has passed through the block on the A-frame, stop the deployment. Haul the line back in until you can grab the drop line while standing on the fantail. Use the drop line in conjunction with the release of a little additional line to get the 1m chain down to the deck and stop it off to the deck.

Attach the 1m chain to the swivel using a ½” shackle

Detach the lifting line from the 1m chain and transfer it to the quick release attached to the 5/8” shackle, mid way on the 2m chain between the anchor and the release. This is your pick-up point.

Take up the strain on the lifting line, check with the bridge and tow the mooring until you get to the anchor drop point.

When you are approaching 5 minutes from the drop point, lift the anchor off the deck, go out on the A-frame, lower the anchor to the water’s edge and wait for the bridge to give the order to drop the anchor.

DEPLOYMENT PROCEDURES: HARP_03, HARP_02, HARP_01

Mooring Design

Mooring design is 21m long and weighs a total of 650lb consist: of:

- Mclane glass floats
- HARP Hydrophone Recorder
- Float Cage, 400 lbs weight
- Dual ORE PORT acoustic release system, 30 lbs
- 200lb anchor weights

1. Deployment

NOTE: DEPLOYMENTS SHOULD TARGET A DEPTH OF ~1000m. PLEASE CHECK SITE DEPTHS AND ADJUST SHIP POSITION IF NECESSARY.

For any technical questions during deployment you may contact Ryan Griswold Field Support Lead from Scripps Institution of Oceanograph. (619-708-1894 mobile; 858-534-5765 office) The following steps focus on the procedure for deploying the underwater autonomous recorders and their associated moorings. Equipment preparation and deployment will be carried out by the deck crew under supervision of deck officer or embarked science officer. Deployment vessel positioning usually takes 10 minutes per mooring. This operation must be carried out in daylight hours as no strobe is affixed to the mooring top float, and always in appropriate sea states. HARP recorders are not normally deployed in sea states exceeding Beaufort Sea State 4. This can be reassessed based on vessel size and deployment crew/equipment available.

Equipment Power On and Check

Prior to starting the deployment procedure, all equipment must be turned on and tested.

1. *HARPS*

Connect the HARP and power it on as per the HARP User Guide. Verify that the HARP is recording.

2. *Satellite Beacon*

Use the magnet to power on the satellite beacon as per the User Manual. The only way to test the beacon is by observing received emails from Iridium with correct position reports.

Note that you may need to pre-arrange email or phone contact with Scripps at the appropriate time for beacon tests prior to deployment.

3. *Dual ORE PORT Acoustic Release*

Functionality of acoustic release system will be tested prior to deployment.

4. *Mooring Hardware and Connections*

Note that the field team and/or vessel crew may determine it necessary to attach a loop of line above the flotation package in order to facilitate retrieval, based on vessel layout and capabilities.

If this is done, ensure the line is not likely to cause additional acoustic noise in the data recording.

When assembling the mooring, ensure all nuts and bolts are tight and all shackles have their cotter pins installed.

Deployment Procedure

All deployment and retrieval tasks must have a risk assessment conducted in a team meeting prior to all deployments and retrievals. All necessary safe work procedures and processes utilizes for its equipment will be communicated to vessel officers and deck crews via an Operations Plan and associated HSE Plan (if requested) before the start of deployments and retrievals to ensure all procedural overlaps and requirements are appropriately communicated. A Job Safety Analysis (JSA) review is recommended to be held before the deployment to clearly identify tasks, roles, hazards, and controls. If a prefilled JSA is requested prior to deployment or retrieval for the ship's safety rep, one can be provided.

Each HARP and associated mooring will be deployed as follows:

1. Job Safety Analysis meeting with all personnel involved in the deployment (recommended).

2. Steps for HARP assembly and deployment (subject to change based on vessel equipment and crew consultation):

a. Organize all mooring items on-deck near the deployment location and clear of any unrelated tools, equipment, etc. that may interfere with deployment. The on-deck deployment location should be chosen to ensure risk of mooring line entanglement with vessel propellers and thrusters is mitigated, and such that there is a clear lowering path for the HARP and mooring to drift down stream with the prevailing currents. On the CCGS Hudson this may be accomplished via deck crane or A-frame. A-frame is only to be utilized if a clear deployment path to the waterline is available without dragging the HARP and mooring across the deck.

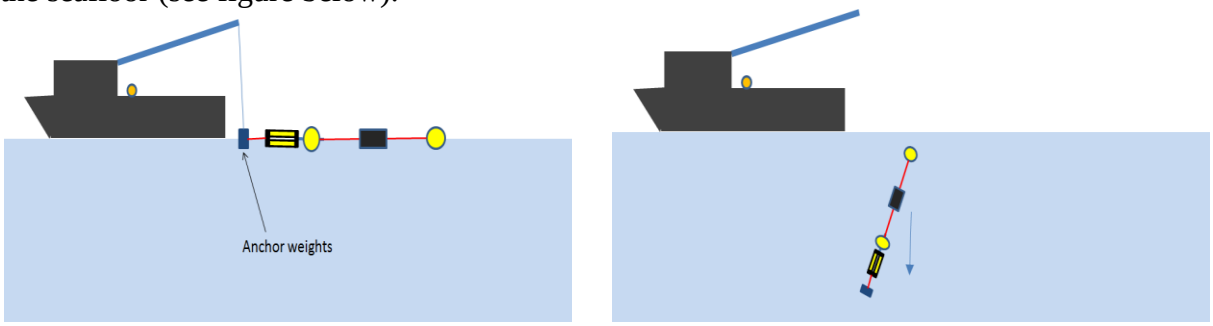
b. Assemble the mooring as per mooring design/provided assembly instructions.

c. Manoeuver vessel to within 500m of deployment position, upstream from the intended deployment location and maintain position.

d. Using a SeaCatch TR-7 or similar quick release mechanism, lift the float via over the stern or side of the vessel to the waterline and release. Let the float and HARP drift away from the vessel. If the deployment is done over the side of the vessel, use pass-through taglines attached to the vessel and HARP to control the mooring, using enough slack to allow the mooring to drift with the vessel until the anchor, release and glass sphere floats are ready to be deployed.

e. Attach pass-through tag-lines to the shackle above the glass balls and have two deck hands manage/minimize movement on the deck of the ship. Lift the anchor assembly via anchor stem post; the acoustic release assembly and glass spheres are in-line and will be lifted over the

side (or aft) of the vessel. Slowly lower to just above the surface of the water (see figure below). The anchor should be submerged just below the waterline to ensure shock loading during deployment is minimized.
Release the tether lines holding the float float (SUBS C2 or OF4 for deep and shallow mooring respectively) and HARP and let drift astern of the vessel. When deployment position confirmed with vessel master and the complete mooring assembly has drifted downstream with just the anchor assembly at the waterline, the quick release can be activated and the anchor will fall to the seafloor (see figure below).



Anchor lowered to surface of water; mooring falling to sea floor after quick release of anchor.

f. Take a GPS position at time of release. Record the bottom depth.

3. Debrief meeting to capture lessons learned and any HSE concerns.

RETRIEVAL PROCEDURES: AMAR_01

The following steps outline the procedure for retrieving the AMAR mooring. The retrieval will be carried out by NEFSC and NOAA Ship Gordon Gunter personnel with JASCO documentation on Edgetech deck sets provided. This procedure is subject to change after consultation with the vessel master and crew. Retrieval usually takes 30 minutes. This operation can be carried out at any time of day as long as there is adequate lighting and appropriate sea states ≤ SS4. At higher sea states equipment movement may injure personnel or damage the equipment.

The release of these moorings should only be attempted when a minimum of 2 nm visibility is available and in favorable sea states as this mooring is not outfitted with a strobe. GPS/Iridium positioning beacons (XEOS Kilo) are affixed to the moorings. The positioning beacon will transmit location messages every 10 minutes for the first hour after surfacing and then every three hours afterwards. This will provide a backup location mechanism should a visual sighting not be made.

The retrieval team should pre-arrange a communications plan with JASCO to ensure access to the beacon messages sent by email, if necessary.

The moorings will be retrieved as follows:

1. Job Safety Analysis meeting with all personnel involved in the retrieval.

2. Steps for mooring retrieval:

a. Lower the transducer of the acoustic release command unit over the side at ~10m below the waterline of the Gordon Gunter.

b. Enable the release(s) and conduct a range check. Once range is confirmed (several ranges of approximately similar value) and indicate the vessel is positioned near the anticipated surfacing location (taking into account slant range to mooring acoustic release); release the upper mooring from the anchor with the acoustic release system (deck set) by entering and transmitting the release code. The mooring will ascend to the sea surface in ~5-10 mins considering depth with the positive buoyancy of either the Open Seas Subs C2 (53kg buoyancy) and the tandem glass sphere floats (53kg buoyancy). A GPS position and time must be recorded upon releasing the system. All upper-deck and bridge personnel are to carry out a 360° surface search for the SUBS and glass sphere floats on the surface.

c. When the system surfaces, carefully maneuver the vessel alongside, upstream and attach a line with snap hook to any appropriate attachment point on either the float (SUBS C2 for deep mooring, OF4 for shallow mooring) or the AMAR strongback immediately attached to the float.Take a GPS fix.

d. Recover the excess safety/recovery line by hand or winch until it can be attached to the crane to pull the float unit out of the water and onto the deck. Raise the float and AMAR assembly to clear the ship's side rails and place it gently on-deck taking care not to hook the hydrophone cables or hydrophone itself upon recovery or handling on deck.

e. The tandem glass sphere floats (deep mooring) or OF4 (shallow mooring) will be clearly visible on the surface. A snap hook or carabineer can be placed via boathook in the shackle between the acoustic release assembly, around the entire shackle, or on the

strong-back (mounting bar) if using a large snap-hook. It can then be hoisted on-deck taking care not to hit the ship's side or rails.

f. GPS position and time will be recorded once system is back on deck.

g. Debrief meeting to capture lessons learned and any HSE concerns.

Note. * At no point during deployment or recovery should the mooring or any of its components be dragged over or across the deck or banged against the ship's side or rails. * This deployment and retrieval plan may be altered depending on the outboard reach of the A-frame or crane in use. All components are tested to a minimum 5:1 load rating or clearly annotated in the mooring diagram of their WLL.

See Jasco Operations Plan for More Information.

RETRIEVAL PROCEDURES: PMEL_RWM01

Hydrophone Recovery Procedures

Location: 42.6501 -64.1499

Release

After an accurate location is determined, the ship is required to maneuver to a location approximately ½ km from the mooring location. The mooring technician will then lower the transducer and signal the acoustic release to drop the anchor, releasing the mooring from the seafloor. The float ascends at 200m/min and typically surfaces within 5 minutes of release. The mooring is a low drag design with a small cross section, so it is not strongly affected by the currents while it is surfacing. It will surface almost directly over the surveyed anchor point. The mooring will however begin to drift almost immediately upon reaching the surface.

Capture of the Float

Fairlead a line of suitable strength to lift 2500kg (order of magnitude safety margin - the heaviest piece of the mooring is the float at 250 kg) through a block with a shive capable of accepting a 5/8" shackle or larger attached to the a-frame. The float at the top of the mooring (1m syntactic foam sphere) has a 10m floating line spliced into a loop attached to the top of the float. The loop is used to attach a lifting line to, either by maneuvering the ship close enough to throw a grappling hook, or by using a small boat to take a lifting line out to the float and manually attach it.

Recovery

Refer to the mooring diagram to get familiar with the components of the mooring. Begin the recovery by bringing the float aboard. Lift the float up to the A-frame and bring the A-frame inboard. Lower the float onto the deck and secure it to the deck. Transfer the lifting line to the 40m ¾" nylon line attached to the bottom of the float and recover the 40m piece directly onto the empty spool. The spool should be positioned to receive the mooring line after it has gone around the capstan and is no longer under tension. The hydrophone is located at the bottom of the 40m line. When the phone is recovered, secure it to the deck and transfer the lifting line from the top of the ¾" nylon line to the paralink on the bottom of the hydrophone. Recover the 2500 to 3300m long, 3/8" diameter yalex, mooring line directly onto the empty spools provided for this purpose. 1 to 2 empty spools will be required per mooring. At the bottom of the final section of yalex line is the acoustic release. Bring it aboard, disconnect it and secure all recovered mooring equipment.