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

MEMORANDUM FOR: Lieutenant Commander Nicholas Chrobak, NOAA
Commanding Officer, NOAA Ship *Nancy Foster*

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

SUBJECT: Project Instruction for NF-14-03
Gray's Reef National Marine Sanctuary SREA

Attached is the final Project Instruction for NF-14-03, Gray's Reef National Marine Sanctuary Southeast Regional Ecosystem Assessment, which is scheduled aboard NOAA Ship *Nancy Foster* during the period of 20 April to 1 May, 2014. Of the 12 DAS scheduled for this project, 12 days are funded by an OMAO allocation. This project is estimated to exhibit a High Operational Tempo. Acknowledge receipt of these instructions via e-mail to **OpsMgr.MOA@noaa.gov** at Marine Operations Center-Atlantic.

Attachment

cc:
MOA1

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
Gray's Reef National Marine Sanctuary
10 Ocean Science Circle
Savannah, GA 31411

FINAL Project Instructions

Date Submitted: February 22, 2014

Platform: NOAA Ship *Nancy Foster*

Project Number: NF-14-03 (OMAO)

Project Title: Gray's Reef National Marine Sanctuary Southeast Regional Ecosystem Assessment

Project Dates: April 19, 2014 to May 1, 2014

Prepared by: _____ Dated: 3/24/14
Sarah Fangman
Chief Scientist
Office of National Marine Sanctuaries, Southeast Region

Approved by: _____ Dated: 3/24/14
George Sedberry
Acting Sanctuary Superintendent
Gray's Reef National Marine Sanctuary

Approved by: _____ Dated: 17 APR 2014
Captain Anne K. Lynch, NOAA
Commanding Officer
Marine Operations Center - Atlantic

I. Overview

A. Brief Summary and Project Period

Gray's Reef National Marine Sanctuary has a variety of ongoing research and monitoring projects that will be continued during this research expedition. Projects will investigate questions related to fish and invertebrate abundance and distribution, habitat and human impacts, and invasive species.

Mobilization/Open House: April 19, 2014 - Savannah, GA
Departure: April 20, 2014
Return/Demobilization: May 1, 2014 - Charleston, SC

B. Days at Sea (DAS): 12

Of the 12 DAS scheduled for this project, 12 DAS are funded by an OMAO allocation. This project is estimated to exhibit a High Operational Tempo.

C. Operating Area (include optional map/figure showing op area)

Diving and sampling will be conducted in waters within Gray's Reef National Marine Sanctuary (GRNMS). Exact locations of these sites will be determined while at sea based on a variety of factors and will be provided to the ship's navigation crew the night before a site is to be visited. Multibeam mapping activities will occur outside of the boundaries of Gray's Reef NMS.

D. Summary of Objectives

Objective 1: Ship based mapping and characterization of benthic habitats in the waters in and around Gray's Reef National Marine Sanctuary. Collected data will need to include backscatter.

Objective 2: Continue investigations to quantify variation in space and time of the abundance of schooling prey and mid-water predators at mid-shelf reefs. This involves conducting survey lines using the EK-60 survey system. Divers will also visit these sites to groundtruth fisheries acoustic data.

Objective 3: Continue collecting data on the abundance, diversity and distribution of both fish and invertebrates both inside and outside the Research Area in Gray's Reef. This project will include diving to assess fish and invertebrate populations around the sanctuary.

Objective 4: Service acoustic telemetry array. This involves divers deploying instruments on established arrays, and retrieving instruments deployed previously.

Objective 5: Continue investigation of abundance and distribution of invasive lionfish within the sanctuary. This will require divers to conduct visual fish censuses at numerous sites around the sanctuary.

Objective 6: Continue long term monitoring of marine debris distribution, accumulation and characterization at established sites within the sanctuary. This involves divers conducting survey

transects at nine locations within GRNMS.

Objective 7: Collect photo and video imagery of the living marine resources and habitats within Gray's Reef. These images will be used for education and outreach purposes.

Objective 8: Collect photo and video of sea turtles, as encountered, for the purpose of photo-identification of individual turtles.

E. Participating Institutions

Office of National Marine Sanctuaries, Southeast, Gulf of Mexico and Caribbean Region

Office of National Marine Sanctuaries, Gray's Reef National Marine Sanctuary

Office of National Marine Sanctuaries, Monitor National Marine Sanctuary

NOAA National Centers for Coastal Ocean Science

NOAA Teacher At Sea Program

NOAA Diving Program

Gray's Reef National Marine Sanctuary Team Ocean Volunteer Program

College of Charleston

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

Name (Last, First)	Title	Date Aboard	Date Disembark	Gender	Affiliation	Nationality
Fangman, Sarah*	Chief Scientist	April 19, 2014	May 1, 2014	F	NOAA/GRNMS	USA
Mayer, Jamie	TAS	April 19, 2014	May 1, 2014	F	NOAA/TAS	USA
Rudd, Randy*	Scientist	April 24, 2014	May 1, 2014	M	NOAA/GRNMS	USA
Harbin, Hampton*	Scientist	April 24, 2014	May 1, 2014	M	NOAA/GRNMS	USA
Stecher, Mike	Scientist	April 19, 2014	April 24, 2014	M	NOAA/NCCOS	USA
LaPalme, Richard*	Scientist	April 24, 2014	May 1, 2014	M	NOAA/GRNMS	USA
Heesman, Lauren*	Scientist	April 24, 2014	May 1, 2014	F	NOAA/MNMS	USA
Thompson, Buster*	Scientist	April 24, 2014	May 1, 2014	M	NOAA/GRNMS	USA
Rath, Amy	Outreach Coordinator	April 19, 2014	May 1, 2014	F	NOAA/GRNMS	USA
Mahaffey, Kathleen	Scientist and Divemaster	April 24, 2014	May 1, 2014	F	NOAA/NDC	USA

Halonen, LTJG Jared*	Scientist and Divemaster	April 24, 2014	May 1, 2014	M	NOAA/GRNMS	USA
Webb, Sarah*	Scientist	April 24, 2014	May 1, 2014	F	NOAA/GRNMS	USA
Sautter, Will	Scientist	April 19, 2014	April 24, 2014	M	NOAA/GRNMS	USA
Morris, Caitlyn	Scientist	April 19, 2014	May 1, 2014	F	College of Charleston	USA

** Denotes Diver*

G. Administrative

1. Points of Contacts:

Sarah Fangman, *Chief Scientist*
Gray's Reef NMS
10 Ocean Science Circle
Savannah, GA 31411
912-598-2428
Sarah.Fangman@noaa.gov

LT Colin Kliewer, Operations Officer
NOAA Ship *Nancy Foster*
1050 Register St., North Charleston, SC 29405
843-991-6326
ops.nancy.foster@noaa.gov

2. Diplomatic Clearances

None Required.

3. Licenses and Permits

This project will be conducted under the Gray's Reef National Marine Sanctuary Manager's Permit, which expires December 31, 2018.

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:

April 19:	Open House conducted along the pier Downtown Savannah
April 20:	Depart Savannah, transit to GRNMS
May 1:	Return to Charleston

B. Staging and Destaging:

Mobilization activities will occur in Savannah, GA on April 19. Demobilization will occur in Charleston, SC on May 1. Ship's crew and equipment will be requested to assist with loading/offloading all miscellaneous equipment and SCUBA bottles.

C. Operations to be Conducted:

Multibeam Mapping

Use Reson 7125 (or mid-water) multi-beam system aboard NOAA Ship *Nancy Foster* to collect acoustic and backscatter data for preparation of maps of habitats in and around GRNMS. Multibeam operations will occur 24 hours/day during the first few days of the cruise (until mapping the entire sanctuary has been completed; estimated to require 4 days), and then take place primarily at night at locations outside the sanctuary during the remainder of the cruise.

Fisheries Acoustics

Continue investigations to quantify variation in space and time of the abundance of schooling prey and mid-water predators at mid-shelf reefs. This involves conducting survey lines using the EK-60 survey system. Survey six dive sites (three inside the Research Area and three outside the Research Area) along parallel transects (50m spacing) using split beam sonar in the morning (dawn) and afternoon (dusk). In addition, fisheries acoustics will run simultaneously with night-time multibeam mapping operations. Time permitting, mid-day surveys may also be attempted.

Visual Fish Surveys

Divers will conduct visual fish surveys at the six fisheries acoustics sites to investigate seasonal variation in fish abundance and ground truth fisheries acoustics data. Divers will also conduct REEF fish and invertebrate surveys at multiple sites within the sanctuary.

Acoustic Telemetry

Numerous acoustic receivers are deployed within Gray's Reef to track the movement of tagged fish. Divers will return to receiver sites to service the array which includes checking line, shackles and floats as well as removing deployed instruments and replacing with new acoustic receivers. Receiver arrays (float, line and anchor) may be recovered from one area of the sanctuary to be deployed in another area of the sanctuary. This task would be considered a working dive and would be conducted according to all NOAA Dive Program working dive regulations and would be under the supervision of a NOAA Divemaster.

Lionfish Surveys/Removal

Lionfish are now regularly observed within Gray's Reef National Marine Sanctuary. As an invasive species, these fish can be very disruptive to the benthic community, and the Office of National Marine Sanctuary's Lionfish Response Plan recommends removal where possible. Divers will conduct surveys to quantify lionfish abundance and distribution and will remove all fish encountered when feasible.

Marine Debris Surveys

Divers will survey nine long term monitoring sites within GRNMS to characterize the types, abundance, and accumulation rates of marine debris within the sanctuary (see Table 1 for site locations and Figure 1 for site map). Ledge sites were selected to compare debris metrics between

regions with differing relative use (low, high) and among ledge height classes (tall, medium). Nine sites were previously marked and surveyed in September 2007 and May 2008; these sites will be revisited during the cruise to measure new debris accumulation. This will require a minimum of nine dives although additional dives may be needed to survey complex or heavily fouled sites, or if any sites need to be re-marked. Dives can be completed during the morning or afternoon. Dive time is expected to be ~30 minutes per site.

Photo and Video Documentation of Benthic Habitats and Marine Organisms
Divers will collect video and photo documentation of habitats and marine life for use with education and outreach activities. In addition, divers will conduct 360° video surveys of select locations to identify habitat changes over time.

Sea Turtle Surveys and Photo/Video Identification
Gray's Reef, in partnership with scientists at the Beaufort NOAA Fisheries lab, has begun an effort to collect photos and video for the purpose of identifying individual turtles encountered in the sanctuary. Divers will collect photo and/or video records of all sea turtles encountered as part of other dive activities.

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.

Diving operations will be conducted as required to support photography, habitat characterization, invertebrate studies, piscivore ecology, acoustic array service and recovery of lost gear (if necessary). Three small boats will be needed simultaneously to support these various projects. Each small boat will carry 3-6 divers and will conduct 2-4 dives before returning to the ship. Individuals who will function as divers are identified above in the list of scientific crew. Ship's divers are invited to assist with dive operations as other duties allow. Two NOAA Divemasters (LTJG Jared Halonen and Kathleen Mahaffey) will be provided for all dive operations on this project and will follow all NOAA diving policies and regulations. A minimum of two divers will work together on all dives. Dives may be conducted in teams of two, three or four people. Each team will dive between one and six times daily as allowed under "No Decompression" limits of 36% NITROX except where working dives will occur, requiring the use of air. The presence and use of a qualified technician or crewmember to assist with the mixing of NITROX is respectfully requested.

The Dive Plans encompassing all legs of NF-14-03 are presented in Appendix 3.

E. Applicable Restrictions

Conditions which preclude normal operations: Poor weather, equipment failure, poor underwater visibility, safety concerns or unforeseen circumstances. Regular safety and planning meetings will be held to consider and address these potential events.

III. Equipment

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

- A trained technician / crew member to assist with mixing breathing gas
- 15 NITROX scuba tanks and means of refilling tanks at sea to support dive

operations

- 1 small boat for deployment of up to 6 divers **AND**
- 2 small boats for deployment of 2 to 4 divers
- 2 portable emergency oxygen delivery kits
- One operator for each of the small boats (projects require three small boats to be operated simultaneously)
- Storage Area – Dry storage for the scientific party's supplies
- Icemaker
- 1 Freezer (minimum of 0 ± 5° F) – For sample storage
- 1 Refrigerator for sample storage
- Wet Lab and Dry Lab work space
- Electronic feed into dry lab of ship's GPS and fathometer
- CTD
- Crane and operator for mobilizing and demobilizing equipment and gear and for launching boats
- Clean 110v power from the wet lab
- EK-60 Split Beam Sonar System
- Reson 7125 Multibeam Sonar
- One technician to acquire and process multibeam imagery
- Scientific Computer System (SCS) – Data-logging capability; centralized location in dry lab for optimal use by scientific party; sensors to include: DGPS, depth, wind speed/direction, vessel speed

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

- 24 NITROX Tanks
- 1 portable emergency oxygen delivery kit
- Sample containers and miscellaneous sampling supplies
- Various redundant diving equipment
- Various lab supplies and equipment
- Coolers for sample storage and transport
- Sample containers and miscellaneous sampling supplies
- Any small tools and hardware necessary for scientific objectives.
- Dive sites will be entered into small boat GPS units by science party.

IV. Hazardous Materials

A. Policy and Compliance

No Hazardous Materials are being brought aboard the ship for this project.

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*

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 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 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 Commanding Officer, Operations Officer, and the Chief Scientist, and is 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.

The Customer Satisfaction Survey is one of the primary methods OMAO and Marine Operations (MO) utilize to improve ship customer service. Information submitted through the form is automatically input into a spreadsheet accessible to OMAO and MO management for use in preparing quarterly briefings. Marine Operations Centers (MOC) address concerns and praise with the applicable ship. Following the quarterly briefings the data are briefed to the Deputy Director of OMAO.

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.

Special dietary requests: One vegetarian (does eat dairy) and two vegetarians (do eat seafood).

B. Medical Forms and Emergency Contacts

The NOAA Health Services Questionnaire (NHSQ, Revised: 02 JAN 2012) 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. The completed form should be sent to the Regional Director of Health Services at Marine Operations Center. The participant can mail, fax, or scan and send via secure e-mail the form using the contact information below; participants should take precautions to protect their Personally Identifiable Information (PII) and medical information. The NHSQ should reach the Health Services Office no later than 4 weeks prior to 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 the NHSQ. Be sure to include proof of tuberculosis (TB) testing, sign and date the 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.

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 MOA.Health.Services@noaa.gov

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 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.

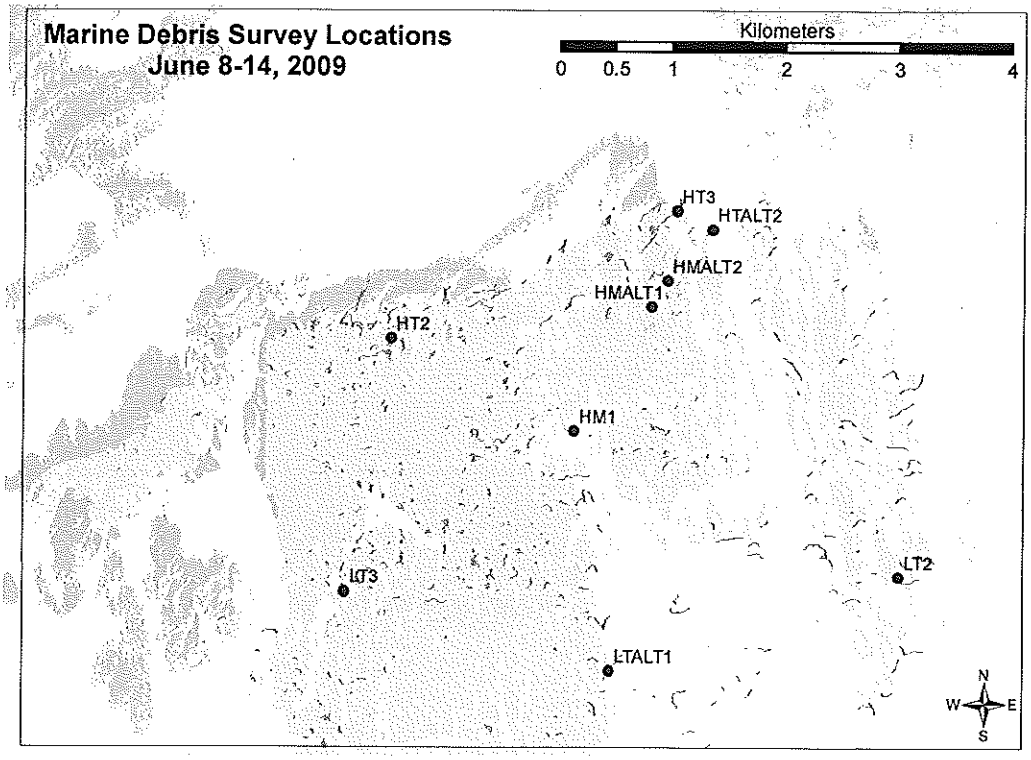
F. Foreign National Guests Access to OMAO Facilities and Platforms

Foreign National access to the NOAA ship or Federal Facilities is not required for this project.

VIII. Appendix 1. Figures, maps, and tables.

Table 1 Site coordinates of marine debris monitoring locations.

Site ID	X (Long)	Y (Lat)
HM1	-80.869749	31.387953
HMALT1	-80.862573	31.397819
HMALT2	-80.861127	31.399873
HT2	-80.886675	31.395251
HT3	-80.860281	31.405431
HTALT2	-80.856932	31.403933
LT2	-80.839535	31.376462
LT3	-80.891009	31.375283
LTALT1	-80.866389	31.369041



HT= High boat area, Tall
HM = High boat area, Medium height
LT = Low boat area, Tall
ALT = Alternate

● Survey Locations

Figure 1. Marine Debris Survey Locations

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

TELEMETRY ARRAY STATIONS:

Name	Latitude	Longitude	D Latitude	D Longitude
09T	31 23.218	-80 52.436	31.38697	-80.87393
09MN	31 23.773	-80 53.154	31.39622	-80.8859
09MS	31 23.636	-80 53.296	31.39393	-80.88827
10FS17	31 23.943	-80 54.127	31.39905	-80.90212
10FS15	31 22.580	-80 50.372	31.37633	-80.83953
10FS18	31 23.882	-80 52.742	31.39803	-80.87903
10Wof15	31 22.725	-80 50.784	31.37875	-80.8464
10RoldanNof15	31 23.374	-80 50.368	31.38957	-80.83947
10MNW	31 23.88	-80 53.400	31.398	-80.89
VPS1	31 22.5589	-80 50.370	31.375983	-80.839500
VPS2	31 22.559	-80 50.310	31.375983	-80.8385
VPS3	31 22.609	-80 50.370	31.37682	-80.839500
VPS4	31 22.559	-80 50.250	31.375983	-80.8375
VPS5	31 22.609	-80 50.48	31.37682	-80.837470
VPS6	31 22.609	-80 50.310	31.37682	-80.8385
Recon4	31 22.680	-80 50.220	31.378	-80.837000
Recon9	31 22.02	-80 50.46	31.367	-80.841

FISHERIES ACOUSTICS/DIVE SURVEY SITES:

Site	Longitude	Latitude
02OUT	-80.879	31.3881
41OUT	-80.8903	31.39652
01OUT	-80.894	31.3963
15IN	-80.8463	31.37808
05IN	-80.895	31.36749
41IN	-80.8912	31.37538

ADDITIONAL POTENTIAL SURVEY SITES:

Site	LONG_DD	LAT_DD
01ALTIN	-80.8791	31.37791
01ALTOUT	-80.8628	31.40024
01IN	-80.8881	31.37854
01OUT	-80.894	31.3963
02ALTIN	-80.8687	31.38328
02ALTOUT	-80.8384	31.38887
02IN	-80.8913	31.36438
02OUT	-80.879	31.3881
03ALTIN	-80.8479	31.38296
03ALTOUT	-80.858	31.40167
03IN	-80.8913	31.37542
03OUT	-80.8778	31.39066
04ALTIN	-80.8815	31.38084
04ALTOUT	-80.8983	31.39313
04IN	-80.8751	31.37697
04OUT	-80.8617	31.40042
05ALTIN	-80.8859	31.37475
05ALTOUT	-80.852	31.40431
05IN	-80.895	31.36749
05OUT	-80.8396	31.38955
06ALTIN	-80.8876	31.38295
06ALTOUT	-80.8869	31.39465
06IN	-80.8666	31.3732
06OUT	-80.8885	31.3939
07ALTIN	-80.8395	31.37649
07ALTOUT	-80.8402	31.38678
07IN	-80.8431	31.36613
07OUT	-80.8379	31.38586
08ALTIN	-80.8397	31.38257
08ALTOUT	-80.8749	31.38621
08IN	-80.8428	31.38106
08OUT	-80.8573	31.40373
09ALTIN	-80.8774	31.37667
09ALTOUT	-80.8443	31.38894
09IN	-80.8676	31.36621
09OUT	-80.8778	31.39653
10ALTIN	-80.8849	31.38366

10IN	-80.8709	31.37424
10OUT	-80.8636	31.40216
11ALTIN	-80.871	31.38252
11IN	-80.8923	31.36547
11OUT	-80.845	31.38846
12ALTIN	-80.8667	31.36869
12ALTOUT	-80.8792	31.38618
12IN	-80.8819	31.37883
12OUT	-80.878	31.39902
13ALTIN	-80.869	31.37564
13ALTOUT	-80.8836	31.397
13IN	-80.8718	31.36398
13OUT	-80.8862	31.39769
14ALTIN	-80.8737	31.37583
14ALTOUT	-80.8382	31.39142
14IN	-80.8389	31.37047
14OUT	-80.8885	31.3962
15ALTIN	-80.8677	31.37711
15ALTOUT	-80.862	31.40561
15IN	-80.8463	31.37808
15OUT	-80.8964	31.39117
16ALTIN	-80.853	31.36766
16ALTOUT	-80.849	31.39281
16IN	-80.8452	31.37522
16OUT	-80.8636	31.40489
17ALTIN	-80.8802	31.38221
17ALTOUT	-80.8766	31.39905
17IN	-80.8832	31.38011
17OUT	-80.8601	31.39741
18ALTIN	-80.868	31.3827
18ALTOUT	-80.8702	31.39806
18IN	-80.8707	31.37491
18OUT	-80.8429	31.3876
19ALTOUT	-80.8789	31.39819
19IN	-80.894	31.36421
19OUT	-80.8424	31.3972
20IN	-80.8773	31.36425
20OUT	-80.8818	31.3981
21ALTOUT	-80.8383	31.38482
21IN	-80.8924	31.36884
21OUT	-80.884	31.39741

22ALTOUT	-80.8771	31.38722
22IN	-80.8521	31.37805
22OUT	-80.8932	31.39739
23ALTOUT	-80.8938	31.39143
23IN	-80.89	31.37658
23OUT	-80.9026	31.39849
24IN	-80.8912	31.37728
24OUT	-80.8829	31.39419
25ALTOUT	-80.8706	31.40317
25IN	-80.8546	31.37958
25OUT	-80.8509	31.39552
26ALTOUT	-80.8526	31.39835
26IN	-80.8676	31.37005
26OUT	-80.8856	31.39786
27ALTOUT	-80.8722	31.40165
27IN	-80.8858	31.3822
27OUT	-80.8666	31.39726
28ALTOUT	-80.8914	31.39667
28IN	-80.8415	31.37682
28OUT	-80.8617	31.38824
29ALTOUT	-80.8867	31.39625
29IN	-80.8529	31.37921
29OUT	-80.8511	31.40263
30ALTOUT	-80.88	31.39547
30IN	-80.8709	31.3641
30OUT	-80.8738	31.38731
31ALTOUT	-80.8455	31.40002
31IN	-80.8656	31.37
31OUT	-80.8865	31.3955
32ALTOUT	-80.8522	31.4064
32IN	-80.8886	31.38373
32OUT	-80.8529	31.40375
33ALTOUT	-80.8751	31.39438
33IN	-80.8408	31.36716
33OUT	-80.8902	31.39121
34ALTOUT	-80.8848	31.39692
34IN	-80.8803	31.38007
34OUT	-80.8651	31.40107
35ALTOUT	-80.8605	31.40157
35IN	-80.8871	31.37734
35OUT	-80.845	31.39352

36ALTOUT	-80.8939	31.39684
36IN	-80.8888	31.37709
36OUT	-80.8668	31.40481
37ALTOUT	-80.8886	31.39456
37IN	-80.8831	31.37454
37OUT	-80.866	31.38629
38ALTOUT	-80.8662	31.40562
38IN	-80.8898	31.36838
38OUT	-80.8769	31.38662
39ALTOUT	-80.8764	31.39355
39IN	-80.8981	31.3723
39OUT	-80.8591	31.40393
40IN	-80.872	31.38213
40OUT	-80.8409	31.3925
41OUT	-80.8903	31.39652

Appendix 3. Dive Plan

To be sent separately.