Project Instructions: EX2309: EXPRESS West Coast Exploration and Mapping

Date Submitted: Nov 9, 2023

Platform: NOAA Ship *Okeanos Explorer*

Project Number: EX2309

Project Title: EX2309: EXPRESS West Coast Exploration and Mapping

Project Dates: November 29 - December 8, 2023

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Approved by: GOELLER.AMANDA.LYNNE.1267671644 Digitally signed by GOELLER.AMANDA.LYNNE.1267671644 Date: 2023.11.15 09:32:46 -05'00' **Dated:** _____

CAPT Amanda Goeller
Commanding Officer
NOAA Marine Operations Center — Atlantic

I. Overview

A. Brief Summary and Project Period

This document contains project instructions specific to EX2309. This expedition will commence on November 29, 2023, in San Francisco, CA, and conclude on December 8, 2023, in San Francisco, CA. Operations will be conducted 24 hours a day, and consist of autonomously operated vehicle (AUV) dives, mapping system integration (and, if successful, mapping operations), and potential camera drop deployments.

AUVs, Eagle Ray and Mola Mola, will be provided and operated by the University of Southern Mississippi through the Ocean Exploration Cooperative Institute (OECI). Ocean Discovery League will join to test their modular drop camera systems, Maka Niu and Wayfinders, pending a feasibility assessment. Mapping objectives will focus on setting up the ship's acquisition suite using the deepwater mapping systems: Kongsberg EM 304 multibeam, EK60/EK80 split-beam sonars, Knudsen 3260 Chirp sub-bottom profiler, and Teledyne acoustic Doppler current profilers. If this objective is met, mapping operations will focus on filling bathymetric gaps in the U.S. Exclusive Economic Zone (EEZ). Operations will primarily focus on exploring deep waters (greater than 200 m in U.S. waters).

B. Days at Sea

Of the 10 days at sea (DAS) scheduled for this expedition, all are Program Funded Days provided by the Office of Ocean Exploration and Research.

This expedition is estimated to exhibit a high operational tempo due to 24-hour operations, which include daily AUV dives, system integration, potential drop camera deployments, and if integration is successful, exploration mapping operations.

C. Operating Area

EX2309 will focus operations on areas within the West Coast US EEZ. Operations will be conducted at depths between 200 and 6000 m. **Figure 1** shows the general operating area for the expedition. The waypoints for the general working area and proposed expedition track are in **Appendix A**.

As this expedition is likely to conduct overhead operations, a medical officer is requested to be aboard for the entirety of the expedition.

Figure 1. Map showing the general operating area for EX2309. The expedition track is subject to change based on survey results, field conditions, and the discretion of the commanding officer.

D. Summary of Objectives

EX2309 operations will involve collecting data in support of the EXpanding Pacific Research and Exploration of Submerged Systems (EXPRESS) campaign. EXPRESS is a multiyear, multi-institution cooperative research campaign in deep-sea areas off California, Oregon, and Washington, including the continental shelf and slope. EXPRESS data and information are intended to guide wise use of living marine resources and habitats, inform ocean energy and mineral resource decisions, and improve offshore hazard assessments. In support of EXPRESS< this expedition will collect data to inform resource management plans of the three National Marine Sanctuaries in the region (Cordell Bank National Marine Sanctuary, Greater Farallones

National Marine Sanctuary, and Monterey Bay National Marine Sanctuary), gather new information on underwater cultural heritage sites, and provide critical data regarding habitat composition in areas of interest for offshore wind energy development as well as greater explore deep sea coral and sponge habitats in the region.

NOAA Ocean Exploration's expeditions on *Okeanos Explorer* also contribute to the National Strategy for Mapping, Exploring, and Characterizing the United States Exclusive Economic Zone and Seabed 2030.

EX2309 was significantly rescoped from its original plans due to unforeseen circumstances. Mission objectives now include mapping and visual surveys with two University of Southern Mississippi AUVs (Mola Mola and Eagle Ray), field testing of two Ocean Discovery League drop cameras (Maka Niu and Wayfinders), mapping systems integration for an OMAO-operated acquisition suite, and if the previous objective is successful, exploration mapping. Considering the last-minute rescope of the expedition, there is an understanding that there is no guarantee that all objectives will be achieved. The following list outlines an ideal scenario. See **Appendix B** for the expedition data management plan.

1. University of Southern Mississippi AUV Objectives

a. Continue to field test functionality and integration of two University of Southern Mississippi AUVs (Eagle Ray and Mola Mola).
b. Conduct XBTs (where permissible) to support the accurate positioning of AUVs.
c. Perform an inventory of data types and metadata for ingestion into the public archive.
d. Demobilize AUVs once the ship reaches the shipyard.

2. Ocean Discovery League Drop Camera Objectives

a. Perform field testing of two Ocean Discovery League drop camera systems (pending feasibility assessment and successful integration of retrieval system)
    i. Maka Niu - this system will be deployed tethered to a surface float and hauled in using a retrieval system mounted to the ship. It will likely be able to be deployed up to 700 m, to sit on the seafloor. No weights will be left on the seafloor.
    ii. Wayfinders - this system will be deployed and retrieved in shallow depths (up to 100 m). Any testing of this system will be beneficial.
    iii. Deployment locations will be where feasible to pair with ongoing AUV dives.
b. Retrieve Maka Niu.
c. Perform training on Maka Niu for Polynesian Voyaging Society representatives.

d. Conduct outreach events using Google Meets (or similar) using the OMAO network, pending further information being provided to the ship.

3. OMAO Mapping Systems Acquisition Set Up

a. Integrate and test the ship's multibeam acquisition system.
b. Integrate and test the EKs, Kundsen, and K-Sync.
c. Test OMAO Sound Speed acquisition set up.

4. Science Objectives

The following objectives are dependent on the successful completion of the preceding objectives.

a. Identify, map, and explore the diversity and distribution of benthic habitats, including potential deep-sea coral and sponge communities, fish habitats, and chemosynthetic communities.
b. Map geologic features to better understand the geological context of the region and improve knowledge of past and potential geohazards, and seafloor composition.
c. Acquire acoustic and oceanographic data as a foundation to better understand the characteristics of the water column and the pelagic fauna that inhabit it.
d. Create and provide input into standard science products to provide a foundation of publicly accessible data and information products to spur further exploration, research, and management activities.
e. Collect comparison data between 26 khz mapping systems using the ship's acquisition system to ensure system performance.
f. Collect transit data that addresses bathymetric gaps or prioritizes areas with poor bathymetric or seabed backscatter data quality using the ship's acquisition system for the EM304 MKII.
g. Collect high-resolution bathymetry in areas with no (or low quality) sonar data.
h. Conduct XBT casts as data quality requires, but not more than six hours apart.
i. Collect sun photometer measurements as part of surveys of opportunity in partnership with NASA.

5. Additional Project of Opportunity

a. As feasible (outside of Sanctuary boundaries and at available opportunities for ship's crew) deploy 2-3 small, handheld drifting buoys. Pending further information being provided to the ship.

6. Data Management Objectives

a. Ensure all data is stored and transferred off ship and has a pathway to the public archives.

7. Outreach and Education Objectives

a. Host port event 12/9 and 12/10 in conjunction with AGU and the Exploratorium (exact schedule TBD)
b. Engage the general public in ocean exploration through social media and timely content on the NOAA Ocean Exploration website.
c. Host media guests during port event to support NOAA Public Affairs and outreach objectives

8. Ship Objectives

a. Conduct drills.
b. Conduct small boat transfer on 12/5 to offload 4 mission personnel and bring on 1 mission person.
c. Support PIAD visiting guests through discussions of what operationally works, and what could be possible with a new build as time allows for the ship's crew.

9. Ethanol Testing

a. Test the quality of the ethanol stored in the ethanol barrels before and after each expedition. Take test samples and secure HAZMAT for dry dock.
b. Use NOAA Ocean Exploration's Ethanol Test Guide (**Appendix C**), which provides detailed instructions on how to test the ethanol, calculate the measurements, and record the results.

E. Participating Institutions

- United States Naval Research Laboratory, Stennis Space Center, MS 39529
- Ocean Exploration Cooperative Institute, University of Rhode Island, Kingston, RI 02881
- University of Southern Mississippi, 118 College Dr, Hattiesburg, MS 39406
- Ocean Discovery League, PO Box 182, Saunderstown, RI, 02874
- Bureau of Ocean Energy Management, 3801 Centerpoint Drive, Suite 500, Anchorage, AK 99503
- NOAA, Deep Sea Coral Research and Technology Program, 1315 East-West Hwy, Silver Spring, MD 20910 USA

- NOAA, National Centers for Environmental Information, 1021 Balch Boulevard, Suite 1003, Stennis Space Center, MS 39529
- NOAA, Office of Coast Survey, Integrated Ocean and Coastal Mapping, 7600 Sand Point Way NE Seattle, WA 98115
- NOAA, Pacific Marine Environmental Research Laboratory, 7600 Sand Point Way NE Seattle, WA 98115
- United States Environmental Protection Agency, Ocean Dumping Program, Oregon Operations Office, 805 SW Broadway, Suite 500, Portland, OR 97205
- United States Geological Survey, Eastern Ecological Science Center at the Leetown Research Laboratory, Species Population Dynamics & Surveillance Capability Team 11649 Leetown Road, Kearneysville, WV 25430
- United States Geological Survey, Pacific Coastal and Marine Science Center, 2885 Mission Street, Santa Cruz, CA 95060 USA

F. Personnel (Mission Party)

Mission personnel (see **Table 1**) will arrive in San Francisco, CA on November 26-27, 2023. Most mission personnel will be aboard for the entire expedition, with four departing by small boat on 12/5 and one arriving. Most personnel will depart by December 10. Some will stay on to transit to the shipyard for demobilization. All demobilization will take place once the ship has reached the shipyard. The expedition will also be supported by shoreside personnel (see **Table 2**).

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.

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

#	Name (Last, First)	Title	Date Aboard	Date Disembark	Gender	Affiliation	Nationality
1	Cantwell, Kasey	Expedition Coordinator	11/26	12/11	F	NOAA Ocean Exploration	USA
2	Hoy, Shannon	Mapping Lead	11/27	12/10	F	NOAA Ocean Exploration	USA

#	Name (Last, First)	Title	Date Aboard	Date Disembark	Gender	Affiliation	Nationality
3	Macelloni, Leo	AUV Team Lead	11/27	12/11	M	USM	US Permanent Resident
4	D'Emidio, Marco	AUV Team Lead	11/28	12/11	M	USM	US Permanent Resident
5	Rubim de Assis, Agno*	AUV Team	11/27	12/11	M	USM	Brazil
6	Woolsey, Max	AUV Team	11/27	12/11	M	USM	USA
7	Jarnagin, Roy	AUV Team	11/27	12/11	M	USM	USA
8	Battista, Brad	AUV Team	11/27	12/11	M	USM	USA
9	Kennedy, Brian	Drop Camera Team	11/27	12/8	M	Ocean Discovery League	USA
10	Leeper, Katie	Drop Camera Team	11/27	12/9	F	Ocean Discovery League	USA
11	Sandoval, Jessica	Drop Camera Team	11/27	12/10	M	Ocean Discovery League	USA
12	Kamalu, Lehua	Drop Camera Team	11/27	12/9	F	Ocean Discovery League	USA
13	Ruby, Caitlin	Data management Lead	11/27	12/10	F	NCEI	USA
14	Cervone-Richards, Thomas	Augmenting Officer and Ocean Prediction Center rep	11/27	12/10	M	NWS Ocean Prediction Center	USA
15	Jerram, Kevin	Mapping watch lead	11/27	12/10	M	UCAR	USA
The following personnel will be onboard during the **first leg** of the expedition (11/29/23- 12/5) and will participate in the small boat transfer **from the ship** on 12/5							
16	Crouse, Courtney	PIAD Class A manager	11/27	12/5	F	OAMO PIAD	USA
17	Korthauer, Dan	Navy project manager for NOAA Class A vessels	11/27	12/5	M	US Navy	USA

#	Name (Last, First)	Title	Date Aboard	Date Disembark	Gender	Affiliation	Nationality
18	Vice, Ami	Drop Camera Team	11/27	12/5	F	Ocean Discovery League	USA
19	Sweeney, Edward	Scientist	11/27	12/5	M	NOAA NCCOS	USA
The following personnel will be onboard during the **second leg** of the expedition (12/5 - 12/8) and will participate in the small boat transfer **to the ship** on 12/5							
16	Bell, Katherine	Drop Camera Team	12/5	12/9	M	Ocean Discovery League	

*pending FNG extension

Table 2. Shoreside support personnel and key contacts.

#	Name (Last, First)	Title	Affiliation	Nationality
1	Crum, Emily	Comms Coordinator	NOAA Ocean Exploration	USA
2	Johnson-Rodney, Shellby	Outreach Coordinator	NOAA Ocean Exploration	USA

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

Foreign national access to *Okeanos Explorer* or other federal facilities **will be required** for this expedition. Our Foreign National Guest for this expedition is Agno Rubim de Assis who is currently cleared for access onboard *Okeanos Explorer* through Nov 14. Given the last minute change of plans for this expedition, we have submitted an FN visit request as well as a longer FNG request that will cover Agno's time onboard. Kasey Cantwell will be the escort/sponsor.

G. Administrative

1. Points of Contact

Table 3. Points of contact.

Operations	Name, Title	Office	Address	Phone	Email
Marine Operations Center, Atlantic	CAPT Amanda Goeller, Commanding Officer	Marine Operations Center, Atlantic	439 West York Street Norfolk, VA 23510-1145	(757) 441-6778	co.moc.atlantic @noaa.gov
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	Chiefops.MOA @noaa.gov
NOAA Ship Okeanos Explorer (primary)	CAPT Colin Little, Commanding Officer	NOAA Ship Okeanos Explorer	NOAA Ship Okeanos Explorer 47 Chandler Street Newport, RI 02841	(401) 439-7848	CO.Explorer @noaa.gov
NOAA Ship Okeanos Explorer (primary)	LT Tim Holland, Operations Officer	NOAA Ship Okeanos Explorer	NOAA Ship Okeanos Explorer 47 Chandler Street Newport, RI 02841	(808) 659-9179 x221	ops.explorer @noaa.gov
Mission (primary)	Kasey Cantwell, Operations Chief	NOAA Ocean Exploration	1315 East-West Highway, Silver Spring, MD 20910	(301) 717-7776	kasey.cantwell @noaa.gov
Mission (other)	Rachel Medley, Chief, Expeditions and Exploration Division	NOAA Ocean Exploration	1315 East-West Highway, Silver Spring, MD 20910	(301) 789-3075	rachel.medley @noaa.gov
Mission (other)	Jeremy Weirich, Director	NOAA Ocean Exploration	1315 East-West Highway, Silver Spring, MD 20910	(301) 452-7366	jeremy.weirich@ noaa.gov

2. Diplomatic Clearances

Planned operating area resides within the U.S. Exclusive Economic Zone or the high seas, so no diplomatic clearances are needed.

3. Licenses and Permits

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. The NEPA categorical exclusion and amended supplemental for this expedition are included as supplemental files to this document.

Significant work is planned within Greater Farallones and Cordell Bank National Marine Sanctuaries. A multi-Sanctuary permit was requested and approved by Office of National Marine Sanctuaries (ONMS permit # MULTI-2022-008) to conduct activities within Channel Islands, Cordell Bank, Greater Farallones, Monterey Bay and Olympic Coast National Marine Sanctuaries (CINMS, CBNMS, GFNMS, MBNMS and OCNMS; or sanctuaries). The permit covers activities from April 1-December 31, 2023.

The expedition coordinator is responsible for obtaining and listing all permits as well as any identification numbers they contain. Final documents will be archived with the associated expedition report.

See the "NOAA Ship *Okeanos Explorer FY23 Field Season Instructions*" for additional information regarding environmental compliance that applies to the entire field season (such as the Endangered Species Act Section 7 consultation and potential impacts to essential fish habitat).

4. 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.

For shipments to arrive while in port in San Francisco, CA, at the start of the expedition, **shipments should arrive no later than November 15, 2023**, and be shipped to the following address:

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

Due to the ship entering shipyard after this project, and the officer who supports the ship from the New England Port office is sailing during this leg, no mission mail will be coordinated for shipment to the ship at the end of the project.

5. COVID-19 Contingency Plan for Scientific Party

In accordance with the "OMAO Marine Operations COVID-19 Protocols" effective May 3, 2023, shelter-in-place is not required for sailing, the COVID 19 booster is not required for sailing, and pre-sail testing requirements have an on/off toggle. All mission personnel shall follow the guidelines written within the documentation, subject to change, pending the release of the new guidance. All sailing personnel are required to have completed the initial vaccination series.

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:

Rachel Medley
Expeditions and Exploration Division
NOAA Ocean Exploration
1315 East-West Highway, Silver Spring, MD 20910

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 conditions and the discretion of the commanding officer. Locations are approximate. Due to the considerable rescope of this expedition, we request the schedule to be flexible to determine optimal timings as plans finalize. The Expedition Coordinator will work closely with the Operations Officer to ensure the evolving schedule is able to be accommodated by the ship.

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 AUV dive details.

Date	Activities
11/27	Mission personnel move aboard. Mobilization begins. Mission personnel will need laptop computers added to the OMAO wireless network. **Deck and Engineering support may be needed by AUV, Mapping or Drop Camera teams (e.g., to mount the hauler). Survey and CET support will be needed.** May also need an operator for crane and A-frame operations to conduct a dunk test for the AUVs, if needed. Stores will be loaded.
11/28	Final mission personnel arrive and move aboard. Vessel familiarization and safety briefing tour for new personnel. Mission personnel will need laptop computers added to the OMAO wireless network. **Deck, Survey, CET, and Engineering support may be needed by AUV, Mapping, or Drop Camera teams**. May also need an operator for crane and A-frame operations to conduct a dunk test for the AUVs, if needed. Stores will be loaded.
11/29	Depart San Francisco, CA. Mission all-hands briefing and open tech talks (timing TBD). Potential to conduct drop camera deployment. Mapping integration and testing.
11/30	AUV, drop camera, and mapping operations (integration or exploration, depending on status). Open tech talks (timing TBD). **Meeting to go over Port Event and schedule.**
12/1	AUV, drop camera, and mapping operations (integration or exploration, depending on status). **Department Head meeting with Visiting PIAD and Navy representatives.**
12/2	AUV, drop camera, and mapping operations (integration or exploration, depending on status).
12/3	AUV, drop camera, and mapping operations (integration or exploration, depending on status).
12/4	AUV, drop camera, and mapping operations (integration or exploration, depending on status).
12/5	Small boat transfer (4 offloaded and one onboarded). Mapping/Drop Cam objectives if/when small boat transfer is complete. Vessel familiarization for new personnel. Open tech talks (timing TBD)
12/6	AUV, drop camera, and mapping operations (integration or exploration, depending on status). **(UCH operations anticipated)**
12/7	AUV, drop camera, and mapping operations (integration or exploration, depending on status).
12/8	Ship arrives in San Francisco, CA @ Exploratorium for port event
12/9	AGU port event - VIP Tours
12/10	AUG port event. Mission personnel move off ship.
12/11	Ship transitions to shipyard in Vallejo, CA
12/12	Offload of USM AUVs

Date	Activities
12/13	Offload of ROVs
12/14	Mission personnel depart San Francisco, CA.

B. Staging and Destaging

Limited onloading of equipment is expected as most mission equipment will already be aboard. Support will be needed from CET and Survey to bring mission team's laptops online and to support the updating and integration of the OMAO multibeam acquisition systems (hydrographic workstation), most of which will be completed during EX2308. Depending on how operations go during EX2308 (previous expedition) we may need support from Deck and Engineering Departments to support a dunk test of the AUVs before departure. Additional support may be needed from the ship's crew (likely Deck Department) to assist with integration of the drop camera system during mobilization. This camera system will not be integrated into the CTD rosette and will have its own deployment system. Conversations are ongoing about the feasibility of this deployment system.

Shipyard Crane operations for demobilization are anticipated to offload AUV vehicles and equipment. End of season demobilization of ROV and mission equipment is anticipated once the ship arrives to shipyard.

C. Operations to Be Conducted

1. AUV Dives

Table 5. List of planned AUV dive sites for EX2309: 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. **As AUV operations were only confirmed on 10/26 for this expedition, the below sites are the highest priority sites originally planned for this expedition when it was ROV operations -** these are likely to change given depth limitations of the vehicles. The position information for each dive is tentative until the dive planning is completed one day before each scheduled dive.

Date	Activity	Dive #	Dive Name	Longitude (DD, E)	Latitude (DD, N)	Depth, approx. (m)
11/29	Transit		San Francisco	-122.5	37.8	
11/30	Dive+Map	1	Unnamed Canyon 1	-123.9510	38.530188	2,760.00

				991	61	
12/1	Dive+Map	**2**	Unnamed Canyon 3	-123.577773	37.811746	2,770.00
12/2	Dive+Map	**3**	Pioneer Seamount	-123.3619583	37.36169059	1,840.00
12/3	Dive+Map	**4**	Gumdrop Seamount	-123.5168073	37.40134062	2,200.00
12/4	Dive+Map	5	Lucia Chica Channel	-121.788775	35.745728	998.00
12/3	Dive+Map	**6**	UCH	UCH	UCH	2,460.00
12/7	Dive+Map	**7**	Unnamed Canyon 2	-123.632	37.867	2,720.00

2. CTD Casts

No CTD casts are planned for this expedition.

3. Drop Camera Deployments

Locations for the drop camera deployments are in the process of being scoped. They will be limited to the length of the rope (likely 700 m). They will need to be planned in coordination with AUV operations.

4. Extended Operations

Approval of extended dive and over-the-side operations is at the commanding officer's discretion, and every effort shall be taken to minimize undue hardship on the crew and disruptions to work schedules.

5. Telepresence/Outreach Events

a. No telepresence is expected for this expedition.

6. In-Port Events

a. AGU port event is planned for 12/9 and 12/10 and will include a variety of ship tours at times and schedule set by CO.

7. Special/Unusual Operations or Requests

Please see notes about staging and destaging as this expedition will have unfamiliar tech (AUVs and drop cameras) and have end of season demobilization in advance of dry dock.

Small boat personnel transfer planned on 12/5.

Media visits have been coordinated between OAR, OMAO, and ONMS comms/public affairs teams.

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 EX2309, but the ship may plan training, safety drills, or maintenance dives.

E. Applicable Restrictions

Not applicable.

III. Equipment

A detailed list of equipment provided by the ship and NOAA Ocean Exploration can be found in the "NOAA Ship *Okeanos Explorer* FY23 Field Season Instructions." Telepresence capabilities are not available for this expedition. Additionally, the Ocean Exploration Cooperative Institute/ USM are providing two AUVs during this expedition - AUV Mola Mola and Eagle Ray. Ocean Discovery League is providing two drop camera systems (Maka Niu and Wayfinders) for testing and integration into operations.

IV. Hazardous Materials

A. Policy and Compliance

See the "NOAA Ship *Okeanos Explorer* FY23 Field Season Instructions."

B. Inventory

Table 6. Inventory of hazardous materials that will be aboard for EX2309.

Item	Use	Approximate Locations
95% UPS denatured ethanol (120 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

Item	Use	Approximate Locations
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
AP 120 Metal Prep	Degreaser/cleaner for metal surfaces	Pit

Item	Use	Approximate Locations
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

Appendix A. Waypoints

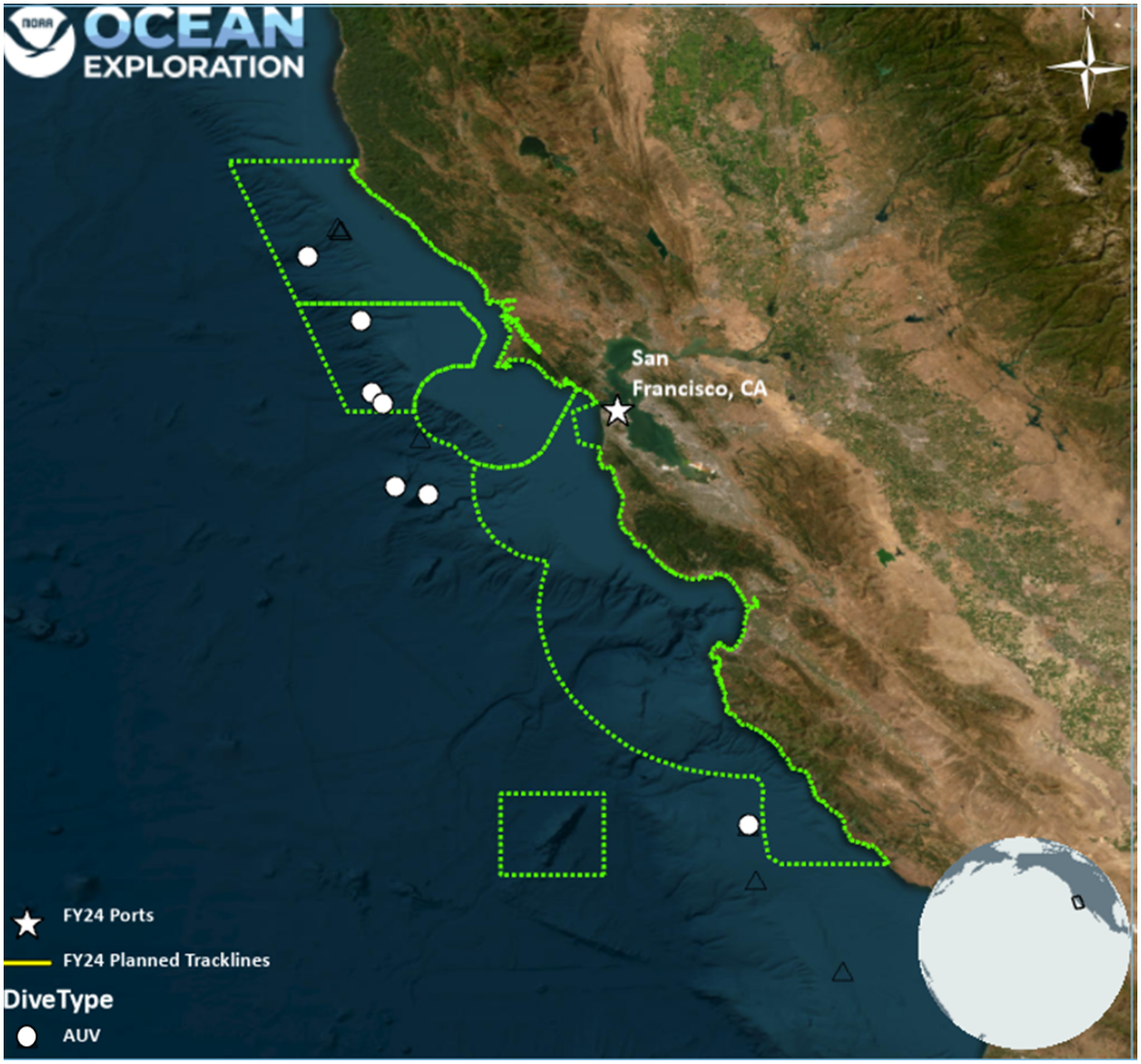

Figure A1. Map showing the general operating area and targeted sites for EX2309. As operations and the technology onboard just changed 10/26, a specific cruise track has not been determined yet. Drop camera locations have not been determined yet. This figure and waypoints will be updated as soon as possible.

Table A1. Proposed expedition **bounding box** (subject to change).

Latitude (D DM)	Longitude (D DM)
39.015	-124.345

Latitude (D DM)	Longitude (D DM)
39.0227	-123.762
35.342	-120.985
35.142	-122.872

Appendix B. Data Management Plan

Okeanos Explorer Mission EX2309 Data Management Plan

Report Date: 2023-11-08

1. General Description of Data to be Managed

1.1 Name and Purpose of the Data Collection Project:

EX-23-09, EXPRESS West Coast Exploration and Mapping
This expedition will commence on November 29, 2023, in San Francisco, California and conclude on December 8, 2023 in San Francisco, California. Operations will be conducted 24 hours a day, and consist of autonomously operated vehicle (AUV) dives, mapping system integration (and, if successful, mapping operations), and potential camera drop deployments.

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, EK60/EK80 split-beam sonars, Knudsen 3260 Chirp sub-bottom profiler, and Teledyne acoustic Doppler current profilers), expendable bathythermograph (XBTs) in support of multibeam sonar mapping operations, the large AUVs Eagle Ray and Mola Mola operated by the University of Southern Mississippi, launched and recovered from a Launch and Recovery Systems (LARS), ship crane, and small boat. Operations will focus on exploring deep waters (greater than 200 m for mapping operations and between 40 and 130 m for AUV operations) in U.S. waters off the central California coast. Additionally, there is potential for drop camera operations using the Ocean Discovery League's Maka Niu and Wayfinders (limited to 700 m).

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

Theme Keywords:
bathymetric gaps, CTD, EM304, fish habitats, geohazards, habitat areas of particular concern, HAPC, mapping survey, marine education, multibeam, multibeam backscatter, multibeam sonar, multi-beam sonar, noaa, noaa fleet, ocean, ocean discovery, ocean education, ocean exploration, ocean exploration and research, ocean literacy, ocean research, oceans, OER, okeanos, okeanos explorer, R337, science, sun photometer, scientific computing system, scientific mission, scientific research, SCS, sea, Seabed 2030, single beam sonar, singlebeam sonar, single-beam sonar, site characterization, sonar anomalies, split beam sonar, stewardship, pelagic infauna, systematic exploration, sub-bottom profile, systematic exploration, water column backscatter, EXPRESS, EXpanding Pacific Research and Exploration of Submerged Systems, autonomous underwater vehicle, AUV, Eagle Ray, Mola Mola, magnetometer, drop camera, modular drop camera, Maka Niu, Wayfinders, OECI, Ocean Exploration Cooperative Institute, OECI, Ocean Discovery League, University of Southern Mississippi

Place Keywords:

California, Cordell Bank National Marine Sanctuary, Greater Farallones National Marine Sanctuary, and Monterey Bay National Marine Sanctuary, San Francisco, U.S. West Coast

1.4 If this mission is part of a series of missions, what is the series name?
Okeanos AUV Expedition

1.5 Planned or Actual Temporal Coverage of the data:
Start Date: 2023-11-29 and End Date: 2023-12-08

1.6 Actual or Planned Geographic Coverage of the data:
Northernmost Boundary: 39.02 and Southernmost Boundary: 35.142
Westernmost Boundary: -124.345 and Easternmost Boundary: –120.985

1.7 What data types will be created or captured and submitted for archive?
Project Instruction, Expedition Report, EK60 Split Beam Data, EK80 Split Beam Data, Multibeam (image), Multibeam (processed), Multibeam (product), Multibeam (raw), Bottom Backscatter, Navigational Data, Meteorological Data (raw), Seafloor Imagery, Sound Velocity Profile, Sub-Bottom Profile data, Temperature data, Water Column Backscatter, XBT (raw), CTD, Magnetometer, Photomosaic, Video, Still Imagery

1.8 What platforms will be employed?
NOAA Ship Okeanos Explorer, USM Eagle Ray AUV, USM Mola Mola AUV, ODL Maka Niu Drop Camera, ODL Wayfinders Drop Camera

2 Points of Contact for this Data Producing Project
Overall POC: Kasey Cantwell, kasey.cantwell@noaa.gov
Title: Expedition Coordinator
Affiliation: NOAA Office of Ocean Exploration and Research
Phone: (301) 734-1050 (Kasey Cantwell)

3 Points of Contact for Managing the Data
Data POC: NOAA National Centers for Environmental Information (NCEI)
Data POC Title: Stewardship Data Management Team
Data POC Email: OER.info.mgmt@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?

Navigational, meteorological, and oceanographic data shall be delivered in its native format to NCEI for preservation in the Oceanographic Archive. Mapping (multibeam, water column, sub bottom) data are sent to the University of New Hampshire (UNH) for post-processing. Raw and processed mapping data are then delivered to NCEI for preservation in the Geophysical Archives. AUV mapping (multibeam, water column, sub bottom) data and magnetometer data may be sent to NCEI for preservation in the Geophysical Archives. AUV navigation, oceanographic, and photo mosaic, and navigation data may be sent to NCEI for preservation in the Oceanographic Archive. Drop camera imagery may be sent to NCEI for preservation in the Oceanographic Archive.

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. XBT data are archived in their native format. AUV and drop camera quality control procedures will be determined ad hoc during operations.

6 Data Documentation

6.1 Does the metadata comply with the Data Documentation Directive?

Yes

6.1.1 If metadata are non-existant 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 published in the NOAA OneStop catalog and an NOAA Ocean Exploration 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.

Restricted data from identified Underwater Cultural Heritage Sites will need special permission to access.

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 NOAA. Data access prior to public accessibility is documented through the use of Data Request forms and standard operating procedures. Please contact OER.info.mgmt@noaa.gov for data access prior to formal public access.

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 Section 304 of the National Historic Preservation Act of 1966. Data collected and derivative data products produced by the *Okeanos Explorer* will be archived in a location where it can be withheld from public disclosure.

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 (NCEI). Refer to the Annual *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?

AUV and drop camera operations may still be in a preliminary status so not all data may be of archive quality.

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 .kmall 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 Ocean Exploration.

Appendix C. NOAA Ocean Exploration Ethanol Testing

To ensure the quality of the ethanol stored aboard NOAA Ship *Okeanos Explorer,* NOAA Ocean Exploration has developed an Ethanol Test Guide. This guide provides step-by-step instructions on how to test the ethanol stored in the ethanol barrels in the hazmat shed on the O2 weather deck near the Damage Control locker. This guide also provides a built-in calculator to plug in the measurements and get a definitive result. Finally, this guide is a log of the current and previous results of the ethanol testing.