

# Project Instructions: EX-22-06, Voyage to the Ridge 3 (ROV and Mapping)

**Date Submitted:** July 21, 2022  
**Platform:** NOAA Ship *Okeanos Explorer*  
**Project Number:** EX-22-06  
**Project Title:** Voyage to the Ridge 3  
**Project Dates:** August 6 - September 2, 2022

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**Dated:** 7/21/2022

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Operations Chief  
NOAA Ocean Exploration

**Dated:** 7/21/2022

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Rachel Medley  
Chief, Expeditions and Exploration Division  
NOAA Ocean Exploration

**Dated:** 7/22/2022

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Commanding Officer  
NOAA Marine Operations Center — Atlantic

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**Dated:** \_\_\_\_\_

# I. Overview

## A. Brief Summary and Project Period

August 6 - September 2, 2022

Horta, Faial, Portugal to San Juan, Puerto Rico

EX-22-06, Voyage to the Ridge 3 (ROV and Mapping)

This document contains project instructions specific to EX-22-06. For the annual cross-expedition details, see the “[NOAA Ship \*Okeanos Explorer\* FY22 Field Season Instructions](#).”

This expedition will commence on August 6, 2022, in Horta, Faial, Portugal, and conclude on September 2nd, 2022, in San Juan, Puerto Rico. Operations will be conducted 24 hours per day and consist of remotely operated vehicle (ROV) dives, mapping operations (primarily overnight), and full shore-based participation via telepresence.

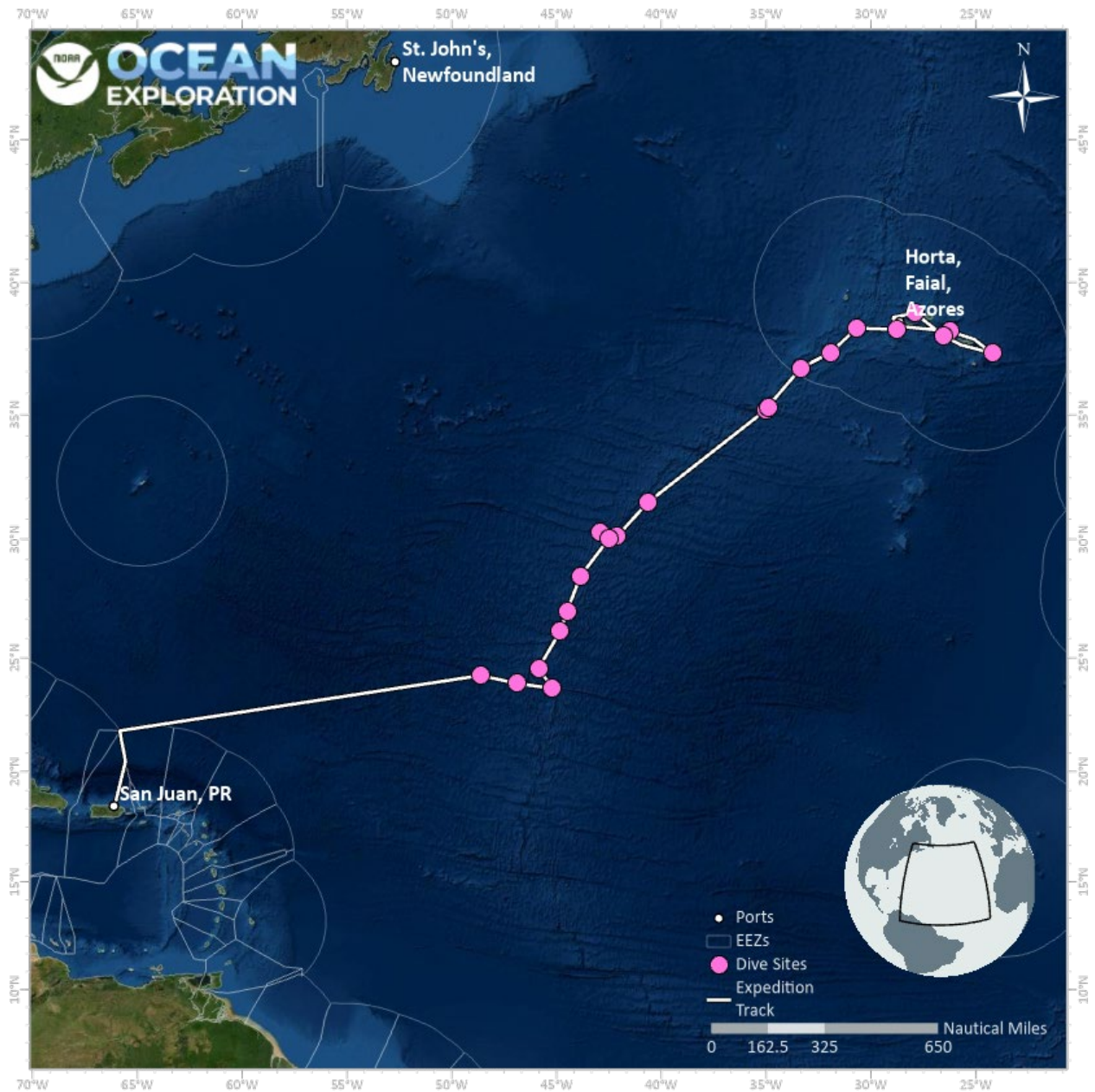
Operations will include the use of the ship’s deepwater mapping systems (Kongsberg EM 304 multibeam sonar, EK60/EK80 split-beam sonars, Knudsen 3260 Chirp sub-bottom profiler, and Teledyne acoustic Doppler current profiler), expendable bathythermograph (XBTs) in support of multibeam sonar mapping operations, conductivity, temperature, depth profiler (CTD) casts, NOAA Ocean Exploration’s two-body ROV system (*Deep Discoverer* and *Seirios*), and a high-bandwidth satellite connection for continuous ship-to-shore communications. Operations will focus on exploring deep waters (greater than 250 m for ROV operations and greater than 200 m for mapping operations) along the Mid-Atlantic Ridge (MAR) south of the Azores and the Azores Plateau. One additional dive and transit mapping operations are planned in the Sargasso Sea en route to San Juan.

## B. Days at Sea

Of the 28 days at sea (DAS) scheduled for this expedition, 28 DAS are funded by NOAA Office of Oceanic and Atmospheric Research allocation. This expedition is estimated to exhibit a high operational tempo due to 24-hour operations, which include daily ROV dives, overnight mapping operations, CTD casts, and continuous shoreside participation via telepresence. Additionally, we would like to request support for up to four days of extended over-the-side operations (CTD operations and extended ROV dives) a week during this expedition.

## C. Operating Area

EX-22-06 will focus operations on The MAR and the Azores Plateau. ROV and CTD operations will be conducted at depths between 250 to 6000 m. **Figure 1** shows the general operating area for the expedition.



**Figure 1.** Map showing the general operating area for EX-22-06 and the draft cruise track. Note that the expedition track is subject to change based on survey results, feedback from the science community, field conditions, and the discretion of the commanding officer.

## D. Summary of Objectives

EX-22-06 operations will involve transiting southwest from the Azores along the MAR, where we will conduct daily ROV dives and overnight mapping operations. Priority mapping and ROV targets in the vicinity of the Azores Plateau and islands will also be completed early in the expedition, with targets further afield as we head south along the MAR. The focus of this work

will be in deep water (greater than 250 m for ROV operations and greater than 200 m for mapping operations). This expedition will collect critical baseline information to support priority NOAA science, partner, and management needs.

Mission objectives for EX-22-06 include a variety of objectives focused on science, mapping, education, outreach, and data management. Overarching objectives that span the entire Fiscal Year 2022 (FY22) field season are covered in the “[NOAA Ship Okeanos Explorer FY22 Field Season Instructions](#).” See section II for a detailed schedule of operations by date. Additional objectives specific to EX-22-06 are as follows:

## 1. Science Objectives

- a. Improve knowledge of unexplored areas along the Mid-Atlantic Ridge and Azores Plateau to inform management needs for sensitive habitats, geological features, and potential resources.
- b. Locate and characterize deep-sea coral, sponge, and hydrothermal communities.
- c. Groundtruth existing bathymetric data, habitat suitability models, seafloor composition models, and inferred hydrothermal vent sites.
- d. Characterize water column habitats along the Mid-Atlantic Ridge using acoustics, visual observations, and emerging technologies.
- e. Collect data to enhance predictive capabilities for vulnerable marine habitats, seafloor composition, island formation, plate tectonics, hydrothermal vents, critical minerals, and submarine geohazards.
- f. Investigate biogeographic patterns of deep-sea ecosystems and connectivity across the Mid-Atlantic Ridge, Azores Plateau, and in the Sargasso Sea for use in broader comparisons of deepwater habitats throughout the Atlantic Basin.
- g. Map, survey, and sample geological features, including ocean spreading centers, hydrothermal vents, extinct polymetallic sulfide systems, fracture zones, and rift zones to better understand the geological context of the region and improve knowledge of past and potential future geohazards.
- h. Utilize the dual-body ROVs for seafloor habitat exploration to accomplish:
  - i. close-up imaging operations on potential new, rare, and poorly documented organisms, as well as dominant members of benthic communities;
  - ii. the collection of biological samples of potential new species, new records, dominant community members if not easily recognized, and other animals to aid in site characterization;
  - iii. the collection of geological samples that can be used to age a feature, provide additional insight into the geological context of the region, or improve knowledge of marine minerals and potential future or past geohazards.

- i. Extended dive operations should be expected up to four times per week during the expedition (approximately every other day following the two day mapping transit out of port). The exact dive locations for extended dives is to be determined upon further coordination with the marine science community, but will likely be prioritized for the deeper dives of the expedition in order to maximize time at the seafloor. Extended dive operations may also be requested by the mission team in the case of unexpected late ROV deployments and/or exceptional discoveries (e.g., a new hydrothermal vent system, coral garden, shipwreck, etc.). Approval of extended dive operations is at the discretion of the CO, and every effort shall be taken to minimize undue hardship on crew fatigue and disruptions to work schedules.
- j. Conduct stationary CTD casts as required to support high priority requests from the science community (e.g., to help identify potential hydrothermal vents).
- k. Utilize the onboard laboratory to preserve and catalog all biological and geological samples and ready them for shipping to their respective public archives.
- l. Collect water samples using the ROV- and CTD-mounted Niskin bottles and filter samples in the laboratory to obtain eDNA samples for shoreside processing.
- m. Collect sun photometer measurements as part of surveys of opportunity in partnership with NASA.

## 2. Remote Science and Exploration Command Center Objectives

- a. Provide operational support and training to scientists and managers to enable remote participation in at-sea operations.
- b. Support and communicate with a newly established exploration command center established at the University of the Azores.

## 3. ROV Engineering Objectives

- a. Conduct daytime ROV dives on exploration targets.
- b. Complete engineering objectives during ROV dives.
- c. Continue training of engineers and pilots.
- d. Continue system maintenance, documentation, and training.
- e. Test and continue to refine new ROV midwater exploration procedures.

## 4. Video Engineering Objectives

- a. Test terrestrial and high-speed satellite links.
- b. Support telepresence-enabled ROV operations.

- c. Collect/create all standard video products.
- d. Facilitate live outreach events between ship and shore.

## 5. Acoustic Mapping Objectives

- a. Collect high-resolution bathymetry in areas with no or low-quality sonar data to extend bathymetric mapping coverage in support of Seabed 2030.
- b. Collect high-resolution mapping data from sonars in priority areas as dictated by operational needs and science and management community input.
- c. Support ROV operations with mapping products and expertise.
- d. Conduct mapping operations during transit, with possible further development of exploration targets.
- e. Collect XBT casts as data quality requires during mapping operations.
- f. Create daily standard mapping products.
- g. Evaluate water column sonar data as possible to identify possible anomalies (seeps, vents, etc.).

## 6. Data Management Objectives

- a. Provide a foundation of publicly accessible data and information products.
- b. Provide daily products to shore for operational decision making purposes.
- c. Formalize Data Management SOPs.
- d. Complete sensor reports for each dive.
- e. Verify that GFOE and NCEI data systems operate as expected.
- f. Perform Sample Data Management (SDM).

## 7. Outreach and Education Objectives

- a. Host interactions with audiences on shore (Exact schedule TBD).
- b. Potential to host limited scheduled ship tours while in port in Horta, Faial, Azores at the start of the expedition and potentially in Charlotte Amalie, St. Thomas at the conclusion of the expedition.
- c. Engage the general public in ocean exploration through social media and live video and timely content (dive updates, topical essays and web logs, highlight videos, video clips, still imagery, and mapping products) on the NOAA Ocean Exploration website.

## 8. Ship Objectives

- a. Conduct stationary CTD operations as requested and able.
- b. Review ROV Emergency Procedures.

- c. Conduct wardroom and deck department refresher training of ROV deployment and recovery with discussion of emergency procedures.
- d. Conduct wardroom Aft Conn familiarity refresher training.
- e. Practice and discuss man-overboard scenarios during ROV recovery, depending on weather and operations.

## 9. Ethanol Testing

- a. Test the quality of the ethanol stored in the ejectable O2 Deck container before and after each ROV expedition.
- b. Use the NOAA Ocean Exploration [Ethanol Test Guide](#) which provides detailed instructions on how to test the ethanol, to calculate the measurements, and record the results.
- c. Update the internal NOAA Ocean Exploration Ethanol Test Guide as procedures are refined.

## E. Participating Institutions

- U.S. Naval Research Laboratory, 1005 Balch Boulevard, Stennis Space Center, MS 39529
- Fisheries and Oceans Canada, Ocean and Ecosystem Sciences Division, Oceanography and Climate Section. Bedford Institute of Oceanography, P.O. Box 1006, 1 Challenger Dr., Dartmouth, Nova Scotia, Canada
- Geological Survey of Canada, Natural Resources Canada, 1 Challenger Drive, Dartmouth, Nova Scotia B2Y 4A2, Canada
- NOAA, Deep Sea Coral Research and Technology Program, 1315 East-West Hwy, Silver Spring, MD 20910 USA
- U.S. Geological Survey (USGS), Woods Hole Coastal and Marine Science Center, Woods Hole, MA 02532 USA
- U.S. Geological Survey, Pacific Coastal and Marine Science Center, 2885 Mission Street, Santa Cruz, CA 95060 USA
- U.S. Geological Survey, Hawaiian Volcano Observatory, 1266 Kamehameha Avenue, Suite A-8, Hilo, HI 96720
- NOAA, Pacific Marine Environmental Research Laboratory, 7600 Sand Point Way NE Seattle, WA 98115
- NOAA, National Centers for Environmental Information, 1021 Balch Boulevard, Suite 1003, Stennis Space Center, MS 39529
- NOAA, Atlantic Oceanographic and Meteorological Laboratory, 4301 Rickenbacker Causeway, Miami, FL, 33149

- NASA, Mary W. Jackson NASA Headquarters, 300 E. Street SW, Suite 5R30, Washington, DC 20546
- National Academy of Sciences, 500 Fifth Street, NW, Washington, DC 20001
- Pew Charitable Trust, 901 E Street NW, Washington, DC 20004-2008
- Instituto Hidrografico, Rua das Trinas 49, Lisbon
- University of Porto, Praça de Gomes Teixeira, 4099-002 Porto, Portugal
- University of the Azores, R. da Mãe de Deus, 9500-321 Ponta Delgada, Portugal
- Memorial University of Newfoundland, 230 Elizabeth Ave, St. John's, NL A1C 5S7, Canada
- University of Edinburgh, Old College, South Bridge, Edinburgh EH8 9YL, United Kingdom
- University of Manchester, Oxford Rd, Manchester M13 9PL, United Kingdom
- GEOMAR Helmholtz Centre for Ocean Research Kiel
- Spanish Institute of Oceanography, C. del Corazón de María, 8, 28002 Madrid, Spain
- National Science Foundation, Division of Ocean Sciences, 2415 Eisenhower Avenue, Alexandria, Virginia 22314
- University of Louisiana at Lafayette, 104 E University Ave, Lafayette, LA 70504
- Woods Hole Oceanographic Institute, 86 Water St, Falmouth, MA 02543
- Institute of Marine Research, Rua Prof. Dr. Frederico, Machado, no. 4, 9900-138 Horta

See “[NOAA Ship \*Okeanos Explorer\* FY22 Field Season Instructions](#)” for institutions that consistently participate throughout the field season.

## F. Personnel (Mission Party)

**Table 1** describes the currently planned arrival times for personnel in advance of EX-22-06. Several personnel are on the previous expedition, which is noted as such, and may depart the ship for short periods of time between expeditions. The exact dates of those plans are not known at this time, but will be provided to the ship as soon as possible. Expedition mobilization is scheduled for August 3-5, and all personnel are planning to move aboard on August 3rd and we will work with OPS to schedule times of arrival to organize COVID-19 testing. The expedition will also be supported by shoreside personnel (see **Table 2**).



**Table 1.** Seagoing mission personnel: This list is tentative until travel is booked. Any deviations will be communicated to the operations officer.

#	Name	Role Onboard	Date Aboard	Date Disembark	Gender	Affiliation	Nationality
1	Kasey Cantwell	Expedition Coordinator	8/3	9/7	F	NOAA Ocean Exploration	USA
2	Deborah (Deb) Glickson	Science Lead	8/3	9/4	F	National Academy of Science/UCAR	USA
3	Joana Xavier	Science Lead	8/3	9/4	F	University of Porto/UCAR	Portugal
4	Samuel (Sam) Candio	Mapping Lead	8/3	9/7	M	NOAA Ocean Exploration	USA
5	Trey Gillispie	Mapping Watch Lead	8/3	9/4	M	UCAR	USA
6	Thomas Morrow	EC-in-training	8/3	9/7	M	NOAA Ocean Exploration	USA
7	Levi Unema	GFOE Team Lead	On EX2205	9/4	M	GFOE <sup>2</sup>	USA
8	Chris Wright	Data Manager	On EX2205	9/4	M	GFOE <sup>2</sup>	USA
9	Fernando Aragon	Data Manager	On EX2205	9/4	M	GFOE <sup>2</sup>	USA
10	Bobby Mohr	ROV Engineer	8/3	9/4	M	GFOE <sup>2</sup>	USA
11	Mark Durbin	Data Manager	8/3	9/4	M	GFOE <sup>2</sup>	USA
12	Sean Kennison	ROV Engineer	On EX2205	9/4	M	GFOE <sup>2</sup>	USA
13	Jon Mefford	ROV Engineer	On EX2205	9/4	M	GFOE <sup>2</sup>	USA
14	Todd Gregory	ROV Engineer	8/3	9/4	M	GFOE <sup>2</sup>	USA
15	Jim Meyers	ROV Engineer	8/3	9/4	M	GFOE <sup>2</sup>	USA
16	Art Howard	Videographer	8/3	9/4	M	GFOE <sup>2</sup>	USA

#	Name	Role Onboard	Date Aboard	Date Disembark	Gender	Affiliation	Nationality
17	Caitlin Bailey	Videographer	On EX2205	9/4	F	GFOE <sup>2</sup>	USA
18	Anna Sagatov	Videographer	On EX2205	9/4	F	GFOE <sup>2</sup>	USA
19	Brian, Roland	Video Engineer	On EX2205	9/4	M	GFOE <sup>2</sup>	USA
20	Doros, Brian	Video Engineer	On EX2205	9/4	M	GFOE <sup>2</sup>	USA
21	Megan Cromwell	Sample Data Manager	8/3	9/4	F	NOAA NCEI <sup>3</sup>	USA
22	Jack Conroy	Knauss Fellow	8/4	9/4	M	NOAA Ocean Exploration	USA

<sup>1</sup>University Corporation for Atmospheric Science

<sup>2</sup>Global Foundation for Ocean Exploration

<sup>3</sup>National Centers for Environmental Information

**Table 2.** Shoreside support personnel and key contacts.

#	Name	Title	Affiliation	Nationality
1	Rachel Gulbra	Web Coordinator	NOAA Ocean Exploration (UCAR)	USA
2	Anna Lienesh	Data Manager	NCEI <sup>3</sup>	USA

## 1. Foreign National Guests (FNGs) Access to OMAO Facilities and Platforms

Joana Xavier is a Portuguese Citizen. NOAA Ocean Exploration has requested FNG clearance for her to sail during this expedition and is awaiting approval through the Foreign National Registration System (FNRS). Conditional approval by OMAO was received before submission through FNRS. Kasey Canwell will serve as her host onboard.

## G. Administrative

### 1. Points of Contact

**Table 3.** Points of contact.

Operations	Name, Title	Office	Address	Phone/Fax	Email
Marine Operations Center, Atlantic	CAPT Nicholas Chrobak, Commanding Officer	Marine Operations Center, Atlantic	439 West York Street Norfolk, VA 23510-1145	(757) 441-6776/ (757) 441-6495	<a href="mailto:co.moc.atlantic@noaa.gov">co.moc.atlantic@noaa.gov</a>
Marine Operations Center, Atlantic	CDR Steven Barry, Chief of Operations	Marine Operations Center, Atlantic	439 West York Street Norfolk, VA 23510-1145	(757) 441-6842/ (757) 441-6776	<a href="mailto:Chiefops.MOA@noaa.gov">Chiefops.MOA@noaa.gov</a>
NOAA Ship Okeanos Explorer (primary)	CDR Colin Little, Commanding Officer	NOAA Ship Okeanos Explorer	NOAA Ship Okeanos Explorer 47 Chandler Street Newport, RI 02841	(401) 439-7848	<a href="mailto:CO.Explorer@noaa.gov">CO.Explorer@noaa.gov</a>
NOAA Ship Okeanos Explorer (primary)	LT Hunter Brendel, NOAA Operations Officer	NOAA Ship Okeanos Explorer	NOAA Ship Okeanos Explorer 47 Chandler Street Newport, RI 02841	(808) 659-9179 x221	<a href="mailto:ops.explorer@noaa.gov">ops.explorer@noaa.gov</a>
Mission (primary)	Kasey Cantwell, Expedition Coordinator/ Operations Chief	NOAA Ocean Exploration	1315 East-West Highway, Silver Spring, MD 20910	(301)-717-7776	<a href="mailto:Kasey.cantwell@noaa.gov">Kasey.cantwell@noaa.gov</a>
Mission (other)	Rachel Medley, Chief, Expeditions and Exploration Division	NOAA Ocean Exploration	1315 East-West Highway, Silver Spring, MD 20910	(301) 789-3075	<a href="mailto:rachel.medley@noaa.gov">rachel.medley@noaa.gov</a>
Mission (other)	Jeremy Weirich, Director	NOAA Ocean Exploration	1315 East-West Highway, Silver Spring, MD 20910	(617) 875-4658	<a href="mailto:jeremy.weirich@noaa.gov">jeremy.weirich@noaa.gov</a>

### 2. Diplomatic Clearances

This expedition will involve marine scientific research in waters under the jurisdiction of Portugal, Puerto Rico, the British Virgin Islands, and Anguilla. Diplomatic clearance has been requested for each Coastal State. Consent from all Coastal States is pending.

### 3. Shipments

The *Okeanos Explorer* operations officer should be notified of any shipments to the ship. Send an email describing the shipment (including size and number of items) to

[OPS.Explorer@noaa.gov](mailto:OPS.Explorer@noaa.gov) and [newengland.portops@noaa.gov](mailto:newengland.portops@noaa.gov).

All mail that needs to be sent to the *Okeanos Explorer* prior to the expedition should be sent to the Newport, RI home port address for forwarding on to Horta, Portugal. **Shipments should arrive in Newport no later than July 22, 2022**, and be shipped to the following address:

NOAA Ship *Okeanos Explorer*  
Attn: Name/Dept  
47 Chandler Street  
Newport, RI 02841

For shipments that need to be sent to meet the ship when it arrives in port in San Juan, Puerto Rico after the expedition from September 2-10, 2022, shipments should be sent to the Newport, RI home port address for forwarding on to Horta. **Shipments should arrive in Newport no later than August 26, 2022**, and should be shipped to the following address:

NOAA Ship *Okeanos Explorer*  
Attn: Name/Dept  
47 Chandler Street  
Newport, RI 02841

#### 4. COVID-19 Plan for Mission Personnel

In accordance with the “OMAO Marine Operations COVID-19 Protocols” effective April 16, 2022, shelter-in-place is not required for sailing. All mission personnel shall follow the guidelines written within the documentation, subject to change pending new guidance released. All sailing personnel are required to be fully vaccinated, which means they must have completed the initial vaccination series and all applicable boosters.

Mission personnel will be tested via rapid antigen tests the day of or night before sailing and potentially before being cleared to move onboard the ship for berthing. Any mission personnel who test positive will be disqualified from sailing, and backup personnel will be activated as mission objectives and priorities dictate.

If any mission personnel test positive for COVID-19 during any required testing as dictated by OMAO:

- NOAA Marine Health Services will notify the individuals who test positive that they are not cleared to board the ship. NOAA Ocean Exploration will reimburse the individual for 5 days of shelter-in-place lodging to complete their isolation and for a COVID-19 test to confirm they are negative prior to returning home or returning to work to sail if the expedition has not already departed.

- The expedition coordinator will be notified of any mission personnel who are not cleared to sail.
- The expedition coordinator will notify the NOAA Ocean Exploration operations chief.
- The expedition coordinator will determine, in consultation with the ship's commanding officer, NOAA Ocean Exploration's operations chief, and appropriate parties, whether the mission will continue without the uncleared personnel.

If any mission personnel develop COVID-19-like symptoms while underway, OMAO protocols will be strictly followed. The expedition coordinator (or designee if they are unable to fulfill this role) will remain the primary point of contact for all mission personnel. Additional support with onshore logistics for impacted mission personnel will be provided by:

LT Christopher "J" Dunn, NOAA  
Acting Deputy Operations Chief, Expeditions and Exploration Division  
NOAA Office of Ocean Exploration and Research  
215 South Ferry Road  
Narragansett, RI 02882  
Desk: (401) 874-6478  
Cell: (262) 995-3410

## II. Operations

The expedition coordinator is responsible for ensuring mission personnel are trained in planned operations and are knowledgeable about expedition objectives and priorities. The commanding officer is responsible for ensuring all operations conform to the ship's accepted practices and procedures.

### A. Expedition Itinerary

**Table 4** summarizes the expedition itinerary. All times and dates are subject to prevailing conditions and the discretion of the commanding officer. Locations are approximate. Final ROV dive sites will be delivered to the bridge at night for the next day's ROV dive.

Additional items may be added to the itinerary as expedition plans are further developed.

**Table 4.** Expedition itinerary: This is an approximate itinerary and is subject to change based on objective completion, weather, and logistical needs. See **Table 5** for ROV dive details.

Date	Activities
8/3	<p>Mobilization. Most mission personnel arrive for mobilization day work on the ship. Mission personnel do not plan to move onboard for overnight berthing on this date.</p> <p>Preparations, equipment testing, and training all day. Mission personnel will need laptop computers added to the wireless network. High voltage and hydraulics needed by ROV team to roll Deep Discoverer out of hanger and conduct pre-expedition testing. ROV team may also need an operator for crane and A-frame operations to dunk Deep Discoverer and Seirios overboard. A dunk test will likely be requested prior to departing. GFOE personnel may also need to place a transponder overboard and ping the USBL. Informal ship tours for VIPs and partners are possible.</p>
8/4	<p>Mobilization. Mission personnel plan to move aboard for overnight berthing this day. COVID-19 testing to be completed as required and offered by OMAO. More mission personnel will need laptop computers added to the wireless network. High voltage and hydraulics needed by ROV team to roll Deep Discoverer out of the hangar and conduct pre-expedition testing. ROV team may also need an operator for crane and A-frame operations to dunk Deep Discoverer and Seirios overboard. A dunk test will likely be requested prior to departing. GFOE personnel may also need to place a transponder overboard and ping the USBL. Dockside scientific sonar pinging may be requested.</p>
8/5	<p>Mobilization. Mission personnel will need laptop computers added to the wireless network. High voltage and hydraulics needed by ROV team for full power-on, high voltage pre-expedition checklist. ROV team may also need an operator for crane and A-frame operations to dunk Deep Discoverer and Seirios overboard. A dunk test is currently not planned, but may be needed prior to departing. GFOE personnel may also need to place a transponder overboard and ping the USBL. COVID-19 testing to be completed as required and offered by OMAO. Dockside scientific sonar pinging may be requested. Mapping watch schedule posted.</p> <p>Pre-expedition meeting in the afternoon with expedition coordinator, operations officer, and commanding officer. Mission personnel orientation meeting. Vessel familiarization meeting (~45 min) with mission personnel that have not sailed on Okeanos Explorer within the last year.</p>
8/6	<p>Depart Horta, Faial, Azores, Portugal in the morning. Safety drills including donning of survival suits. Underway transit mapping towards Flores dive site. No ROV dive planned.</p>
8/7	<p>ROV dive on Deep Plateau site. Overnight transit mapping to East of Formigas Rift site</p>
8/8	<p>ROV dive on East of Formigas Rift site. Overnight transit mapping to Azores mid-water site.</p>
8/9	<p>ROV dive on Azores Mid-water site. Overnight transit mapping to Isla Azul Ridge site.</p>
8/10	<p>ROV dive on Isla Azul Ridge site. Overnight transit mapping to South of Faial site</p>

Date	Activities
8/11	ROV dive on South of Faial site. Overnight transit mapping to Cavala Beta site
8/12	ROV dive Cavala Beta site. Overnight transit mapping to Sarda Monte Alto dive site.
8/13	ROV dive on Sarda Monte Alto site. Overnight transit mapping to Sarda Cavalo dive site.
8/14	ROV dive on Sarda Cavalo site. Overnight transit mapping across N Oceanographer dive site to Oceanographer FZ Massif site.
8/15	ROV dive on Oceanographer FZ Massif site. Overnight transit mapping to N Oceanographer dive site and potential CTD cast.
8/16	ROV dive on N Oceanographer potential vent site. Overnight transit mapping to off axis dive target site.
8/17	Transit mapping to off axis dive site.
8/18	ROV dive on off axis dive target site. Overnight mapping to Lost City hydrothermal vent site.
8/19	ROV dive on Lost City hydrothermal vent site. Overnight mapping to coral and sponge target dive site.
8/20	ROV dive on coral and sponge target dive site. Overnight mapping to MAR 30 inferred hydrothermal vent site.
8/21	ROV dive on MAR 30 inferred hydrothermal vent site. Overnight transit mapping to coral and sponge target dive site.
8/22	ROV dive on coral and sponge target dive site. Overnight transit mapping to MAR 27 inferred hydrothermal vent site.
8/23	ROV dive on MAR 27 inferred hydrothermal vent site. Overnight transit mapping to TAG sulfide dive site.
8/24	ROV dive on TAG sulfide dive site. Overnight transit mapping to off axis coral and sponge target dive site.
8/25	ROV dive on off axis coral and sponge target dive site. Overnight mapping to Kane FZ dive 1 site.
8/25	ROV dive on Kane Fracture Zone 1Z site. Overnight mapping to Kane FZ dive 2 site.
8/27	ROV dive on Kane Fracture Zone 2. Overnight transit mapping.
8/28	ROV dive west Kane FZ site, potential early recovery. Overnight transit mapping.
8/29	Transit mapping.
8/30	Transit mapping.
8/31	Transit mapping.
9/1	Transit mapping

Date	Activities
9/2	Arrival to port in San Juan, Puerto Rico. Demobilization. Support from the ship for high voltage and hydraulics may be needed by the ROV team.
9/3	Finish ROV demobilization if needed. Support from the ship for high voltage and hydraulics may be needed by the ROV team. Potential for US Fish and Wildlife Inspection for CITES specimens. Some mission personnel depart the ship
9/4	Finish ROV demobilization if needed. Support from the ship for high voltage and hydraulics may be needed by the ROV team. Potential for US Fish and Wildlife Inspection for CITES specimens.
9/5	Sample packaging for shipment. Potential for US Fish and Wildlife Inspection for CITES specimens.
9/6	Sample packaging for shipment. Backup date for US Fish and Wildlife Inspection.

## B. Staging and Destaging

ROV-related mission equipment will already be aboard. Standard preparation for ROV expeditions is anticipated, which includes hydraulic use, the ability to place a transponder overboard and ping the USBL, the ability to ping the mapping sonars, high voltage operations, and crane and A-frame operations to potentially dunk *Deep Discoverer* and *Seirios* overboard. A dunk test may be requested prior to departing if a needed repair during the import warrants in water testing.

Minimal demobilization is expected, as the ROVs will be used on the EX-22-08 expedition. Standard demobilization for ROV expeditions is anticipated, which may include hydraulic crane use and high voltage operations.



## C. Operations to Be Conducted

### 1. ROV Dives

Extended dive operations should be expected up to four times per week during the expedition (approximately every other day following the two day mapping transit out of port). The exact dive locations for extended dives is to be determined upon further coordination with the marine science community, but will likely be prioritized for the deeper dives of the expedition in order to maximize time at the seafloor. Extended dive operations may also be requested by the mission team in the case of unexpected late ROV deployments and/or exceptional discoveries (e.g., a new hydrothermal vent system, coral garden, shipwreck, etc.). Approval of extended dive operations is at the discretion of the CO, and every effort shall be taken to minimize undue hardship on crew fatigue and disruptions to work schedules. This includes providing as much advance notice as possible for an extended dive request. Extended dives are limited by operational staffing.

**Table 5.** List of planned ROV dive sites for EX-22-06: Note, this is an approximate itinerary and is subject to change based on community input, survey results, field conditions, and discretion of the commanding officer. The position information for each dive is tentative and approximate until the dive planning call, which is held one day before each scheduled ROV dive.

Dive #	Date	Dive Site	Latitude	Longitude	Depth (m)	Dive Focus
1	8/6	Deep Plateau	38.1918812	-26.2533747	2500	Geology
2	8/7	East of Formigas Geology/Rift	37.3636333	-24.2182551	1500	Geology
3	8/8	Azores Mid-water	38.0180997	-26.5363369	1000	Midwater
4	8/9	Isla Azul ridge	38.8640587	-27.9028375	1500	coral/Sponge
5	8/10	South of Faial Geology	38.2596522	-28.7758796	1200	Geology
6	8/11	Cavala Beta	38.30321	-30.6834	1500	Coral/Sponge
7	8/12	Sarda Monte Alto	37.39995	-31.9067	500	Coral/Sponge
8	8/13	Sarda Cavalo	36.79297	-33.3545	2000	Coral/Sponge
9	8/14	Oceanographer FZ Massif	35.2044513	-35.0321057	1500	Fracture Zone
10	8/15	N Oceanographer Inferred Vent	35.283	-34.867	2800	Vents
11	8/17	Off Axis Benthic exploration	31.5145451	-40.6407753	1500	Coral/Sponge
12	8/18	Lost City	30.079	-42.171	1000	Vents

Dive #	Date	Dive Site	Latitude	Longitude	Depth (m)	Dive Focus
13	8/19	Coral and sponge hunting @ Atlantic Fracture Zone	30.27839	-42.932295	1300	Coral/Sponge
14	8/20	MAR 30 Inferred (Conn Nugent)	30.0333	-42.5	2800	Vents
15	8/21	coral and sponge hunting 2	28.4734326	-43.8611187	2400	Coral/Sponge
16	8/22	MAR 27 - inferred (Interridge)	27	-44.5	3800	Vents
17	8/23	TAG extinct sulfides (Humphries)	26.1367	-44.8267	3000	Extinct sulfides
18	8/24	Off Axis	24.5535258	-45.8556675	2200	Coral/Sponge
19	8/25	Kane fracture zone placeholder	23.6769412	-45.1901158	4000	Fracture Zone
20	8/26	Kane fracture zone placeholder	23.8927976	-46.8834815	4200	Fracture Zone
21	8/27	Western Kane Fracture Zone	24.2389551	-48.63582	2000	Fracture Zone

## 2. CTD Casts

CTD casts are likely to be requested in portions of the MAR, and Azores Plateau based on guidance from onboard and onshore scientists. The most likely region for requests will be mid-expedition along the MAR within the vicinity of possible hydrothermal vent sites inferred from previous research expeditions. Advanced notice of 1-2 days for possible planned CTD casts will be scoped with the operations officer and senior survey technician and planned through operations meetings. In the case that unexpected water column anomalies are detected in the scientific sonars, the mission team may ask if a same-day CTD operation is feasible given staffing schedule considerations and weighing timing impacts on ROV and mapping operations. CTD casts will not be planned on the same day as an extended ROV dive. A minimum of one CTD cast is expected for this expedition, and possibly up to a maximum of ten.

## 3. Telepresence/Outreach Events

- a. Three live video feeds will be used throughout the expedition to provide situational awareness for onshore personnel.
- b. It is expected that at least live interactions with shore-based participants will be conducted during the expedition. Specifics for each event are TBD.

## 4. In-Port Events

- a. Scheduled ship tours are likely in each of the ports for this expedition, but are still TBD at this time. Additional details will be added to this section prior to final submission. Tours of internal ship spaces will be at the discretion of the CO, and if they do occur can be limited to mission spaces (e.g., the labs and control room).

## 5. Special/Unusual Operations or Requests

No unusual operations are planned.

### D. SCUBA Dive Plan

All SCUBA dives are to be conducted in accordance with the requirements and regulations of the [NOAA Diving Program](#) and require the approval of the ship's commanding officer. No SCUBA science dives are planned during EX-22-06, but the ship may plan training, safety drills, or maintenance dives.

### E. Applicable Restrictions

ROV dives conducted in the vicinity of Portugal (EZZ and Extended Continental Shelf) will be completed under permissions granted via the marine scientific research permit process. This request is pending. All physical biological sample collection will comply with CITES permit requirements. Endangered Species Act and Essential Fish Habitat regulatory compliance has been completed (see Appendix C for further information).

## III. Hazardous Materials

### A. Policy and Compliance

See the "[NOAA Ship \*Okeanos Explorer\* FY22 Field Season Instructions.](#)"

## B. Inventory

**Table 6.** Inventory of hazardous materials that will be aboard for EX-22-06.

Item	Use	Approximate Locations
95% UPS denatured ethanol (248 gal)	Sample preservation	02 Deck, port side ethanol storage container
Formaldehyde (2 gal) to be buffered into 10% buffered formalin	Sample preservation	Wet lab, under the chemical hood
Bleach (1 qt)	Sterilization and sample preservation	Wet lab cabinet under sink
Magnesium chloride (500 g)	Sample preservation	Wet lab under hood
Sodium phosphate (1 kg)	Sample preservation	Wet lab under hood
AquaShield	Underwater lubricant	ROV workshop fire cabinet, pit
Dow Corning 4	Electrical insulating compound	ROV workshop fire cabinet, pit
Fluid film spray	Silicone lubricant	ROV workshop fire cabinet
Isopropanol alcohol (2 gal)	Solvent	ROV workshop fire cabinet
Scotchkote	Electrical insulating compound	ROV workshop fire cabinet
3M silicone spray	Silicone lubricant	ROV workshop fire cabinet
Synthetic AW hydraulic oil, ISO-22	Amsoil (AWG-05)	Hanger, pit, vehicles
Tap Magic cutting fluid	Cutting/machining lubricant	ROV workshop fire cabinet
Tap Magic heavyweight cutting fluid	Cutting/machining lubricant	ROV workshop fire cabinet
Tuff Coat M	Marine lubricant	Winch room
Dow Corning Molykote 111	Valve lubricant and sealant	ROV workshop Fire cabinet, pit
WD40	Lubricant	ROV workshop fire cabinet
Loktite	Bolt adhesive	ROV workshop fire cabinet
Shell Diala S2	Vitrea	Hanger, vehicles
Por-15	Paint kit	ROV workshop fire cabinet
Aeroshell 41	Hydraulic fluid	Hanger, ROV Deep Discoverer
Ultratane	Butane fuel	ROV workshop fire cabinet
Rust-oleum	Protective enamel	ROV workshop fire cabinet
Flux-Off	Soldering flux remover	ROV workshop fire cabinet
Propane	Torch fuel	ROV workshop fire cabinet
Adhesive Pliobond 25	General adhesive	Tool room

Item	Use	Approximate Locations
AP 120 Metal Prep	Degreaser/cleaner for metal surfaces	Pit
Butane fuel	Torch refill	Tool room
PVC cement	Adhesive for PFV plastic piping	Tool room
Phosphoric acid	Ferrous metal rust removal	Tool room
Pipetite paste	Plumbing sealant	Tool room/pit
Spindle oil 10, ROS PT	Lubricant/compensation oil	Tool room
DC557	Silicon grease	Tool room/pit
Tether potting catalyst	Two part epoxy catalyst	Pit
Tether potting compound	Two part epoxy ingredient	Pit
ThermaPlex bearing grease	Lubricant	Pit
Tritech Seaking	Compensator oil for sonar head	Pit

## IV. Equipment

A detailed list of equipment provided by the ship and NOAA Ocean Exploration can be found in the [“NOAA Ship \*Okeanos Explorer\* FY22 Field Season Instructions”](#) There are no specific changes relative to this expedition.

# Appendix A. Additional Information

Not applicable

# Appendix B. Data Management Plan

## Okeanos Explorer Mission EX2206 Data Management Plan

Report Date: 2022-05-24

### 1. General Description of Data to be Managed

#### 1.1 Name and Purpose of the Data Collection Project:

EX-22-06, Voyage to the Ridge 3 (ROV and Mapping)

This expedition will commence on August 6,, 2022, in Horta, Faial, Portugal, and conclude on September 2, 2022, in San Juan, Puerto Rico. Operations will be conducted 24 hours per day and consist of remotely operated vehicle (ROV) dives, mapping operations (primarily overnight), and full shore-based participation via telepresence. Operations will focus on exploring deep waters (greater than 250 m for ROV operations and greater than 200 m for mapping operations) along the Mid-Atlantic Ridge (MAR) south of the Azores and the Azores Plateau. One additional dive and transit mapping operations are planned in the Sargasso Sea en route to San Juan.

#### 1.2 Summary Description of the data to be collected:

Operations will include the use of the ship's deepwater mapping systems (Kongsberg EM 304 multibeam sonar, EK60/EK80 split-beam sonars, Knudsen 3260 Chirp sub-bottom profiler, and Teledyne acoustic Doppler current profiler), expendable bathythermograph (XBTs) in support of multibeam sonar mapping operations, conductivity, temperature, depth profiler (CTD) casts, NOAA Ocean Exploration's two-body ROV system (*Deep Discoverer* and *Seirios*), and a high-bandwidth satellite connection for continuous ship-to-shore communications.

#### 1.3 Keywords or phrases that could be used to discover the data:

##### Theme Keywords:

Atlantic Ocean Research Alliance, AORA, bathymetric gaps, benthic habitats, biogeographic patterns, critical minerals, deep-sea corals, deep-sea ecosystem connectivity, eDNA, Galway Statement on Atlantic Ocean Cooperation, hydrothermal communities, inferred vent sites, island formation, plate tectonics, Seabed 2030, seafloor composition, site characterization, sonar anomalies, sponges, submarine geohazards, vulnerable marine habitats

##### Place Keywords:

Azores, Azores Plateau, San Juan, Horta, Mid-Atlantic Ridge, MAR, Portugal, Sargasso Sea, Puerto Rico

#### 1.4 If this mission is part of a series of missions, what is the series name?

Okeanos ROV Cruises

### **1.5 Planned or Actual Temporal Coverage of the data:**

Start Date: 2022-08-06 and End Date: 2022-09-03

### **1.6 Actual or Planned Geographic Coverage of the data:**

Northernmost Boundary: 40 and Southernmost Boundary: 18

Westernmost Boundary: -65 and Easternmost Boundary: -28

### **1.7 What data types will be created or captured and submitted for archive?**

Bottom Backscatter, Cruise Plan, Cruise Summary, Digital Video, Digital Still Images, EK60 Split Beam Data, EK80 Split Beam Data, Multibeam (image), Multibeam (processed), Multibeam (product), Multibeam (raw), Navigational Data, SCS Output (compressed), SCS Output (native), Seafloor Imagery, Sound Velocity Profile, Sub-Bottom Profile data, Temperature data, Water Column Backscatter, XBT (raw)

### **1.8 What platforms will be employed?**

NOAA Ship Okeanos Explorer, Deep Discoverer ROV, Seirios Camera Platform

## **2 Points of Contact for this Data Producing Project**

Overall POC: Kasey Cantwell, [kasey.cantwell@noaa.gov](mailto:kasey.cantwell@noaa.gov)

Title: Expedition Coordinator

Affiliation: NOAA Office of Ocean Exploration and Research

Phone: (301) 717-7776

## **3 Points of Contact for Managing the Data**

Data POC: Megan Cromwell

Data POC Title: Stewardship Data Management

Data POC Email: [megan.cromwell@noaa.gov](mailto:megan.cromwell@noaa.gov)

## **4 Resources**

### **4.1 Have resources for management of these data been identified?**

Yes

### **4.2 Approximate percentage of the budget devoted to data management. (specify % or unknown)**

Unknown

## **5 Data Lineage and Quality**

### **5.1 What is the processing workflow from collection to public release?**

SCS data shall be delivered in its native format to NCEI-MD (oceanographic archive); the data are then converted to an archive-ready, documented, and compressed NetCDF3 format which is made available for download through the Ocean Exploration Digital Atlas; water column profile data and navigation data will be delivered in ASCII format to NCEI-MD; EM304 and EK60/80 output data and metadata along with water column profiles used for calibration will be delivered to NCEI-CO (geophysical archive). Submersible video and



framegrab imagery will be delivered via hard-drive for inclusion in the NOAA archives and the Ocean Exploration Video Portal.

## **5.2 What quality control procedures will be employed?**

Quality control procedures for the data from the Kongsberg EM304 is handled at UNH CCOM/JHC. Raw (level-0) bathymetry files are cleaned/edited into new data files (level-1) and converted to a variety of products (level-2). Data from sensors monitored through the SCS are archived in their native format and are not quality controlled. Data from CTD casts and XBT firings are archived in their native format.

## **6 Data Documentation**

### **6.1 Does the metadata comply with the Data Documentation Directive?**

Yes

#### **6.1.1 If metadata are non-existent or non-compliant, please explain:**

Not Applicable

### **6.2 Where will the metadata be hosted?**

Organization: An ISO format collection-level metadata record will be generated during pre-cruise planning and published in the NOAA OneStop catalog and an OER Web Accessible Folder (WAF) hosted for public discovery and access at:

URL: <https://data.noaa.gov/waf/NOAA/NESDIS/ncei/oer/iso/>

Metadata Standard: ISO 19115-2 Geographic Information with Extensions for Imagery and Gridded Data will be the metadata standard employed.

### **6.3 Process for producing and maintaining metadata:**

Metadata will be generated via xml editors or metadata generation tools.

## **7 Data Access**

### **7.1 Do the data comply with the Data Access Directive?**

Yes

#### **7.1.1 If the data will not be available to the public, or with limitations, provide a valid reason.**

Not Applicable

#### **7.1.2 If there are limitations, describe how data are protected from unauthorized access.**

Account access to mission systems are maintained and controlled by the Program. Data access prior to public accessibility is documented through the use of Data Request forms and standard operating procedures.

### **7.2 Name and URL of organization or facility providing data access.**

Organization: NOAA National Centers for Environmental Information (NCEI)

URL: <https://www.ncei.noaa.gov>

### **7.3 Approximate delay between data collection and dissemination. By what authority?**

Hold time: Data are considered immediately publicly accessible as soon as possible after the mission, unless there are documented restrictions.

Hold authority: not applicable

### **7.4 Prepare a Data Access Statement**

No data access constraints, unless data are protected under the National Historic Preservation Act of 1966.

## **8 Data Preservation and Protection**

### **8.1 Actual or planned long-term data archive location:**

Data from this mission will be preserved and stewarded through the NOAA National Centers for Environmental Information. Refer to the Okeanos Explorer Data Management Plan at NOAA Central Library Institutional Repository for detailed descriptions of the processes, procedures, and partners involved in this collaborative effort.

### **8.2 If no archive planned, why?**

Not Applicable

### **8.3 If any delay between data collection and submission to an archive facility, please explain.**

The EM304 output data is a new format not currently read by NCEI archive systems. The new file format is being added to the system capability. There will be an unknown delay for the archive of these .kml files. All other data will be archived within 60-90 days of receipt.

### **8.4 How will data be protected from accidental or malicious modification or deletion?**

Data management standard operating procedures minimizing accidental or malicious modification or deletion are in place aboard the Okeanos Explorer and will be enforced.

### **8.5 Prepare a Data Use Statement**

Data use shall be credited to NOAA Office of Ocean Exploration and Research.

## Appendix C. Licenses, Permits, and Environmental Compliance

Pursuant to the National Environmental Policy Act (NEPA), NOAA Ocean Exploration is required to include in its planning and decision-making processes appropriate and careful consideration of the potential environmental consequences of actions it proposes to fund, authorize, and/or conduct. The companion manual for NOAA Administrative Order 216-6A describes the agency's specific procedures for NEPA compliance.

An environmental review memorandum was completed for NOAA Ocean Exploration expeditions on NOAA Ship *Okeanos Explorer* in 2022 in accordance with Section 4 of the companion manual in the form of a categorical exclusion worksheet. Based on this review, a categorical exclusion was determined to be the appropriate level of NEPA analysis necessary, as no extraordinary circumstances exist that require the preparation of an environmental assessment or environmental impact statement. This document is on file with NOAA Ocean Exploration and can be provided upon request. NOAA Ocean Exploration is preparing a programmatic environmental assessment to cover future expeditions.

Marine Scientific Research (MSR) clearances for deepwater mapping and ROV operations are planned inside the waters and extended continental shelf of Portugal, the British Virgin Islands, and Anguilla (MSR #F2022-025). Diplomatic clearances have been requested for each Coastal State. Much of this expedition will take place in high seas areas that do not require a MSR. The Convention on International Trade in Endangered Species (CITES) permits have been submitted to contacts in the United States and Portugal to ensure compliance.

NOAA Ocean Exploration has taken measures to ensure that any effects on species or habitats protected by the ESA, MMPA, MSA or NMSA meet the definition of negligible. The proposed actions will not result in any Federal, State, or local law violations or requirements imposed for protection of the environment. OER has received a letter dated March 14, 2022 from the NMFS ESA Interagency Cooperation Division that concurs with OER that the proposed action may affect, but is not likely to adversely affect ESA-listed species and designated and proposed critical habitat in the action area.

OER requested a Essential Fish Habitat (EFH) consultation for expeditions by NOAA Ship *Okeanos Explorer* to the Greater Atlantic, Southeast, and Gulf of Mexico Regions for operations during the 2022 field season. The Letter of Acknowledgement was received on February 18, 2022 from the Assistant Regional Administrator for the NOAA Office of Habitat Conservation stating that these expeditions will not adversely impact EFH.

See the [“NOAA Ship \*Okeanos Explorer\* FY22 Field Season Instructions”](#) for additional information regarding environmental compliance that applies to the entire field season.

## Appendix D. Emergency Contact Data Sheet

Mission personnel sailing aboard NOAA Ship *Okeanos Explorer* must fill out a [Sailing Contact Form](#) that collects emergency contact information for each person. This information is available to the operations officer to fulfill safety requirements to sail.