UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southwest Fisheries Science Center
Fisheries Ecology Division
110 Shaffer Road
Santa Cruz, CA 95060

Project Instructions

Date Submitted: September 19, 2016

Platform: NOAA Ship *Reuben Lasker*

Project Number: RL-16-06 (OMAO)

Project Title: Mapping and Visual Surveys of Seafloor Habitats and Fishes

Project Dates: October 19, 2016 to October 30, 2016

Prepared by: Dated: 16 September 2016
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Approved by: Dated: 19 September 2016
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Approved by: Digitally signed by PARKER.BRIAN.W.1076514042 Date: 2016.10.19 14:21:16 -07'00' Dated: 10/19/2016
Commander Brian W. Parker, NOAA
Commanding Officer
Marine Operations Center – Pacific

I. Overview

A. Brief Summary and Project Period

Many species of rockfishes live in complex rocky habitats, have been over-fished, and are difficult or impossible to accurately survey using conventional bottom-trawl gear. Our ability to count these species in rocky habitats and to delineate the distribution and extent of these habitats is critical to the estimation of absolute abundance of these species for stock assessments. To that end, NMFS recognizes the need for more high-resolution mapping of the seafloor and also has initiated the Untrawlable Habitat Strategic Initiative (UHSI) field research in the Southern California Bight.

During this mission, we will 1) acquire high-resolution bathymetric data around the northern Channel Islands using the vessel's ME70 sonar, 2) survey rockfishes and habitats visually using NMFS's Seabed autonomous underwater vehicle (AUV), and 3) survey rockfishes acoustically with the vessel's EK60 fishery echosounder in sync with the ME70. During part of this project, we will rendezvous with R/V *Velero IV* (contracted through NMFS) and use the AUV as part of an underwater experiment to observe and quantify the behavior of rockfishes in reaction to mobile survey vehicles (such as the AUV) as part of NMFS UHSI program.

This is a multi-year collaboration among researchers from the SWFSC, NWFSC, and AFSC, and complements ongoing similar surveys being conducted in shallow water in the Gulf of Mexico as well as ongoing seafloor mapping and habitat surveys being conducted by NOAAs Channel Islands National Marine Sanctuary. The results of this mission will lead to more accurate estimates of demersal fish populations and associated habitats in deep-water, thereby supporting NOAA's objectives to achieve sustainable fisheries and improve our understanding of marine ecosystems. Our findings will improve stock assessments of species in untrawlable habitats, and will assist in the interpretation and understanding of the use of deepwater habitats by demersal fishes. The results of this study will be used to inform additional experiments conducted in FY18 in the Southern California Bight.

B. Days at Sea (DAS)

Of the 12 DAS scheduled for this project, 0 DAS are funded by an OMAO allocation, 12 DAS are funded by a Line Office Allocation, 0 DAS are Program Funded, and 0 DAS are Other Agency funded.

C. Operating Area

The operational area will include the waters in and around the Channel Islands National Marine Sanctuary (San Miguel, Santa Rosa, Santa Cruz, Anacapa, and Santa Barbara Islands); see Appendix 1. The majority of operations will be conducted between 50m and 350m.

D. Summary of Objectives

There are five objectives associated with this project:

1) To collect high-resolution bathymetry data using the ship's ME70.
2) To groundtruth bathymetric data using NMFS' Seabed AUV
3) To conduct visual surveys of groundfishes using NMFS' Seabed AUV.
4) Rendezvous with R/V *Velero IV* (contracted by NMFS) at Footprint study site (Appendix 2),

during which time the AUV will operate as part of an underwater experiment to observe and quantify the behavior of rockfishes in reaction to mobile survey vehicles.

5) To acquire water column data on the presence, relative abundance, and distribution of fishes associated with various seafloor features using the ship's EK60 and ME70.

E. Participating Institutions

NOAA: NMFS – Southwest Fisheries Science Center; Northwest Fisheries Science Center; Deep Sea Coral Research and Technology Program; Untrawlable Habitat Strategic Initiative.
NOS – Office of National Marine Sanctuaries; National Centers for Coastal Ocean Science; Office of Coast Survey.

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

Name (Last, First)	**Title**	**Date Aboard**	**Date Disembark**	**Gender**	**Affiliation**	**Nationality**
Anderson, Jeff	Scientist, AUV	10/17/2016	10/31/2016	Male	Contractor	USA
Campanella, Fabio[1]	Scientist, Fish acoustics	10/18/2016	10/31/2016	Male	Contractor	Italy
Clarke, Elizabeth (Liz)	Scientist, AUV, P.I.	10/17/2016	10/31/2016	Female	NOAA NMFS	USA
Fruh, Erica	Scientist, AUV	10/17/2016	10/31/2016	Female	NOAA NMFS	USA
Husted, Rachel	Scientist, Mapping	10/18/2016	10/31/2016	Female	NOAA NOS	USA
Johnson, Kayla	Scientist, Mapping	10/18/2016	10/31/2016	Female	Contractor	USA
Kracker, Laura	Scientist, Geographer	10/17/2016	10/31/2016	Female	NOAA NOS	USA
Malik, Mashkoor	Hydrographer	10/18/2016	10/31/2016	Male	NOAA NOS	USA
Watters, Diana	Scientist, Fisheries Biologist	10/18/2016	10/31/2016	Female	NOAA NMFS	USA
Whitmire, Curt	Scientist, AUV	10/17/2016	10/31/2016	Male	NOAA NMFS	USA
Yoklavich, Mary	Chief Scientist, Fisheries Biologist	10/18/2016	10/31/2016	Female	NOAA NMFS	USA

G. Administrative

1. Points of Contacts:

Chief Scientist – Mary Yoklavich
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[1] Conditional Foreign National clearance approval for Fabio Campanella received from Michael Shearin on October 4, 2016 for the period October 18-31, 2016.

Mapping Operation Lead – Laura Kracker
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AUV Operation Lead – Liz Clarke
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Operations Officer – LT David Vejar
NOAA Ship *Reuben Lasker*
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2. Diplomatic Clearances

None Required.

3. Licenses and Permits

This project is being conducted under a Scientific Research Permit (U.S.) number CINMS-2016-011 issued to Mary Yoklavich by NOAAs Channel Islands National Marine Sanctuary.

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:

We will transit to the Channel Islands from San Diego on October 19, 2016. The ME70 and EK60 will require some synchronization testing that could be performed in transit to our study sites on the first day. Upon arrival at study site, a patch test of the ME70 and a shakedown deployment of the AUV will take place at a selected location. Following successful testing, mapping operations will commence in one of the priority polygons (Appendix 3) during nighttime hours (1700-0700) and AUV visual surveys will commence in areas of interest during daylight hours (0700-1700). Actual survey locations each day will be made available to the Operations Officer during the daily operations meeting. These locations will be determined based on: sea-state; holidays in multibeam echosounder coverage; features identified in previous bathymetric data; and remaining gaps. An overview of length of lines and estimated time to complete the bathymetric survey in each priority area can be viewed in Appendix 4. Waypoints

for line plans in priority polygons for the bathymetric survey can be viewed in Appendix 5.

Additional AUV surveys will be conducted in conjunction with research being carried out from a contracted research vessel (*Velero IV*) at 100-150 m depth on the Footprint seamount in the gap between Santa Cruz and Anacapa Islands (Appendix 2). Prior to AUV surveys on the Footprint, a long baseline (LBL) acoustic positioning system will be deployed from the ship, which includes 3 seafloor transponders as reference points for improved navigation of the AUV relative to experimental camera systems being used from the *Velero IV*. Once the AUV surveys on the Footprint are complete, these transponders will be retrieved by the *Lasker* (potentially using the small boat).

We also will conduct acoustic surveys of fishes over the Footprint seamount using the ship's EK60 echosounder in sync with the ME70 1-2 times daily during daylight hours. We also are interested in using the Kongsburg Simrad SX90 omnidirectional sonar to help us understand distributions of fishes in the water column, relative to seafloor features.

B. Staging and Destaging:

We request a meeting with the operations officer and the survey techs one day prior to departure. This meeting will cover status and operation of the ME70 and EK60, and launch/retrieval protocols for the AUV. AUV equipment will be loaded on the vessel by ship's crane in San Diego following its arrival (October 14, 2016). We request that some of the AUV gear be craned onto the vessel after unloading from the prior project on Oct 14. The gear will be palletized and staged at dockside and crane operations should take less than 45 min on Oct 14. Destaging of the AUV will occur by ship's crane upon arrival at drydock location on October 30, 2016, and all science gear will be removed from the vessel by October 31, 2016 l. Destaging of AUV gear will require the use of a forklift.

C. Operations to be Conducted:

<u>ME70 Testing and Data Acquisition for Seafloor Mapping.</u>
We will use the ship's integrated ME70-Hypack for data collection, which results in real-time bathymetry, efficient line planning, and good communication with the bridge. This requires an operational bridge/survey monitor setup. A first order task will be to verify installation parameters and ME70 setup. DGPS, POS MV, ME70 and software configurations will be reviewed with survey and electronics technicians to assess DGPS integration with POS MV; reference points / vessel offsets; status of surface sound speed sensor (integration and calibration) and Hypack integration. Specifically, POS MV offsets showing lever arms and mounting angles and sensor mounting will be examined, as well as ME70 offsets applied in the ME70 control software (transducer, GPS and MRU offsets). Ship maneuvers will be required to complete ME70 patch tests – navigation timing, pitch and yaw over a distinct feature and roll over a flat surface with results analyzed in Caris. In addition, comparisons with a reference surface and a GAMS calibration will be conducted. Real time surface sound speed will be checked against water column sound speed from XBT and CTD casts (sound speed corrections to the ME70 will be examined). Water column sound speed will be collected via XBT and/or CTD every four hours or as water conditions change during seafloor mapping. Data processing will include tide corrections and computing total propagated uncertainty. The Caris vessel file will be appended. A survey tech should be available during nighttime mapping as CTD or XBT casts will be conducted. To maintain data quality, it is requested that visiting scientists on the mapping shift be permitted access to the ship network to allow for access across the ME70, XBT and CTD computers. Interference from other sounders and ADCP will be assessed.

Securing these systems during mapping operations may be required.

Seabed AUV Data Acquisition.
We will use the NMFS Seabed AUV and attached cameras and sensors during day to quantitatively survey fishes and habitats in priority areas as designated by the scientific staff. Images of the seafloor will be collected from the AUV using HD downward looking and forward-angled cameras. The AUV will be programmed to survey at a height three meters from the seafloor. Images will be retrieved at the end of each mission. Initial scanning of the images to assess habitat and biota prior to the next day's operation will be the goal. AUV ops will be conducted for approx. 6-7 hrs per deployment (dependent on battery life). Standard Operating Procedures (SOP) for AUV operations can be reviewed in the attached file (see March29_AUV_SOP_Ver2.pdf); the SOP has already been supplied to the ship. All personnel participating in AUV operations should review the SOP. An operational risk assessment for AUV operations also will be provided. The SOP should be reviewed and discussed between AUV team, the ship's operations officer and other appropriate personnel so that any questions about operations can be clarified. At the beginning of the project and before AUV operations, a meeting will occur with all personnel participating in AUV operations to review procedures and risks and to walk through AUV operations. On the first day of the project a trial deployment and ballasting of the AUV should be conducted. Prior to each deployment of the AUV a standard "GAR" (green-amber-red) review will be conducted with all personnel participating in AUV operations to assess and review current risks.

Under normal operations there is no requirement for the ship to maintain a specific station during AUV operations. However, in order to maintain communication with the AUV's acoustic modem and navigational system, the ship may be asked to make adjustments to their position relative to the AUV in order to achieve better communication with the AUV. A monitor that will show the relative position of the AUV and ship will be placed on the bridge to facilitate communication between the bridge and AUV operator. The AUV Team uses two modes of acoustic communications during an AUV mission. One form is an ultra-short baseline (USBL) relative navigation system. We use a Link Quest, Inc. TrackLink 1500MA system, which includes a transceiver mounted on the ship below the water line, and a transponder mounted on the AUV. The USBL system provides measures of relative range and bearing to the ship along with estimates of vehicle depth, via transducers operating at a frequency range of 31.0 - 43.2 kHz. The transceiver is ideally mounted in a location free from any line-of-sight obstructions (e.g., ship's keel) and in a location where bubbles are minimized (e.g., hydrophone pole, keel center board). For both the NOAA Ship *Shimada* and *Lasker*, we prefer to use the ship's center board as installation because it is most secure, minimizes potential entanglements with other equipment deployed aside the ship, and provides optimum line-of-sight communications. For the *Lasker*, we hope to use the spare transducer-mounting hole in the centerboard trunk (aft section). We had a Delrin adapter plate and backing ring fabricated to specifications provided by David Murfiin (NOAA-SWFSC) that will allow our transceiver to be mounted such that the transducer face is flush with the bottom plate of the centerboard. An electrical cable that runs from the centerboard up through the multi-cable transit and into the Chem Lab will provide power and communications. David Murfin informed us that this cable is already installed and runs between the centerboard and Chem Lab. The dry end of the cable, located in the Chem Lab, will be connected to a power supply and network interface provided by the AUV Team.

The second form of acoustic communications is an acoustic modem to provide control and telemetry packets to and from the AUV topside electronics unit and AUV onboard computers. We typically use paired ITC-3013 model transducers. Similar to the USBL, one transducer is mounted on the ship below the water line, while another one is mounted on the AUV. As with the USBL communications, optimum installation should be in a location to provide line-of-sight and minimization of bubbles. During a project aboard the *Shimada* in September 2015, we were able to use their EdgeTech 8012A transducer for one of the modem pairs. It was mounted on the aft section of the ship's centerboard. In our topside electronics set up, we use a Woods Hole Oceanographic Institution (WHOI) built ACOMMS communications terminal

to connect the electrical cables providing power and communications to the acoustic modem. During the *Shimada* project, we attached pigtails to the electrical cable routed from the centerboard up to the Chem Lab, so that we could connect it to our WHOI ACOMMS terminal box. We understand the *Lasker* has the same EdgeTech transducer model (81012A) installed on its centerboard, so we hope to use it in much the same way we did on the *Shimada*. If that is not possible, we also have mooring whips where we can dangle one of our ITC-3013 transducers over the side of the ship to provide acoustic modem communications. While this is not our preferred set up, we did successfully implement this on the *Shimada* last fall.

AUV mission plans, including launch and recovery locations, expected surfacing locations, and dive duration will be made available to the ship's and science crews prior to launch. It is expected that AUV launch operations will require approximately 45 minutes once all crew is mustered and the ship is on station. Recovery operations can be expected to take 60 minutes depending on sea state. It is requested that a CTD cast be conducted in the AUV's operating area prior to launch and the cast data provided to the AUV team for programming of the AUV.

Data products generated by the AUV will be coordinated with the science staff.

D. Dive Plan

All dives are to be conducted in accordance with the requirements and regulations of the NOAA Diving Program (http://www.ndc.noaa.gov/dr.html) and require the approval of the ship's Commanding Officer.

Dives are not planned for this project.

E. Applicable Restrictions

Conditions that preclude normal operations:
Equipment failure: Mitigation – at sea repair, refocus acquisition to remaining systems.
Poor weather: Mitigation – switch to more protected area or suspend operations.
Safety concerns: Mitigation – discuss at safety briefing or with ship's command.

III. Equipment

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

1) Dynamic Positioning System:
2) Hand held radios for communications among science crew, bridge and deck.
3) Capability for science party to communicate with another research vessel to coordinate operations between the two vessels.
4) Monitor, computer, keyboard and launcher for XBT. WinMK21 software (associated with launcher) for capturing XBT data. Pydro/Velocipy software, installed on computer in acoustics lab network, to convert sound velocity profiles.
5) Simrad ME70, EK60 (18, 38, 70, 120 and 200 kHz), Kongsburg Simrad SX90 omnidirectional sonar
6) Access to information on DGPS integration with POS MV; reference points / vessel offsets; ship surveys; status of surface sound speed sensor (integration and calibration) and Hypack integration with ME70.
7) Access to the ship network across the ME70, XBT and CTD computers.
8) Survey support (24 hours) to conduct CTD and XBT casts (every 4 hours while mapping is

in progress), AUV launch/recovery, and data processing.
9) Ship's time server
10) CTD and CTD Winch
11) Telescopic boom crane (Aft Deck) for AUV launch and recovery
12) ADCP required for AUV ops.
13) AUV needs heading and will run feeds from Science lab to Bridge.
14) May need ship's utility boat RL-2 to assist in retrieval of AUV
15) Access to the ship's centerboard to mount AUV USBL transceiver (AUV team to provide mounts), which will plug into ship's existing USBL wire (run previously by SWFSC to lab area). Details on p. 6.
16) Access in lab area to unterminated end of wire from Edgetech Acoustic modem that is mounted in the ship's centerboard. AUV team will provide deck box and connectors AND positive and negative leads from the Edgetech transducer labelled on the unterminated wire.

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

1) Seabed AUV: 6'H X 4.5'W X 6.5'L; 650 lbs.
   a. Two banks of 12 Lithium Ion Batteries enclosed in aluminum housings and 2 spare batteries contained in sturdy plastic container and wrapped in bubble wrap
2) Transducers to track and communicate with AUV, mounted to ship (details on p. 6).
3) 2-3 VHF antennas will be mounted on ship to track AUV at surface. Wire will be run (and secured out of the way using cable ties) to high points on the vessel (both port and starboard), and the antennas will be securely attached with cable ties.
4) Long baseline (LBL) transponders to improve AUV navigation
5) AUV crew supplied handheld radios
6) Charging Console
   a. Dimensions: 1m x 1m x 1m
   b. Power Requirements: Clean AC
   c. Cable Connection: Standard Ethernet.
7) Equipment for AUV operation and other assorted spares (See Appendix 6)
8) Mission Planning and Data Processing laptop computers
9) software: CARIS, ArcGIS

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 HAZMAT material will be maintained in the chem lab.
- 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**
Lithium Ion Batteries 12-cell NL2044 family	26	24 contained in aluminum housings, 2 contained in sturdy plastic container and wrapped in bubble wrap	Elizabeth Clarke	B
Parker O Ring lube	500ml	O ring lube	Elizabeth Clarke	B
Ethanol	1 liter	Cleaning O rings	Elizabeth Clarke	B
Corrosion X	500ml	Clean connectors	Elizabeth Clarke	B
Dow Corning 11 Valve Lubricant	500ml	Lubricating Underwater connectors	Elizabeth Clarke	B
Aqualube	500ml	Protecting underwater connectors	Elizabeth Clarke	B
LPS	250ml	Protecting and cleaning electronic connections	Elizabeth Clarke	B

C. Chemical safety and spill response procedures

Spill Control B:
☐Inhalation: Remove from exposure, rest and keep warm.
☐Skin contact: Wash off skin thoroughly with water. Remove contaminated clothing and wash before reuse.
☐Eye contact: Irrigate thoroughly with water for at least 15 minutes
☐Ingestion: Wash out mouth thoroughly with water and give plenty of water to drink.
☐Fire:

- Extinguishing Media Use appropriate extinguishing agent for surrounding fire. For damaged or ruptured cells, use Class D extinguisher or other appropriate agent. Class C fire extinguishers should be used to extinguish electrical fires. Do not use water to extinguish electrical or ruptured cell related fires. Firefighters should wear full protective gear.

☐Spill: Clean-Up Procedures: Absorb spill with inert absorbent material (cat litter). Shovel material into appropriate container for disposal. Clean spill area with detergent and water; collect wash water for proper disposal.

Inventory of Spill Kit supplies

Product Name	Amount	Chemicals it is useful against	Amount it can clean up
Kat Litter	10 lbs	Lithium Ion Batteries, liquid spills	24 kg

D. Radioactive Materials

No Radioactive Isotopes are planned for this project.

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*

The science party will require access to the science network for transferring data. The scientists will be responsible for providing data archives to NCEI as part of the R2R, within 12 months of the completion of the project. In order for this to be accomplished, five scientist Government computers will need network access to the ship's data storage device so that the data can be moved from the acquisition computer to storage, and subsequently accessed by other Government computers tasked with data post-processing.

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 on 14 October 2016. 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 conducting 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 https://sites.google.com/a/noaa.gov/omao-intranet-dev/operations/marine/customer-satisfaction-survey and provides a "Submit" button at the end of the form. It is also located at https://docs.google.com/a/noaa.gov/forms/d/1a5hCCkgIwaSII4DmrHPudAehQ9HqhRqY3J_FXqbJp9g/viewform. 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 forms should be sent to the Regional Director of Health Services at the applicable Marine Operations Center. The NHSQ and Tuberculosis Screening Document 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 should health services require it, 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 – Pacific
2002 SE Marine Science Dr.
Newport, OR 97365
Telephone 541-867-8822
Fax 541-867-8856
Email MOP.Health-Services@noaa.gov

Note: All participating scientists on RL-16-06 have been medically cleared by the Regional Director of Health Services.

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.

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 email 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 through the ship's Commanding Officer 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.

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 email generated by the Servicing Security Office granting approval for the foreign national guest's visit. (For NMFS-sponsored guests, this email will be transmitted by FNRS.) This email 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 email 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.

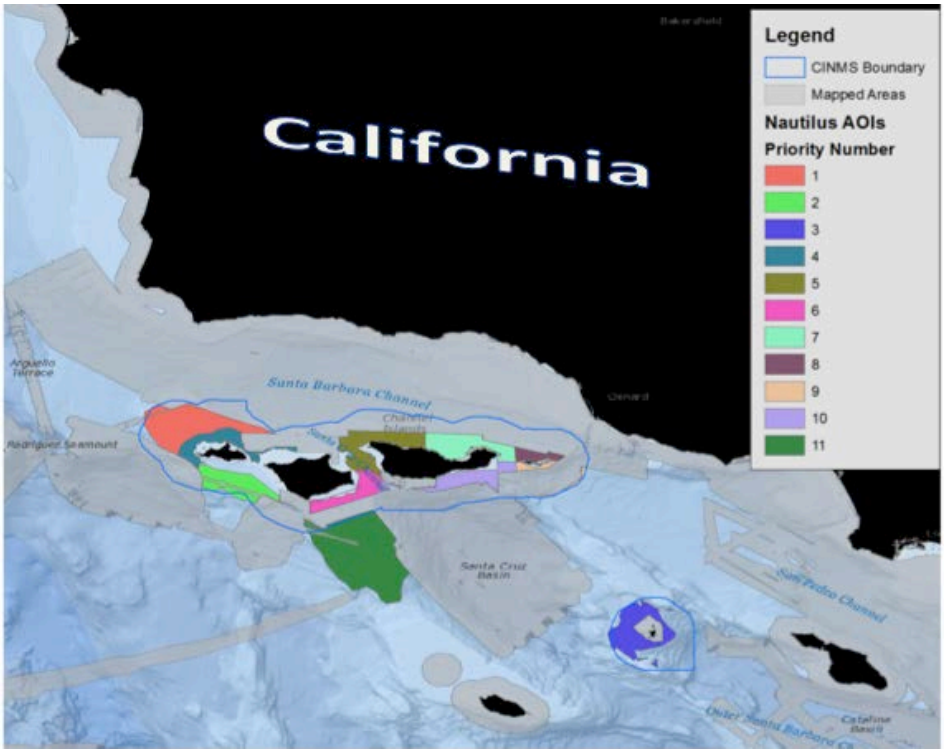
Responsibilities of the Foreign National Sponsor:

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

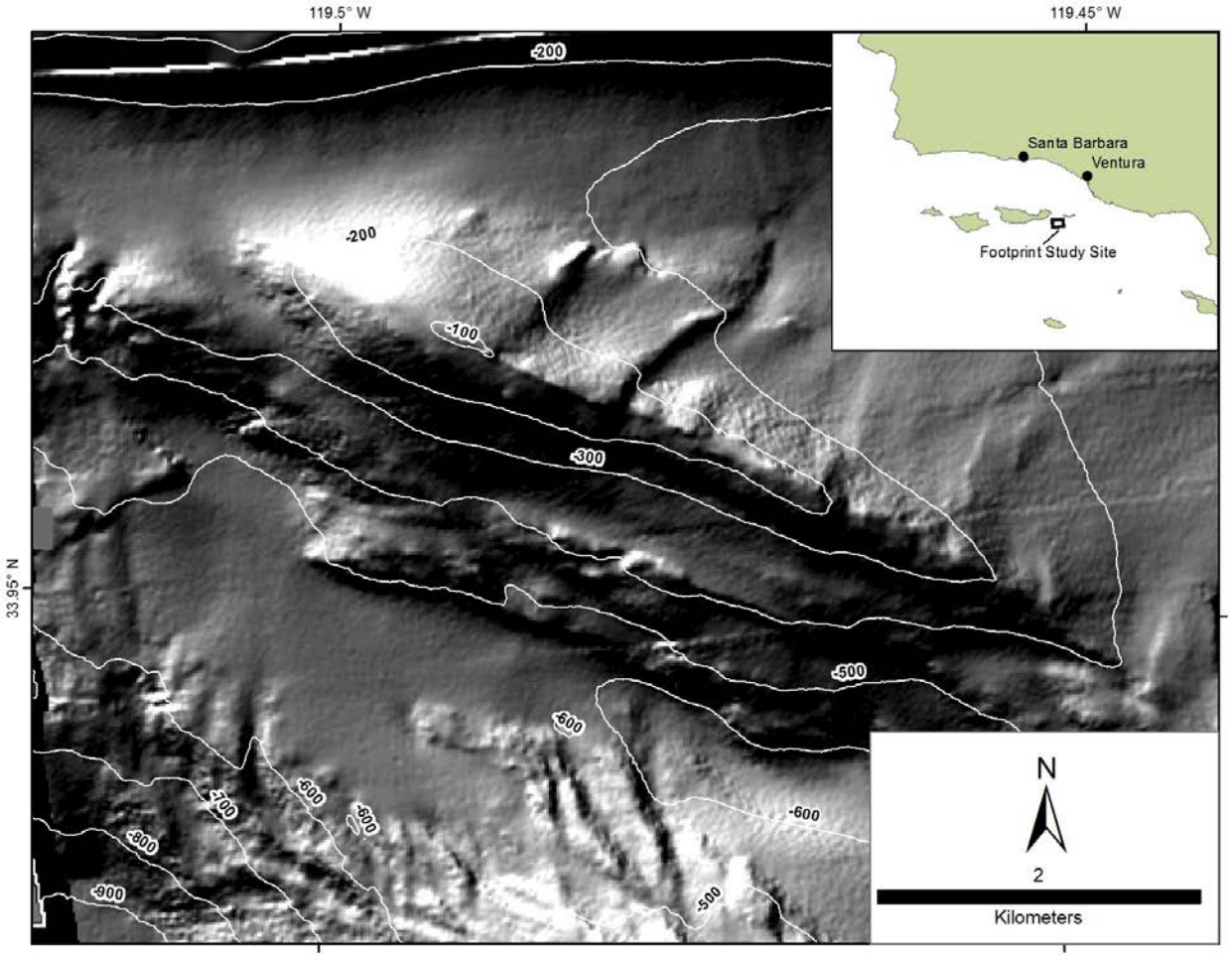
a U.S. citizen and a NOAA or DOC employee. According to DOC/OSY, this requirement cannot be altered.

3. Ensure completion and submission of Appendix C (Certification of Conditions and Responsibilities for a Foreign National

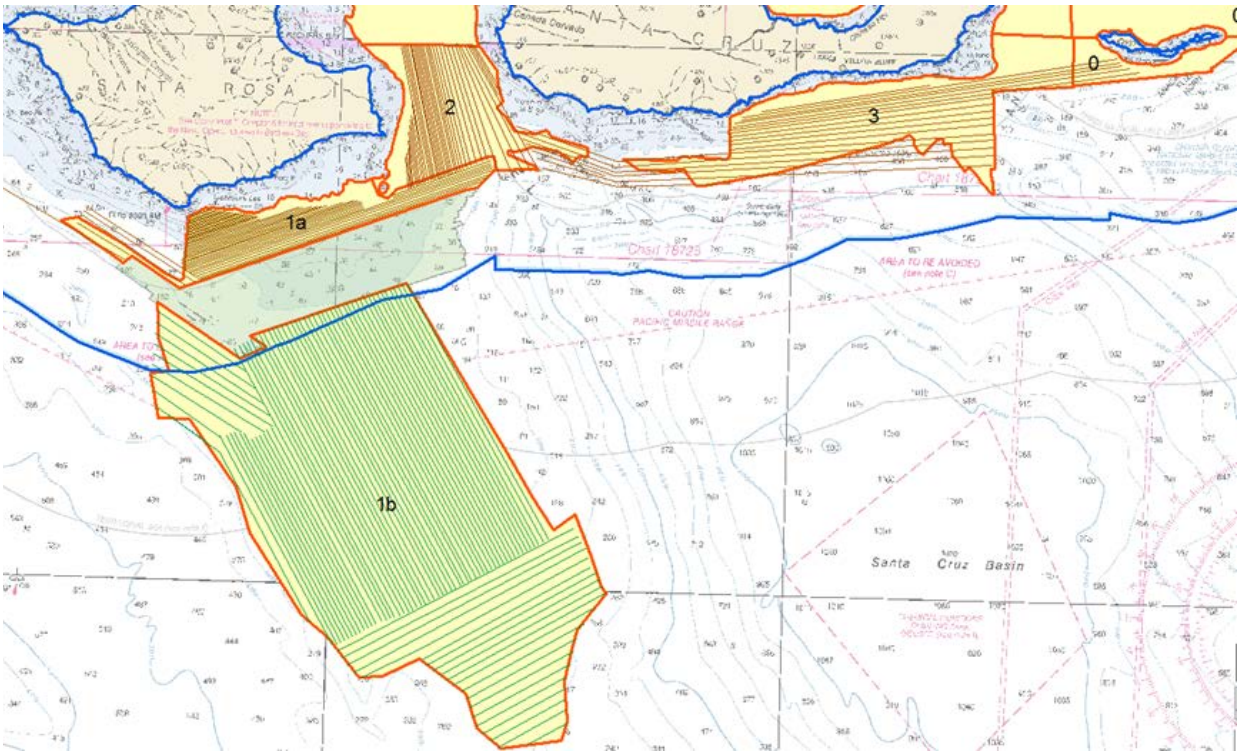
IX. Appendices



Appendix 1. Study area in vicinity of northern Channel Islands in Southern California Bight. Various colored polygons are areas where we will conduct seafloor mapping and visual surveys with an autonomous underwater vehicle (AUV).



Appendix 2. Footprint Seamount study area located in the gap between Santa Cruz and Anacapa Islands in Southern California Bight. We will conduct visual surveys with an autonomous underwater vehicle (AUV) at depths 100-150 m.



Appendix 3. Map of line plans for mapping survey to be conducted using the ME70 sonar off Santa Rosa I. (1a), on Santa Rosa Flats (1b), between Santa Rosa and Santa Cruz Islands (2), and south of Santa Cruz and Anacapa Islands (3).

Appendix 4. Overview of line planning information for priority areas of the bathymetric survey.

	Min depth (fa)	Min depth (m)	LineSet	# Lines	Total Length (km)	Ave. Length (km)	Total Length (nmi)	Ave. Length (nmi)	Est. time (hrs) @ 7 kts	Total time (hrs) plus 10%	Total time (half days)	Description
1a	20	38	Priority1a_ RL1702	47	411.2	8.7	222.0	4.7	31.7	34.9	***2.9***	SE of Santa Rosa/Flats
1b	56	100	Priority1b_ RL1702	82	1354.9	16.5	731.6	8.9	104.5	115.0	***9.6***	Santa Rosa Flats
2	30	55	Priority3_R L1702	38	279.1	7.3	150.7	4.0	21.5	23.7	***2.0***	Santa Cruz Channel (south)
3	30	55	Priority4_R L1702	18	415.1	23.1	224.6	12.5	32.1	35.3	***2.9***	S of Santa Cruz

Appendix 5. Waypoints for line plans of priority polygons for mapping survey to be conducted in the northern Channel Islands.

FID	Name	LAT	LONG	Priority1a_line
0	4_0	33.861198	-120.154999	4
1	4_1	33.904999	-120.251000	4
2	5_2	33.882900	-120.191002	5
3	5_3	33.864300	-120.151001	5
4	7_4	33.887699	-120.186997	7
5	7_5	33.846699	-120.110001	7
6	8_6	33.848499	-120.102997	8
7	8_7	33.890801	-120.186997	8
8	10_8	33.893299	-120.183998	10
9	10_9	33.850300	-120.098999	10
10	11_10	33.896500	-120.028999	11
11	11_11	33.870300	-120.111000	11
12	1_12	33.889500	-120.106003	1
13	1_13	33.893601	-120.093002	1
14	2_14	33.887798	-120.109001	2
15	2_15	33.893398	-120.091003	2
16	42_16	33.886902	-120.109001	42
17	42_17	33.893299	-120.088997	42
18	43_18	33.886002	-120.109001	43
19	43_19	33.893101	-120.086998	43
20	44_20	33.885101	-120.109001	44
21	44_21	33.892899	-120.084999	44
22	45_22	33.884201	-120.109001	45
23	45_23	33.892700	-120.083000	45
24	46_24	33.883301	-120.109001	46
25	46_25	33.892601	-120.081001	46
26	48_26	33.882401	-120.109001	48
27	48_27	33.892399	-120.078003	48
28	49_28	33.881500	-120.110001	49
29	49_29	33.892201	-120.075996	49
30	30_30	33.880501	-120.110001	30
31	30_31	33.891998	-120.073998	30
32	33_32	33.879601	-120.110001	33
33	33_33	33.891800	-120.071999	33
34	34_34	33.878799	-120.110001	34
35	34_35	33.891602	-120.070000	34
36	35_36	33.877899	-120.110001	35
37	35_37	33.891300	-120.068001	35
38	36_38	33.876999	-120.110001	36
39	36_39	33.891300	-120.066002	36
40	37_40	33.876202	-120.110001	37
41	37_41	33.891300	-120.063004	37

42	38_42	33.875301	-120.110001	38
43	38_43	33.890900	-120.061997	38
44	39_44	33.874500	-120.110001	39
45	39_45	33.890499	-120.059998	39
46	40_46	33.873501	-120.110001	40
47	40_47	33.890301	-120.058998	40
48	41_48	33.872601	-120.110001	41
49	41_49	33.889702	-120.057999	41
50	31_50	33.871399	-120.111000	31
51	31_51	33.888802	-120.056999	31
52	13_52	33.867901	-120.112000	13
53	13_53	33.897301	-120.018997	13
54	9_54	33.869202	-120.111000	9
55	9_55	33.896599	-120.025002	9
56	24_56	33.866798	-120.112000	24
57	24_57	33.897598	-120.014999	24
58	26_1_58	33.864601	-120.112000	26_1
59	26_1_59	33.897900	-120.007004	26_1
60	25_60	33.865601	-120.112000	25
61	25_61	33.897598	-120.012001	25
62	27_62	33.863201	-120.112999	27
63	27_63	33.900398	-119.996002	27
64	28_64	33.862202	-120.112999	28
65	28_65	33.901600	-119.988998	28
66	29_66	33.861099	-120.112999	29
67	29_67	33.901600	-119.985001	29
68	20_68	33.860100	-120.112999	20
69	20_69	33.901199	-119.983002	20
70	21_70	33.859100	-120.112999	21
71	21_71	33.900501	-119.982002	21
72	22_72	33.858101	-120.112999	22
73	22_73	33.899399	-119.982002	22
74	23_74	33.856899	-120.112000	23
75	23_75	33.898300	-119.981003	23
76	19_76	33.856098	-120.110001	19
77	19_77	33.897301	-119.980003	19
78	14_78	33.855202	-120.109001	14
79	14_79	33.925301	-119.888001	14
80	15_80	33.854302	-120.107002	15
81	15_81	33.924099	-119.887001	15
82	17_82	33.852501	-120.102997	17
83	17_83	33.920300	-119.889000	17
84	16_84	33.853500	-120.105003	16
85	16_85	33.922401	-119.887001	16
86	18_86	33.851399	-120.100998	18
87	18_87	33.918201	-119.889999	18

88	32_88	33.850601	-120.098999	32
89	32_89	33.915699	-119.892998	32
90	6_90	33.905499	-119.959999	6
91	6_91	33.928299	-119.888001	6
92	12_92	33.903999	-119.959999	12
93	12_93	33.926800	-119.888001	12

FID	Name	LAT	LONG	Priority1b_line
0	27_0	33.851898	-119.947998	27
1	27_1	33.697399	-119.837997	27
2	16_2	33.851002	-119.950996	16
3	16_3	33.695900	-119.842003	16
4	17_4	33.850102	-119.954002	17
5	17_5	33.693802	-119.845001	17
6	18_6	33.849201	-119.958000	18
7	18_7	33.692600	-119.848000	18
8	19_8	33.848301	-119.960999	19
9	19_9	33.691200	-119.850998	19
10	20_10	33.847401	-119.963997	20
11	20_11	33.689999	-119.853996	20
12	21_12	33.846500	-119.967003	21
13	21_13	33.688702	-119.857002	21
14	22_14	33.845699	-119.970001	22
15	22_15	33.687401	-119.860001	22
16	23_16	33.844700	-119.973000	23
17	23_17	33.685902	-119.862000	23
18	2_18	33.843800	-119.975998	2
19	2_19	33.684601	-119.864998	2
20	3_20	33.842800	-119.978996	3
21	3_21	33.683300	-119.867996	3
22	4_22	33.841900	-119.983002	4
23	4_23	33.682098	-119.871002	4
24	5_24	33.841000	-119.986000	5
25	5_25	33.680801	-119.874001	5
26	6_26	33.840000	-119.988998	6
27	6_27	33.679501	-119.876999	6
28	7_28	33.839100	-119.991997	7
29	7_29	33.678200	-119.878998	7
30	8_30	33.838100	-119.995003	8
31	8_31	33.676601	-119.882004	8
32	9_32	33.837200	-119.998001	9
33	9_33	33.675400	-119.885002	9
34	10_34	33.836201	-120.001000	10
35	10_35	33.674301	-119.888001	10
36	11_36	33.835300	-120.003998	11

37	11_37	33.672798	-119.890999	11
38	12_38	33.834301	-120.007004	12
39	12_39	33.671398	-119.893997	12
40	13_40	33.833302	-120.010002	13
41	13_41	33.670200	-119.896004	13
42	14_42	33.832298	-120.013001	14
43	14_43	33.668900	-119.899002	14
44	15_44	33.831299	-120.015999	15
45	15_45	33.667599	-119.902000	15
46	1_46	33.830200	-120.019997	1
47	1_47	33.665798	-119.904999	1
48	28_48	33.829201	-120.023003	28
49	28_49	33.664200	-119.907997	28
50	36_50	33.828201	-120.026001	36
51	36_51	33.663101	-119.911003	36
52	37_52	33.827202	-120.028999	37
53	37_53	33.661701	-119.914002	37
54	38_54	33.826302	-120.031998	38
55	38_55	33.660702	-119.917000	38
56	39_56	33.825100	-120.036003	39
57	39_57	33.658501	-119.920998	39
58	40_58	33.824200	-120.039002	40
59	40_59	33.657299	-119.924004	40
60	41_60	33.823200	-120.042999	41
61	41_61	33.655800	-119.927002	41
62	42_62	33.821999	-120.045998	42
63	42_63	33.655201	-119.930000	42
64	43_64	33.820599	-120.049004	43
65	43_65	33.653500	-119.932999	43
66	44_66	33.819099	-120.052002	44
67	44_67	33.651798	-119.935997	44
68	45_68	33.817699	-120.055000	45
69	45_69	33.650299	-119.939003	45
70	46_70	33.816299	-120.057999	46
71	46_71	33.649799	-119.942001	46
72	47_72	33.814800	-120.060997	47
73	47_73	33.647701	-119.945000	47
74	48_74	33.813400	-120.064003	48
75	48_75	33.647301	-119.948998	48
76	49_76	33.811901	-120.067001	49
77	49_77	33.646599	-119.952004	49
78	50_78	33.810501	-120.070000	50
79	50_79	33.645599	-119.955002	50
80	51_80	33.808998	-120.072998	51
81	51_81	33.644501	-119.959000	51
82	52_82	33.761299	-120.043999	52

83	52_83	33.642799	-119.962997	52
84	53_84	33.759701	-120.046997	53
85	53_85	33.641499	-119.966003	53
86	54_86	33.757801	-120.050003	54
87	54_87	33.640099	-119.968002	54
88	55_88	33.756401	-120.052002	55
89	55_89	33.638802	-119.971001	55
90	56_90	33.755100	-120.055000	56
91	56_91	33.637402	-119.973999	56
92	57_92	33.753700	-120.057999	57
93	57_93	33.636101	-119.976997	57
94	58_94	33.757401	-120.064003	58
95	58_95	33.634701	-119.980003	58
96	59_96	33.757000	-120.067001	59
97	59_97	33.633400	-119.982002	59
98	60_98	33.757500	-120.070999	60
99	60_99	33.632000	-119.985001	60
100	61_100	33.756901	-120.073998	61
101	61_101	33.630699	-119.987999	61
102	62_102	33.755699	-120.077004	62
103	62_103	33.629299	-119.990997	62
104	29_104	33.755402	-120.081001	29
105	29_105	33.629700	-119.995003	29
106	65_106	33.830101	-120.129997	65
107	65_107	33.794701	-120.063004	65
108	66_108	33.823601	-120.129997	66
109	66_109	33.784699	-120.056000	66
110	67_110	33.817101	-120.130997	67
111	67_111	33.775501	-120.050003	67
112	68_112	33.810600	-120.130997	68
113	68_113	33.768601	-120.044998	68
114	69_114	33.804298	-120.132004	69
115	69_115	33.762100	-120.042999	69
116	70_116	33.797699	-120.132004	70
117	70_117	33.757999	-120.047997	70
118	71_118	33.790699	-120.132004	71
119	71_119	33.757599	-120.065002	71
120	72_120	33.781502	-120.129997	72
121	72_121	33.754501	-120.081001	72
122	73_1_122	33.751000	-120.091003	73_1
123	73_1_123	33.642700	-120.011002	73_1
124	63_124	33.626099	-119.990997	63
125	63_125	33.705399	-119.820999	63
126	64_126	33.621899	-119.987000	64
127	64_127	33.700600	-119.817001	64
128	75_128	33.617600	-119.983002	75

129	75_129	33.696701	-119.814003	75
130	76_130	33.613499	-119.977997	76
131	76_131	33.693199	-119.810997	76
132	77_132	33.610298	-119.972000	77
133	77_133	33.687401	-119.808998	77
134	78_134	33.622101	-119.929001	78
135	78_135	33.681900	-119.806999	78
136	79_136	33.618401	-119.926003	79
137	79_137	33.678700	-119.802002	79
138	80_138	33.615601	-119.920998	80
139	80_139	33.674500	-119.800003	80
140	81_140	33.612801	-119.916000	81
141	81_141	33.670399	-119.797997	81
142	82_142	33.610100	-119.911003	82
143	82_143	33.666199	-119.795998	82
144	83_144	33.607399	-119.905998	83
145	83_145	33.657501	-119.803001	83
146	84_146	33.603901	-119.899002	84
147	84_147	33.647099	-119.809998	84
148	85_148	33.599300	-119.894997	85
149	85_149	33.637600	-119.816002	85
150	86_150	33.593601	-119.892998	86
151	86_151	33.630100	-119.818001	86
152	87_152	33.588100	-119.889999	87
153	87_153	33.622501	-119.820000	87
154	88_154	33.582600	-119.888001	88
155	88_155	33.614498	-119.821999	88
156	89_156	33.578098	-119.883003	89
157	89_157	33.607498	-119.822998	89
158	90_158	33.574101	-119.876999	90
159	90_159	33.600700	-119.822998	90
160	91_160	33.570099	-119.871002	91
161	91_161	33.594002	-119.822998	91
162	92_162	33.572899	-119.848999	92
163	92_163	33.586102	-119.821999	92

FID	Name	LAT	LONG	Priority2_line
0	34_0	33.998001	-119.910004	34
1	34_1	33.922199	-119.859001	34
2	35_2	33.997601	-119.913002	35
3	35_3	33.920700	-119.863998	35
4	36_4	33.999500	-119.916000	36
5	36_5	33.919399	-119.873001	36

6	32_6	33.998402	-119.917999	32
7	32_7	33.916699	-119.880997	32
8	14_8	33.998001	-119.919998	14
9	14_9	33.928501	-119.890999	14
10	15_10	33.997700	-119.922997	15
11	15_11	33.927101	-119.894997	15
12	16_12	33.997398	-119.926003	16
13	16_13	33.925999	-119.899002	16
14	17_14	33.997398	-119.928001	17
15	17_15	33.924198	-119.903000	17
16	18_16	33.997299	-119.931000	18
17	18_17	33.923000	-119.905998	18
18	19_18	33.997002	-119.933998	19
19	19_19	33.921902	-119.908997	19
20	8_20	33.997101	-119.935997	8
21	8_21	33.921299	-119.911003	8
22	9_22	33.996899	-119.936997	9
23	9_23	33.920502	-119.913002	9
24	10_24	33.997002	-119.939003	10
25	10_25	33.919998	-119.915001	10
26	11_26	33.997002	-119.941002	11
27	11_27	33.919300	-119.916000	11
28	12_28	33.997101	-119.942001	12
29	12_29	33.918800	-119.917999	12
30	13_30	33.996800	-119.944000	13
31	13_31	33.918400	-119.919998	13
32	2_32	33.996601	-119.945000	2
33	2_33	33.917900	-119.920998	2
34	3_34	33.996700	-119.945999	3
35	3_35	33.917500	-119.922997	3
36	4_36	33.996800	-119.947998	4
37	4_37	33.917099	-119.924004	4
38	5_38	33.996899	-119.948998	5
39	5_39	33.916401	-119.926003	5
40	6_40	33.997101	-119.949997	6
41	6_41	33.916000	-119.927002	6
42	7_42	33.997200	-119.952004	7
43	7_43	33.915501	-119.929001	7
44	20_44	33.996899	-119.953003	20
45	20_45	33.915199	-119.931000	20
46	21_46	33.996601	-119.955002	21
47	21_47	33.914700	-119.931999	21
48	22_48	33.996300	-119.957001	22
49	22_49	33.914002	-119.933998	22
50	23_50	33.960899	-119.947998	23
51	23_51	33.913300	-119.936997	23

52	24_52	33.954498	-119.947998	24
53	24_53	33.912701	-119.938004	24
54	25_54	33.951801	-119.947998	25
55	25_55	33.912300	-119.940002	25
56	26_56	33.948700	-119.948998	26
57	26_57	33.911701	-119.942001	26
58	27_58	33.944000	-119.948998	27
59	27_59	33.911202	-119.943001	27
60	28_60	33.939098	-119.948998	28
61	28_61	33.910702	-119.945000	28
62	29_62	33.934101	-119.949997	29
63	29_63	33.910301	-119.945999	29
64	30_64	33.931099	-119.949997	30
65	30_65	33.909901	-119.946999	30
66	31_66	33.928799	-119.950996	31
67	31_67	33.909401	-119.948998	31
68	38_68	33.998402	-119.907997	38
69	38_69	33.923698	-119.853996	38
70	39_70	33.998699	-119.906998	39
71	39_71	33.968601	-119.884003	39
72	40_72	33.998901	-119.904999	40
73	40_73	33.968700	-119.882004	40
74	41_74	33.997898	-119.903000	41
75	41_75	33.970299	-119.882004	41

FID	Name	LAT	LONG	Priority3_line
0	1_0	33.945900	-119.866997	1
1	1_1	33.948799	-119.519997	1
2	2_2	33.942200	-119.865997	2
3	2_3	33.944401	-119.518997	2
4	3_4	33.939301	-119.862999	3
5	3_5	33.939201	-119.518997	3
6	4_6	33.935001	-119.858002	4
7	4_7	33.920700	-119.803001	4
8	5_8	33.930698	-119.853996	5
9	5_9	33.933300	-119.519997	5
10	6_10	33.924801	-119.849999	6
11	6_11	33.917900	-119.712997	6
12	7_12	33.949600	-119.871002	7
13	7_13	33.952702	-119.519997	7
14	8_14	33.939201	-119.713997	8
15	8_15	33.958500	-119.521004	8
16	9_16	33.942200	-119.714996	9

17	9_17	33.962799	-119.521004	9
18	9_1_18	33.944401	-119.713997	9_1
19	9_1_19	33.966999	-119.519997	9_1
20	10_20	33.946999	-119.713997	10
21	10_21	33.971001	-119.521004	10
22	11_22	33.949200	-119.713997	11
23	11_23	33.974999	-119.521004	11
24	12_24	33.952801	-119.710999	12
25	12_25	33.994499	-119.420998	12
26	13_26	33.955002	-119.709999	13
27	13_27	33.996498	-119.427002	13
28	13_1_28	33.957199	-119.705002	13_1
29	13_1_29	33.998299	-119.428001	13_1
30	14_30	33.958901	-119.705002	14
31	14_31	34.000301	-119.431000	14
32	15_32	33.963001	-119.690002	15
33	15_33	33.981602	-119.567001	15
34	16_34	33.950802	-119.713997	16
35	16_35	33.992401	-119.414002	16

Appendix 6. Packing list for AUV equipment and spares.

Item	stock	model_number	CD number
AUV01 (gray coffin) 94"x27"x34”H			
line- poly and nylon			
AUV frame top pontoon	1		CD0004092881
Chassis (CPU)	1		CD0004092884
CPU housing	1		CD0004092882
Octans	1	CT-1489	CD0001674020
Octans Housing	1		CD0004074983
Props - Mejzlik Modellbau 24 x 12W	3	PMK2412WT	
6' to 14' boat hooks with hook adapter	7		
59in to 144in boat hook with happy hooker attached	1		
Thruster	1		CD0004074984
Thruster	1		CD0004074977
Skins- molded plastic	4		
Ship RF antenna	2		
AUV RF antenna	1		
Hemisphere GPS	1	V102 (PN804-0075-000#RevB)	
AUV02 (black coffin) 94"x27"x34”H			
AUV frame bottom pontoon	1		CD0004092881
Parosci	1	118756	CD0004074979
11 mp Nikon DX camera (C5)	1	GE4000C	CD0001724939
RF antennas pouch(CRED16)	1		
wooden cradle board	1		
ADCP (Teledyne RDI)	1	WHN1200-1-UG48	CD0004074963
USBL to AUV mounting kit (2parts and hose clamps)	1		
Acoustic Modem transducer head (on vehicle)	1		
Thruster	1		CD0004074985
strobe in housing	1		
connectors toolbox (pins and crimps)			
Brother Ptouch label maker (1/4 to 3/4 tz tapes)			
C', AA and AAA alkaline batteries- NOT RESTRICTED	20		
CPC connectors, pins and crimpers			
Gige vision camera - Allied Vision	1	GC2440C	CD0004074972
Gige vision camera - Allied Vision	1	GC2440C	CD0004074970
Acoustic Modem transducer head with cable for pole	1		
struts containing cables	2		
line - poly and nylon			

USBL cable for pole	1		
RF coax cable	1		
AUV03 (purple coffin) 94"x27"x34”H			
Teledyne TR-6001-17 Transponder (Larry)	1	TR-6001	CD0004074967
Teledyne TR-6001-17 Transponder (Moe)	1	TR-6001	CD0004074968
Teledyne TR-6001-17 Transponder (Curly)	1	TR-6001	CD0004074969
spectra line (400')	1		
floats	1		
LBL manual and spare parts	1		
Tote 305 (black) 47"x39"x42"H			
USBL Black case (TrackLink 1500 USBL)			
Transceiver (TC1500MA)	1		CD000160323?
Transponder (TN1510B)	1		CD00016092??
cable (power/serial to USBL) (short)	1		
Acoustic Modem transducer head (Y)	1	ITC3013	CD0004074980
Acoustic Modem transducer head (Z)	1	ITC3013	CD0004074981
Monitor pelican case			
HP Officejet H470	1		
Monitor	1		CD0001733799
UPS	1		
Spare Cable Pelican			
spare vehicle cables	6		
dummy plugs	20		
CTD wire whips	2	SBE 17031	
aluminum calibration target and bag	1		
spare Thruster	1		
spare Thruster	1		
spare Thruster	1		
stools	4		
aluminium mounts	8		
Tote 304 (white) 43"x48"x31"H			
Control Box for LBL	1		CD0000475004
stainless steel hardware	1000		
raingear and clothing	2		
Prop case	1		
Props - Mejzlik Modellbau 24 x 12W	10	PMK2412WT	
Box of kimwipes	2		
PPE	8		
spare electronics chassis- parts only	1		

Vacuum Pump- Gast (PIFSC)	1
Electronics Toolbox (CRED09)	
Multi-Tester	1
Soldering Iron	1
Wedges for opening housings (plastic)	2
Solder (60 tin 40 lead)	2
Scotch Linerless Rubber Splicing Tape	1
hard hat	4
Tote 306 (black) 47"x39"x42"H	
Deck Cable Pelican	
spare deck cables	3
rolled steel drop weights	12
Square Pelican	
shrink wrap (various sizes)	1
Wire assorted sizes and colors	1
Pipe Cleaners	4
Banana Connectors	9
Alligator Clips	10
hose clamps	60
Electronics Pelican	
USB to serial adapters	8
Wire multipurpose	8
null modem adapter (M to F)	8
gender changers (9-pin F to M)	8
gender changers (9-pin to F)	8
USB cables	8
Serial 9-pin F to serial 25-pin M	8
serial 9-pin M to serial 25-pin F	8
shear pins for props (Formalium)	8
backing screws to hold thruster together (#6x32x3/4)	8
cotter pins	8
bearings (full ceramic)	8
Ethernet cables	8
Monitor Cable (VGA male male 25ft)	1
EdgePort serial hub (8 ports)	1
ethernet gigabit (8 port)	1
Dlink USB hub (4 ports)	1
Netgear 54 gigabit ethernet hub (5 ports)	1
Moxa serial hub (8 ports)	1
Galvanic Timed Releases (various times)	100
LBL Transducer Pelican	
LBL transducer and cable	1

BluView Pelican			
BluView sonar	1	P900-130	
Tote 302 (white) 43"x48"x31"H			
various tarps	2		
ARGOS tag and accessories	1		
TOPSIDE-Electronics Rack case			
Edgeport netgear cables pouch(CRED14)	1		
DC Power Supply- spare	1	XTR 60-14	
DC Power Supply- Deck	1	XTR 60-14	
DC Power Supply- USBL	1	XTR 60-14	
DC Power Supply- Batteries	1	XTR 60-14	
EdgePort serial hub (8 ports)	1		
power strips	4		
Whoi-acoms acoustic modem box	1	256020	
Netgear 54 gigabit ethernet hub (5 port)	1	GS105 v2	
FreeWave RF modem	1	FGR2-CE-U	
Garmin GPSmap 76CS x (Aax2)	1		
Garmin GPSmap 76CS x (Aax2)	1		
GPS dash mount	1		
GPS antennas + cable 10'	2		
GPS Integrated power supply and data cable (12v) 7ft	1		
Action Packer			
Orings - spares (in notebooks)	500		
spare battery controller cards	2		
Whoi-acoms acoustic modem box	1	256020	CD0004074978
USBL 1510 removable head		TN1510BHR	CD0004092896
anti-static mat	1		
Aqua Shield (14 oz)	1		
Dow corning 111 (14 oz)	1		
DC 4 (5.3 oz)	1		
Parker O-ring lube	1		
aluminium pole mounts			
Tote 303 (black tall) 47"x39"x44"H			
gray case (3x3x2) (CRED05)			
Makita Tool bag (CRED07)	1		
Black Socket Set case (CRED04)	1		
zip ties (assorted)	1000		
extension cords	6		
Y Push heads	3		
West Marine SS hook (small recovery hooks)	3		

line and straps- poly and nylon			
Drill bits	50		
Box of wood screws (3 1/2in)	1		
Red Toolbox (CRED08)			
hand tools general	35		
tape various types	1		
Assorted dummy plugs	40		
Dremel tool kit	1		
small wooden crate			
SBE 49 CTD	1	SBE 49 Fastcat	
Novatech ST-400AR - Xenon Flasher battery housing	1	ST-400AR	
Novatech ST-400AR - Xenon Flasher battery housing	1	ST-400AR	
large wooden crate			
Delta T multibeam	1	837-000-201	CD0001674014
spare strobe			
black camera DSPL camera housings	2		
11 mp Nikon DX camera (C6)	1	GE4000C	CD0001724938
DSPL green laser	1		
Yellow bag - block and tackle	1		
tarp	2		
USBL Pelican			
USBL tranceiver DEEP	1		CD0004075003
USBL tranceiver DEEP	1		
USBL Pelican			
USBL transponder DEEP	1		CD0004075002
USBL transponder DEEP	1		
Spare Battery Bank and Housing	1		CD0004074976