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: Commander Robert Kamphaus
Commanding Officer, NOAA Ship *Okeanos Explorer*

for / CDR/NOAA

FROM: Captain David A. Score, NOAA
Commanding Officer, NOAA Marine Operations Center—Atlantic

SUBJECT: Project Instruction for EX-11-03
Exploration and Mapping, Galapagos Spreading Center

Attached is the final Project Instruction for EX-11-03 Exploration and Mapping, Galapagos Spreading Center, which is scheduled aboard NOAA Ship *Okeanos Explorer* during the period of 8 June- 28 July 2011. Acknowledge receipt of these instructions via e-mail to **OpsMgr.MOA@noaa.gov** at Marine Operations Center—Atlantic.

Attachment

cc:
MOA1

doi:10.25923/1mhs-8w28

OCEAN EXPLORATION & RESEARCH

Final Project Instructions

Date Submitted: Friday May 28, 2011

Platform: NOAA Ship *Okeanos Explorer*

Cruise Number: EX-11-03

Project Title: Exploration and Mapping, Galapagos Spreading Center
Leg I: Mapping, CTD and Tow-yo (June 08 – July 02)
Leg II: ROV, Mapping and CTD (July 07 - 28)

Cruise Dates: June 08 – July 28, 2011

Prepared by: Jeremy Potter
Office of Ocean Exploration & Research

Approved by: _____ Dated: 5/31/11
Craig W. Russell
Program Manager
Office of Ocean Exploration & Research

Approved by: for _____ Dated: 6/1/11
Captain David A. Score, NOAA
Commanding Officer
Marine Operations Center – Atlantic

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I. **Overview**

A. Cruise Plan Period

This cruise plan covers both legs of the Galapagos Expedition. Leg I (June 08 – July 02) includes transit and underway data collection starting from San Diego, California. Mapping and CTD/tow-yo operations will be conducted in international and Ecuador waters in the vicinity of the Galapagos Islands. ROV, mapping, and CTD/tow-yo operations during Leg II (July 07-28) will follow a port call in Puntarenas, Costa Rica (July 02-07).

B. Operating Area

The primary operating area will be in both international and Ecuador waters in the vicinity of the Galapagos Islands. Significant transits at the beginning of Leg I and end of Leg II are required to get to and from the primary operating area.

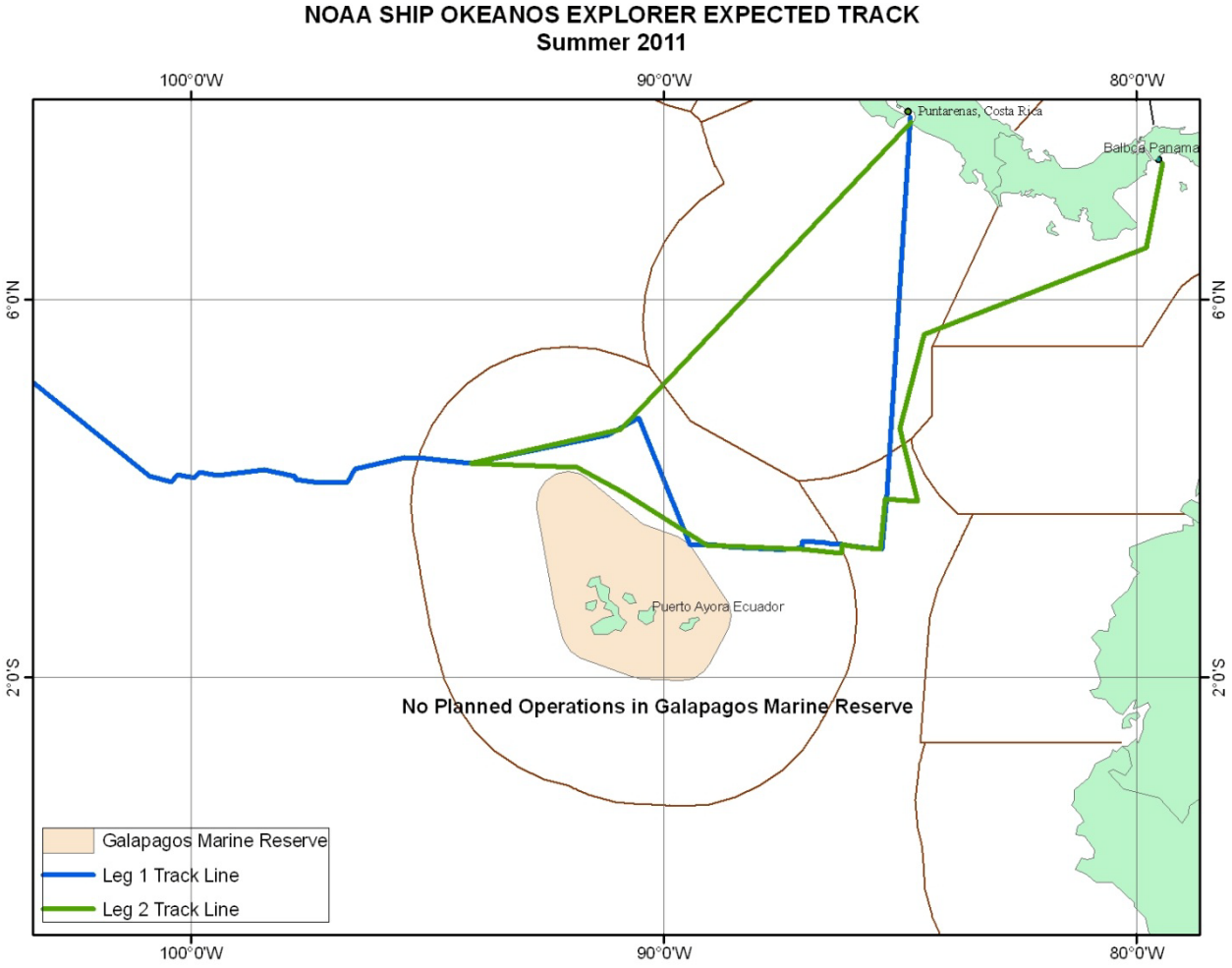

Figure 1. Estimated ship track for both Leg I and Leg II starting toward the end of the transit from San Diego. The mid-cruise port call will be in Puntarenas, Costa Rica.

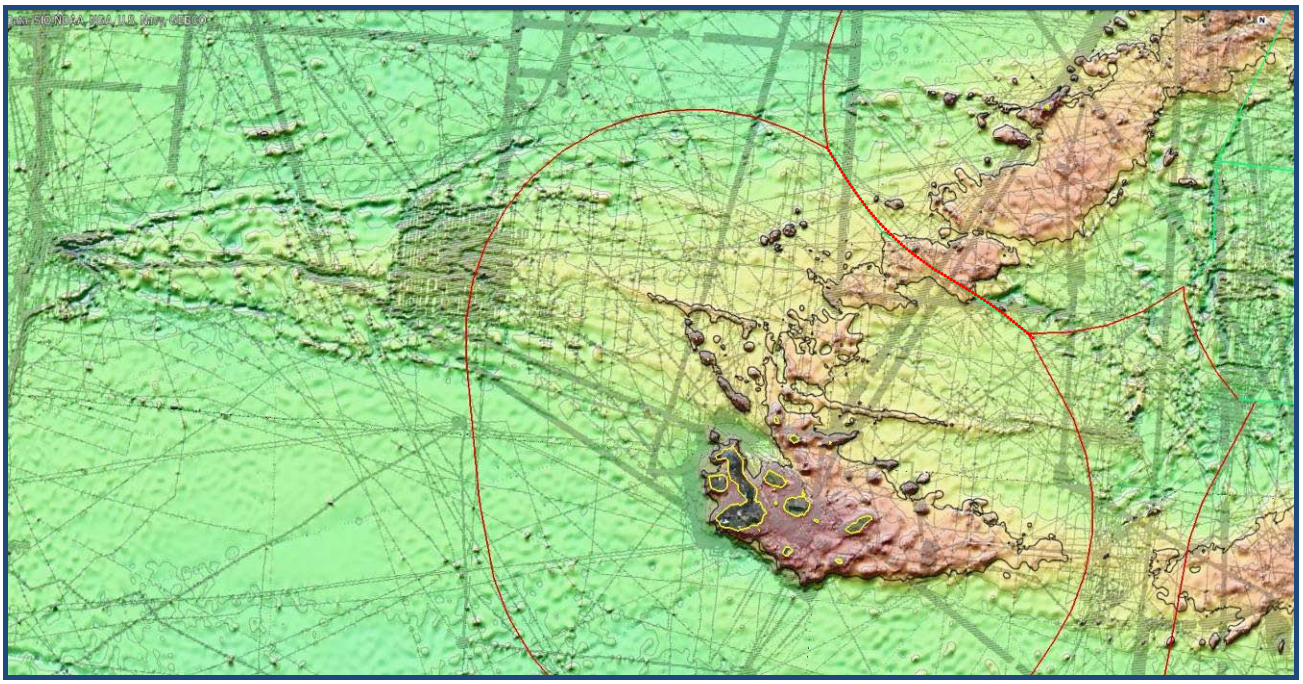

Figure 2. Google Earth image of the Galapagos Spreading Center (GSC) region. Image shows most areas with existing high resolution bathymetry. Solid red line depicts the EEZ boundaries. A dashed red line separates the Ecuador EEZ surrounding the Galapagos Islands (center) and the Costa Rica EEZ (top right).

C. Summary of Objectives

Leg I: Mapping, CTD and Tow-yo (June 08-July 02)

June 08-20 – Initial Transit
Okeanos Explorer will collect underway multibeam and meteorological/oceanographic (METOC) data during the ~ 12 day transit from San Diego to the area of operations in the Galapagos Spreading Center. Objectives during the initial transit (Table 1 - Point ID 1-8) include:

1. Collect EM 302 data while operating in international waters and - assuming the submitted Marine Research Clearance is accepted - while transiting through the French EEZ (Clipperton Island). If it does not compromise data quality, we request a transit speed greater than 8.5 knots.
2. Conduct deep CTD test cast to engage and conduct the first onboard tests of the new altimeter/sensor package which includes a Light Scattering Sensor (LSS), Oxidation-Reduction Potential (ORP) and Dissolved Oxygen (DO) sensor. A cast in an area ~1000m depth will sufficiently test the systems and minimize wire time.
3. Configure and test telepresence communications; and
4. Test ship-to-shore collaboration tools (e.g. *Okeanos Explorer* portal, ftp server)

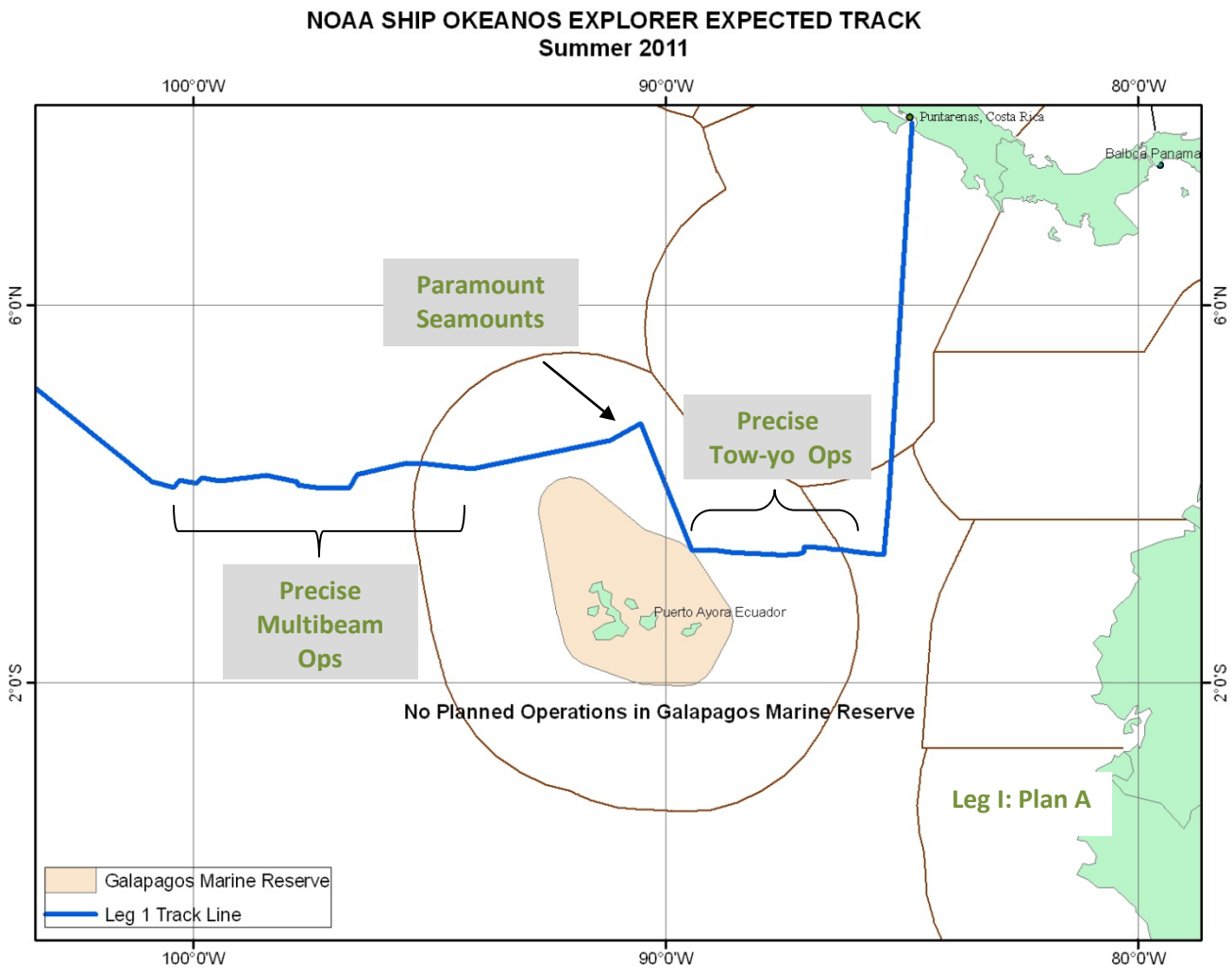

Figure 3. Blue line is the estimated Leg I ship track. Areas are noted where detailed multibeam and or tow-yo operations are planned. Light pink polygon is the Galapagos Marine Reserve. OER expects to have permission to work within the Ecuador EEZ but not permission to work within the Marine Reserve.

June 20-22 (~101W to ~94W): ~3 days of precise multibeam operations includes entry into Ecuador EEZ. See Table 1 - Point ID 8-22

June 23 (Paramount Seamounts): ~1 day of preliminary multibeam operations and a vertical CTD cast. See Table 1 - Point ID 22-25

June 24-30 (~89W to ~86W): ~6 days of precise tow-yo operations and simultaneous multibeam data collection at ~1.5 knots. No water sample collection is expected. See Table 1 Point ID 25-47. Appendix C includes PMEL's tow-yo operations protocol.

June 30-July 02: Multibeam mapping while in transit to Puntarenas, Costa Rica. Refined waypoints will be provided.

Leg I: San Diego to Puntarenas (June 08-July 02)				
POINT ID	ESTIMATED LONGITUDE	ESTIMATED LATITUDE	ESTIMATED DATE	NOTES
1	-117.282	32.905	8-Jun-11	Depart San Diego
2	-122.250	30.433		
3	-122.468	28.431		
4	-118.805	17.760		
5	-117.051	15.264		
6	-112.386	11.700	16-Jun-11	Estimated Entry Clipperton Island waters
7	-107.301	7.575	18-Jun-11	Estimated Exit Clipperton Island waters
8	-100.87520	2.26014	20-Jun-11	Begin precise multibeam line (~8.5 knots)
9	-100.41716	2.12826		
10	-100.28777	2.29375		
11	-99.93842	2.21101		
12	-99.82197	2.34029		
13	-99.43898	2.26272		
14	-98.45303	2.37908		
15	-97.81385	2.26272		
16	-97.80091	2.18773		
17	-97.29112	2.11533		
18	-96.68040	2.12826		
19	-96.53031	2.41269		
20	-95.49003	2.64019		
21	-95.02940	2.62468	21-Jun-11	Estimated entry Ecuador waters
22	-94.09004	2.53420	22-Jun-11	End precise multibeam line
23	-91.17526	3.12789	23-Jun-11	Paramount Seamounts
24	-90.52333	3.48792		
25	-89.44156	0.80330	24-Jun-11	Start tow-yo ops (1.5 knots)
26	-89.42144	0.80138		
27	-89.33038	0.78795		
28	-89.18831	0.78694		
29	-89.07937	0.80564		
30	-88.87940	0.78994		
31	-88.61551	0.75859		
32	-88.46104	0.74811		
33	-88.33083	0.73763		
34	-88.11703	0.72186		
35	-87.97946	0.72348		
36	-87.85560	0.71642		

37	-87.74896	0.71805		
38	-87.56663	0.69519		
39	-87.41701	0.70021		
40	-87.22751	0.71587		
41	-87.07464	0.76317		
42	-87.05264	0.87997		
43	-86.81099	0.86169		
44	-86.58732	0.83950		
45	-86.39329	0.81738		
46	-86.24510	0.80788		
47	-86.03235	0.78183	30-Jun-11	End tow-yo ops
48	-85.736	0.750		Begin transit to Puntareanas, points to be refined
49	-85.378	0.709		Points to be refined
50	-85.274	1.835		Points to be refined
51	-85.184	2.721	1-Jul-11	Estimated entry Costa Rica waters
52	-84.777	9.857	2-Jul-11	Arrive in port, Puntarenas

Table 1: Waypoints for Leg I transit and operations. Some waypoints for precise multibeam line and tow-yo operations may be refined.

Puntarenas Port Call (July 02 – July 07):

The 4-day in port period will include a science planning meeting via telepresence. This will require ship as well as OER personnel. Objectives include discussion of data collected during EX-11-03 Leg 1 and seek recommendations about EX-11-03 Leg II work.

Representatives from National Geographic Television will visit the ship during the port call to film onboard footage for the Oceanus television series. Interviews of onboard ship and mission personnel are expected.

Leg II: ROV, Mapping and CTD (July 07 – 28**):**

Primary objectives include utilization of the full suite of *Okeanos Explorer* capabilities (i.e., ROV, mapping, CTD, and telepresence). Daytime operations will largely focus on ROV dives to explore targets identified using bathymetry collected during Leg I and from other ships during previous expeditions. Nighttime operations will consist of vertical CTD casts, tow-yo operations and multibeam data collection. Operations overview:

1. ROV
    - Daytime ROV dives: Launch at ~0830. Onboard recovery at ~1700

- Ongoing training of pilots
- Ongoing system familiarization and training

2. Telepresence (VSAT 20 Mbps ship-to-shore; 1.54 Mbps shore–to-ship)
    - Test data and information sharing tools between ship and shore
    - Continue to apply and refine SOP's
    - Ongoing system familiarization and training

3. Mapping operations
    - Conduct mapping ops when required
    - Continue cross training of ROV / mapping personnel

4. CTD operations
    - Combination of vertical casts and tow-yo

5. Communications between ship and shore
    - SOPs, *Okeanos Explorer* Portal, ftp server
    - Indonesia Exploration Command Center
    - PMEL Exploration Command Center
    - UNH Exploration Command Center
    - URI Inner Space Center
    - SS Exploration Command Center

6. Data management
    - See the Data Management Plan Appendix D

7. Education and Outreach
    - Support limited number of 'active' telepresence events that include direct discussion/dialogue with onboard mission personnel
    - Support larger number of 'passive' telepresence events that do not include direct/discussion with onboard mission personnel
    - Collect video to support National Geographic *Oceanus* TV series
    - Other TBD

July 07-28 – Ship Track and Schedule

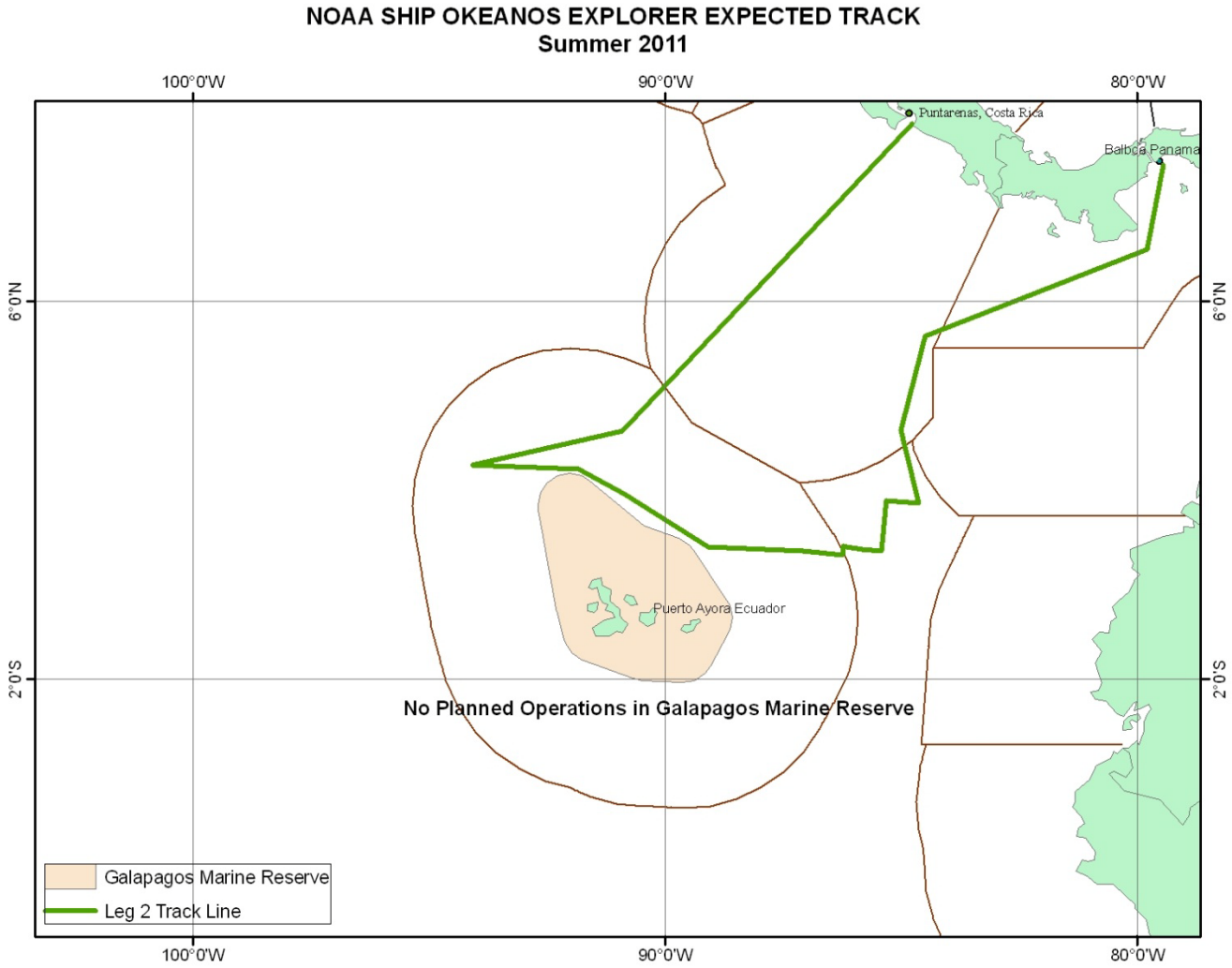

Figure 4. Green line is the estimated Leg II ship track. Light pink polygon is the Galapagos Marine Reserve. OER expects to have permission to work within the Ecuador EEZ but not permission to work within the Marine Reserve.

Leg II: Puntarenas to Balboa, Panama (July 07-28)				
	ESTIMATED LONGITUDE	ESTIMATED LATITUDE	ESTIMATED DATE	NOTES
1	-84.762859	9.75356	7-Jul-11	Depart Puntarenas
2	-89.994364	4.196657	9-Jul-11	Estimated entry Ecuador waters
3	-90.901909	3.250901	9-Jul-11	Paramount Seamounts
4	-94.070672	2.52507	12-Jul-11	Navidad
5	-91.831251	2.437312		Turn in Transit
6	-90.850411	1.90986	15-Jul-11	West Segment End
7	-89.089116	0.798609		Starting point of

8	-87.080727	0.711774	18-Jul	GSC Fracture Zone
9	-86.032351	0.781827	21-Jul-11	Estimated exit Ecuador waters
10	-86.242139	0.625241		End point of Leg I tow yo ops
11	-86.227164	0.804471	21-Jul-11	Rose Bud
12	-86.151291	0.796648	22-Jul-11	Garden of Eden
13	-85.828948	0.74854	23-Jul-11	Off-Axis Sulfide Mounds
14	-85.410846	0.711272		Need refined mapping Line
15	-85.331936	1.4907	24-Jul-11	Approx Inca Fracture Zone point
16	-85.311654	1.769742		Need refined mapping Line
17	-84.620751	1.72085	25-Jul-11	Ecudaor Rift
18	-85.184157	2.721497	25-Jul-11	Estimated entry Costa Rica waters
19	-85.00255	3.25808		
20	-84.485394	5.247793		
21	-84.200601	5.40124	26-Jul-11	Estimated entry Panama waters
22	-79.780743	7.092727		
23	-79.437017	8.869435	28-Jul-11	

Table 2: Waypoints for Leg II transit and operations. Order and locations of dives may change.

Considerations for Leg II ROV Targets and Multibeam Operations:

Leg I operations will provide information for science and operations teams deliberations during the port call to establish Leg II line plans and ROV targets.

Depending on information obtained on Leg I, the following dive targets and operations are being considered for Leg II:

- ROV dives at:
  - New targets located during Leg I
  - Navidad (2.500° -94.080°)
  - Paramount Seamounts (no existing bathymetry; ~24hrs for 100% coverage)
  - Sulfide Mounds (0.75 -85.8417)
  - NOTE: Science Team is interested in a few 'fast' ROV tows ~1.5knots or tows using only the camera sled. To be determined in consultation with the ship and ROV Team leader.
- Vertical CTD casts with water sampling:
  - Eye of Mordor site (near 2.10° -91.93°)
  - Near Navidad site at ~93.7W, ~94.33W and ~94.8W. These may help locate water column anomalies detected in 2005 and 2006.
- Multibeam for easternmost ridge segment (on map):
  - Priority lines are numbers 1, 2, 3 and 4. Lines 1 OR 2 and 3 & 4 could be run as the ship leaves the area on the way to Panama with minimal extra time.
  - Secondary priorities are lines 3a and 3b. These would provide a better picture of large massifs on the Inca Fracture Zone.

- Other considerations:
  - Line 2 would be best if there is only time for one line along the Galapagos Ridge in this area. Line 2 runs through the Off-Axis vents box and no information was found for that trend in NGDC. Collecting a line of bathymetry through the known area (box on map) with a lot of known mounds, might provide an acoustic signature on the backscatter.
  - Collecting one on-axis line would also be valuable as a time series and could yield more detail than previous surveys.
- NOTE: Line spacing is estimated and will be confirmed prior to operations.

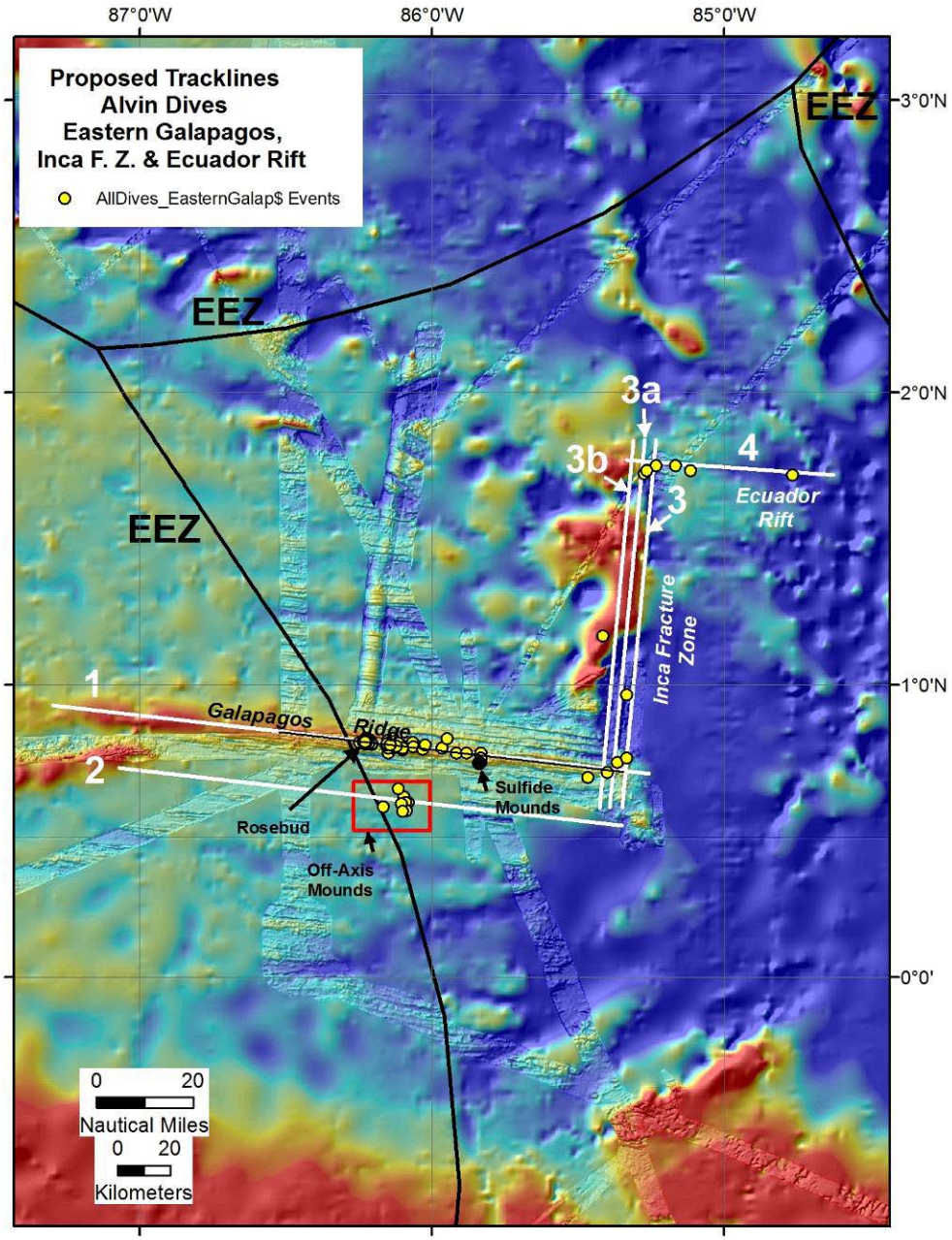

Figure 5: Map of eastern Galapagos area for possible ROV, multibeam and tow-yow operations during Leg II. White lines are estimated mapping lines (see Table 6). Yellows dots are locations of previous Alvin dives.

Line #	Latitude (Dec. Deg)	Longitude (Dec. Degs.)
1 S	0.929	-87.298
1 E	0.695	-85.258
2S	0.715	-87.072
2E	0.518	-85.35
3S	0.581	-85.35
3E	1.837	-85.233
3aS	0.581	-85.391
3aE	1.837	-85.272
3bS	0.578	-85.426
3bE	1.835	-85.311
4E	1.768	-85.335
4E	1.718	-84.626

Table 3: Start and end of potential mapping lines under consideration in the eastern Galapagos area. These may be conducted during Leg II.

D. Participating Institutions

National Oceanic and Atmospheric Administration (NOAA) Office of Ocean Exploration and Research (OER) 1315 East-West Hwy, Silver Spring, Maryland 20910

Woods Hole Oceanographic Institution MS33 Redfield Laboratory, Woods Hole, MA 02543-1049

NOAA Pacific Marine Environmental Lab 7600 Sand Point Way NE, Seattle, WA 98115

University of Massachusetts - Amherst N203 Morrill Science Center IV North Department of Microbiology, University of Massachusetts-Amherst, MA 01003

University of South Carolina, Department of Earth & Ocean Sciences, University of South Carolina, Columbia, SC 29208

University of Florida, Department of Geological Sciences , 241 Williamson Hall, PO Box 112120, Gainesville, FL 32611-2120

Indonesia Agency for Marine and Fisheries Research Ministry of Marine Affairs and Fisheries (KKP) Jl Pasir Putih I Ancol Timur Jakarta Utara 14430 DKI Jakarta, Indonesia

Indonesia Agency for the Assessment and Application of Technology (BPPT) Technology Center for Marine Survey Jalan MH. Thamrin 8, BPPT Building I, 18th Floor, Jakarta Pusat, Indonesia 10340

University of New Hampshire (UNH) Center for Coastal and Ocean Mapping (CCOM) 24 Colovos Road, Durham, NH 03824 USA

Embassy of the United States – Jakarta, Indonesia Jl. Medan Merdeka Selatan No. 3 – 5 Jakarta 10110, Indonesia

University Corporation for Atmospheric Research (UCAR), Joint Office for Science Support (JOSS) PO Box 3000 Boulder, CO 80307

Charles Darwin Research Station Charles Darwin Foundation Puerto Ayora, Santa Cruz Island Galapagos, Ecuador

E. Personnel (Science Party)

Leg I (June 08 – July 02):

	NAME	AFFILIATION	ROLE	M/F	STATUS
1	Elizabeth (Meme) Lobecker	OER	Mapping Team Lead	F	US Citizen
2	Elizabeth (Libby) Chase	OER	Mapping Intern	F	US Citizen
3	Thomas Kok	OER	Mapping Watchstander	M	US Citizen
4	Nicholas Kraus	OER	Mapping Watchstander	M	US Citizen
5	Vincent Howard	OER	Mapping Watchstander	M	US Citizen
6	Christopher Pinero	OER	Mapping Watchstander	M	US Citizen
7	Sharath Ravula	UCAR	CTD Technician	M	US Citizen
8	Brendan Reser	NCDDC	Data Manager	M	US Citizen

Table 7: Full list of the science party and their affiliation for Leg I (mapping/CTD only)

Leg II (July 07-28, 2011):

	NAME	AFFILIATION	ROLE	M/F	STATUS	ON PREVIOUS LEG
1	Jeremy Potter	OER	Expedition Coordinator	M	US Citizen	N
2	Tim Shank	WHOI	Senior Scientist	M	US Citizen	N
3	Dave Lovalvo	OER	ROV Team Lead	M	US Citizen	N
4	Mashkoor Malik	OER	Mapping Team Lead	M	US Citizen	N
5	Webb Pinner	OER	Telepresence lead	M	US Citizen	N
6	Dave Wright	UCAR	ROV Pilot/Co-pilot	M	US Citizen	N
7	Tom Kok	UCAR	ROV Pilot/Co-pilot	M	US Citizen	Y
8	Bobby Mohr	UCAR	ROV Pilot/Co-pilot	M	US Citizen	N
9	Brian Bingham	UCAR	ROV Pilot/Co-pilot	M	US Citizen	N
10	Karl McLetchie	UCAR	ROV Pilot/Co-pilot	M	US Citizen	N
11	Jeff Williams	UCAR	ROV Pilot/Co-pilot	M	US Citizen	N
12	Nicola VerPlanck	OER	Mapping Watch Leader	F	US Citizen	N
13	Vincent Howard	UCAR	ROV Nav/Mechanical Engineer	M	US Citizen	Y
14	Nicolas Kraus	UCAR	ROV Nav/Mechanical Engineer	M	US Citizen	Y
15	Roland Brian	UCAR	ROV Video Engineer	M	US Citizen	N
16	Joe Biscotti	UCAR	ROV Video Engineer	M	US Citizen	N
17	Brian Brinkman	UCAR	ROV Video Engineer	M	US Citizen	N
18	Gregg Diffendale	UCAR	Data	M	US Citizen	N
19	Stuart Banks (Tentative)	CDF	Ecuador Science Rep	M	Ecuador Citizen	N

Table 8: Full list of the science party and their affiliation for Leg II (ROV/Mapping/CTD)

Shore-side Participants (Location and duration of participation with vary):

NAME		INSTITUTION	US CITIZEN	NOTE
Ed	Baker	NOAA	Y	Leg I Senior Scientist (shore-side)
Jim	Holden	UMass-Amherst	Y	
Steve	Hammond	NOAA	Y	
Bob	Embley	NOAA	Y	
Scott	White	Univ. of South Carolina	Y	
Joe	Resing	NOAA	Y	
David	Butterfield	NOAA	Y	
Mike	Perfit	University of Florida	Y	
Santiago	Herrera	WHOI	N	Grad Student of Tim Shank; likely at WHOI

Walter	Cho	WHOI	Y	Post-doc of Tim Shank; likely at WHOI
Tim	McClinton	Univ. of South Carolina	Y	Grad Student of Scott White
Lucy	Stewart	UMass-Amherst	N	Grad Student of Jim Holden
Jennifer	Lin	UMass-Amherst	N	Grad Student of Jim Holden
Art	Trembanis	University of Delaware	Y	
Cat	Munro	WHOI	Y	Shank lab; shore-side ECC or WHOI
Eleanor	Bors	WHOI/NIWA	Y	Grad Student of Shank; shore-side ECC or WHOI
Sharon	Walker	NOAA	Y	
Susan	Merle	NOAA	Y	
Nathan	Buck	NOAA	Y	

Table 9: List of the shore-side science participants during both expedition legs. Location and duration of participation will vary.

F. Administrative

Key Points of Contact

Ship Operations Marine Operations Center, Atlantic (MOA)
439 West York Street
Norfolk, VA 23510-1145
Telephone: (757) 441-6776
Fax: (757) 441-6495

Marine Operations Center, Pacific (MOP)
1801 Fairview Avenue East
Seattle, WA 98102-3767
Telephone: (206) 553-4548
Fax: (206) 553-1109

Chief, Operations Division, Atlantic (MOA)
LCDR Jennifer Pralgo
Telephone: 757-441-6716
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Chief, Operations Division, Pacific (MOP)
CDR Michael Hopkins
Telephone: (206) 553-8705
Email: ChiefOps.MOP@noaa.gov

Mission Operations

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NOAA Ocean Exploration and Research
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Other Mission Contacts

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John McDonough, Deputy Director
NOAA Ocean Exploration & Research
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E-mail: John.McDonough@noaa.gov

Meme Lobecker, Mapping Lead
NOAA Ocean Exploration & Research (ERT, Inc.)
Phone: 603-862-1475/ 301-938-8460
E-mail: elizabeth.lobecker@noaa.gov

Dave Lovalvo, ROV Program Manager
Eastern Oceanics
Phone: 203-246-5531
Email: eo@wispwest.com

Webb Pinner, Systems Engineer
NOAA Ocean Exploration & Research (2020, Inc.)
Phone: 401-749-9322
Email: webb.pinner@noaa.gov

Catalina Martinez, EX Expedition Coordinator
NOAA Ocean Exploration & Research
Phone: 401-874-6250 (o)/ 401-330-9662 (c)
Email: Catalina.martinez@noaa.gov

Shipments

Be sure to send an email to *Okeanos Explorer* Operations Officer OPS.Explorer@noaa.gov indicating the size and number of items being shipped and the name of person it is being shipped to.
For Deliveries Prior to June 07:

For U.S. Postal Service mail (i.e letters):
NOAA Ship Okeanos Explorer
PO Box 368009 - PMB #165-F
San Diego CA 92136-8009

For UPS or FedEx - anything that needs a physical address:
NOAA Ship Okeanos Explorer
PMB #165-F
c/o The UPS Store #3848
32nd Street Naval Base, Bldg 3187
San Diego CA 92136-8009

For large freight shipments* (i.e. anything bigger than a pallet) that need to be delivered directly to the ship use:
NOAA Ship Okeanos Explorer
Quay Wall North Pier 8
32nd Street Naval Base
San Diego CA 92136

* Clearance from the Navy is required for all large deliveries. Provide details to OPS.

For Deliveries after June 07and before July 06: TBD

G. Diplomatic Clearances

As of May 26 all requested Marine Scientific Research (MSR) clearances in foreign waters are ***pending***. The following clearances were originally submitted on March 18:

- **French Republic (Clipperton Island)** – between 12 and 200nm from shore. This requires that all pertinent data collected in their waters be delivered to the coastal state. Only underway data (e.g., multibeam, METOC data) is planned to be collected;
- **Ecuador** - between 12 and 200nm from shore but not within the Galapagos Marine Reserve.
- **Costa Rica** - between 12 and 200nm from shore. This requires that all pertinent data collected in their waters be delivered to the coastal state. Only underway data (e.g., multibeam, met data) is planned to be collected;
- **Panama** - between 12 and 200nm from shore. This requires that all pertinent data collected in their waters be delivered to the coastal state. Only underway data (e.g., multibeam, met data) is planned to be collected.

An MSR clearance request for Mexico will *not* be submitted.

The primary area of operations for this expedition involves MSR in water under the jurisdiction of Ecuador. It is likely that an Ecuador Observer, likely a scientist from the Charles Darwin Research Station (Ecuador), will be onboard during Leg II.

H. Licenses and Permits

NOT APPLICABLE TO THIS CRUISE

II. **Operations**

A. Cruise Plan Itinerary

Please see above

B. Staging and de-staging:

PMEL is providing a new altimeter/sensor package for the CTD. The system is rated to 6000m. The altimeter should have a solid range off bottom at 100m and with additional work up to 200m off bottom in the future. The system was successfully tested in the Puget Sound and has been shipped to San Diego. PMEL engineers are in touch with the ship's survey technicians regarding mounting requirements. Initial tests on *Okeanos Explorer* will likely be at a TBD location during the transit from San Diego to Ecuador.

C. Dive Plan (SCUBA)

NOT APPLICABLE TO THIS CRUISE

D. Applicable Restrictions

NOT APPLICABLE TO THIS CRUISE

III. **Equipment**

A. Equipment and capabilities provided by the ship

- Kongsberg Simrad EM 302 Multibeam Echosounder (MBES)
- Kongsberg Simrad EK60 Deepwater Echosounder (SBES)
- Knudsen 3260 Sub-bottom profiler (SBP)
- LHM Sippican XBT (various probes)
- Seabird SBE 911Plus CTD
- Light Scattering Sensor (LSS)
- Oxidation-Reduction Potential (ORP)
- Dissolved Oxygen (DO) sensor
- Seabird SBE 50 CTD Stand
- CNAV GPS
- POS/MV
- Seabird SBE-45 (Micro TSG)
- Kongsberg Dynamic Positioning-1 System
- NetApp mapping storage system
- CARIS HIPS Software
- IVS Fledermaus Software
- SIS Software
- Hypack Software
- Scientific Computing System (SCS)
- ECDIS
- Met/Wx Sensor Package
- Telepresence System
- VSAT High-Speed link (As of 5/8/2011 VSAT connection is TBD)
- Cruise Information Management System (CIMS)
- Little Hercules ROV
- Seirios Camera Platform

B. Equipment and capabilities provided by the scientists

- Altimeter for Tow Yo operations

IV. **Hazardous Materials**

A. Policy and Compliance

NOT APPLICABLE TO THIS CRUISE

B. Radioactive Isotopes

NOT APPLICABLE TO THIS CRUISE

C. Inventory

NOT APPLICABLE TO THIS CRUISE

V. **Additional Projects**

A. Supplementary ("Piggyback") Projects

NOT APPLICABLE TO THIS CRUISE

B. NOAA Fleet Ancillary Projects

NOT APPLICABLE TO THIS CRUISE

VI. **Disposition of Data and Reports**

A. Data Responsibilities

All data acquired on *Okeanos Explorer* will be provided to the public archives without proprietary rights. All data management activities shall be executed in accordance with NAO 212-15, Management of Environmental and Geospatial Data and Information [http://www.corporateservices.noaa.gov/ames/NAOs/Chap_212/naos_212_15.html].

Ship Responsibilities

The Commanding Officer is responsible for all data collected for missions until those data have been transferred to mission party designees. Data transfers will be documented on NOAA Form 61-29. Reporting and sending copies of project data to NESDIS (ROSCOP form) is the responsibility of OER.

NOAA OER Responsibilities

The Expedition Coordinator will work with the *Okeanos Explorer* Operations Officer to ensure data pipeline protocols are followed for final archive of all data acquired.

Deliverables

a. At sea
   - Daily plans of the Day (POD)
   - Daily situation reports (SITREPS)

b. Post cruise
   - Refined SOPs for all pertinent operational activities
   - Assessments of all activities
   - Provide applicable data to Coastal States in accordance with State Department Marine Science Research permit

c. Science
   - Multibeam and XBT raw and processed data, a full description is available in the data management plan.
   - Mapping Data Report
   - ROV dive summaries
   - Highlight Video Imagery and HD footage archived at the NOAA Central Library
   - Cruise Report

Archive

- The Program and ship will work together to ensure documentation and stewardship of acquired data sets in accordance with NAO 212-15. The Cruise Information Management System is the primary tool used to accomplish this activity.

B. Pre and Post Cruise Meeting

Pre-Cruise Meeting

Prior to departure, the Expedition Coordinator will conduct a meeting of the scientific party to inform them of cruise objectives. Some vessel protocols, e.g., meals, watches, etiquette, etc. will be presented by the ship's Operations Officer.

Post-Cruise Meeting

Upon completion of the cruise, a meeting will be held (unless prior alternate arrangements are made) and attended by the ship Survey Technicians, the Expedition Coordinator and members of the scientific party to review the cruise. Concerns regarding safety, efficiency, and suggestions for improvements for future cruises should be discussed.

Shipboard Meetings

Daily Operations Briefing meetings will be held at 1500 in the forward lounge to review the current day, and define operations, associated requirements and staffing needs for the following day. A Plan of the Day (POD) will be posted each evening for the next day in specified locations throughout the ship. A safety brief and overview of POD will occur on the Bridge each morning at 0800. Daily Situation Reports (SITREPS) will be posted as well and shared daily through e-mail and/or the *Okeanos Explorer* PLONE site (http://terra.gso.uri.edu/NOAAShipOkeanosExplorer).

C. Ship Operation Evaluation Report

Within seven days of the completion of the cruise, a Ship Operation Evaluation form is to be completed by the Expedition Coordinator. The preferred method of transmittal of this form is via email to OMAO.Customer.Satisfation@noaa.gov. If email is not an option, a hard copy may be forwarded to:

Director, NOAA Marine and Aviation Operations
NOAA Office of Marine and Aviation Operations
8403 Colesville Road, Suite 500
Silver Spring, MD 20910

VII. **Miscellaneous**

A. Meals and Berthing

Meals and berthing are required for up to 19 scientists. Meals will be served 3 times daily beginning one hour before scheduled departure, extending throughout the cruise, and ending two hours after the termination of the cruise. 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 twenty one days prior to the survey (e.g., Expedition Coordinator is allergic to fin fish).

Berthing requirements, including number and gender of the scientific party, will be provided to the ship by the Expedition Coordinator. The Expedition Coordinator and Operations 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 Expedition Coordinator 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 Expedition Coordinator is also responsible for the cleanliness of the

laboratory spaces and the storage areas utilized by the scientific party, both during the cruise and at its conclusion prior to departing the ship.

All NOAA scientists will have proper travel orders when assigned to any NOAA ship. The Expedition Coordinator will ensure that all non-NOAA or non-Federal scientists aboard also have proper orders. It is the responsibility of the Expedition Coordinator 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 which forbids the possession and/or use of illegal drugs and alcohol aboard NOAA Vessels.

B. Medical Forms and Emergency Contacts

The NOAA Health Services Questionnaire (NHSQ, Revised: 08/08) must be completed in advance by each participating scientist. The NHSQ can be obtained from the Expedition Coordinator or the NOAA website at NOAA HEALTH SERVICES QUESTIONNAIRE. The completed form should be sent to the Regional Director of Health Services at Marine Operations Center. The participant can mail, fax, or scan the form into an email using the contact information below. The NHSQ should reach the Health Services Office no later than 4 weeks prior to the cruise 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. Clearances are valid for 2 years for personnel under age 50 and 1 year for age 50 and over. All PPD’s expire after one year from the date of administration. 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 Expedition Coordinator must provide a listing of emergency contacts to the Operations Officer for all members of the scientific party, with the following information: name, address, relationship to member, and telephone number.

Emergency contact form is included as Appendix A.

C. Shipboard Safety

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. Steel-toed shoes are required to participate in any work dealing with suspended loads, including CTD deployments and recovery. The ship does not provide steel-toed boots. Hard hats are also 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.

Operational Risk Management: For every operation to be conducted aboard the ship (NOAA-wide initiative), risk management procedures will be followed. For each operation, risks will be identified and assessed for probability and severity. Risk mitigation strategies / measures will be investigated and implemented where possible. After mitigation, the residual risk will have to be assessed to make Go-No Go decisions for the operations. Particularly with new operations, risk assessment will be ongoing and updated as necessary. This does not only apply to over-the-side operations, but to everyday tasks aboard the vessel that pose risk to personnel and property.

- CTD (and other pertinent) ORM documents will be followed by all personnel working on board *Okeanos Explorer*
- All personnel on board are in the position of calling a halt to operations/activities in the event of a safety concern.

D. Communications

A daily situation report (SITREP) on operations prepared by the Expedition Coordinator will be relayed to the program office. Sometimes it is necessary for the Expedition Coordinator to communicate with another vessel, aircraft, or shore facility. Through various modes of communication, the ship is able to maintain contact with the Marine Operations Center on an as needed basis. These methods will be made available to the Expedition Coordinator upon request, in order to conduct official business. 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 it must be arranged at least 30 days in advance.

Specific information on how to contact the NOAA Ship *Okeanos Explorer* and all other fleet

vessels can be found at: http://www.moc.noaa.gov/phone.htm

Important Telephone and Facsimile Numbers and E-mail Addresses

Ocean Exploration and Research (OER):

OER Program Administration:
Phone: (301) 734-1010
Fax: (301) 713-4252
E-mail: Firstname.Lastname@noaa.gov

University of New Hampshire, Center for Coastal and Ocean Mapping

Phone: (603) 862-3438
Fax: (603) 862-0839

NOAA Ship Okeanos Explorer - Telephone methods listed in order of increasing expense:

Okeanos Explorer Cellular:
Ship (401) 932-4114
OOD (401) 378-7414

Okeanos Explorer Iridium:
(808) 659-9179

Okeanos Explorer INMARSAT B
Line 1: 011-872-764-852-328
Line 2: 011-872-764-852-329

Voice Over IP (VoIP) Phone:
301-713-7772 (expect a delay once picked up by directory)

E-Mail: Ops.Explorer@noaa.gov (mention the person's name in SUBJECT field)
expeditioncoordinator.explorer@noaa.gov - For dissemination of all hands emails by Expedition Coordinator while on board. See ET for password.

E. IT Security

Any computer that will be hooked into the ship's network must comply with the NMAO Fleet IT Security Policy 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 these requirements prior to boarding the ship is preferable.

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

No FNGs are expected onboard the *Okeanos Explorer* during Leg I. Jeremy Potter will be the foreign national escort for the Ecuadorian Observer (FNG) onboard during Leg II. FNG paperwork will be submitted as soon as participants are confirmed.

G. Foreign Port Entry/Exit Requirements and Visas

Costa Rica Entry/Exit Requirements: Puntarenas, Costa Rica is the port call location between Leg I and II. The closest airport to Puntarenas is the Juan Santamaria International Airport (SJO) in San Jose, Costa Rica. It is about 70km from Puntarenas. United States citizens may enter Costa Rica without visa for a maximum stay of up to 90 days. Any federal employees traveling with an official passport must be sure that it is valid for at least six months. Federal employees do not need a visa. U.S. citizens that are not federal employees must present a valid passport that will not expire for at least thirty days after arrival and a roundtrip/outbound ticket. Embassy of Costa Rica in Washington DC - http://www.costarica-embassy.org/?q=node/21

Panama Entry/Exit Requirements: Tocumen International Airport (PTY), just outside Panama City, is the closest airport to the *Okeanos Explorer* port of call in Balboa, Panama following Leg II. U.S. citizens traveling by air to and from Panama must present a valid passport when entering or re-entering the United States. Sea travelers must have a valid U.S. passport (or other original proof of U.S. citizenship, such as a certified U.S. birth certificate with a government-issued photo ID). Any federal employees traveling with an official passport must be sure that it is valid for at least six months. Federal employees do not need a visa.
Travelers must present a passport valid for at least three months, and either purchase a tourist card at the airport in Panama before clearing customs, or obtain a multiple entry visa from a Panamanian embassy or consulate before traveling to Panama. Further information may be obtained from the Embassy of Panama, 2862 McGill Terrace NW, Washington, DC 20009, tel. (202) 483-1407, or the Panamanian consulates in Atlanta, Boston, Chicago, Honolulu, Houston, Los Angeles, Miami, New Orleans, New York, Philadelphia, San Diego, San Francisco, San Juan or Tampa.

U.S. citizens transiting the Panama Canal as passengers who do not plan on disembarking from the ship do not need to obtain visas, report to customs, or pay any fees. If citizens plan to disembark, they need to obtain a tourist card from the cruise line or a visa at a Panamanian

embassy or consulate prior to traveling. U.S. State Department: http://travel.state.gov/travel/cis_pa_tw/cis/cis_994.html#entry_requirements

Appendix A

EMERGENCY DATA SHEET
NOAA OKEANOS EXPLORER

PRINT CLEARLY

NAME: _____
(Last, First, Middle)

Mailing Address _____

_____

_____
(Other than the ship address)

Phone (Home) _____

(Cell) _____

Date of Birth _____

Emergency Contact: _____
(Name and Relationship)

Address: _____

_____

_____

Phone (Home) _____

(Work) _____

(Cell) _____

Email: _____

Signature _____ Date _____

Appendix B: Contingency Planning

PLAN B –

Leg I - The contingency plan if the MSR clearance for operations in Ecuador waters is denied will focus on Area B below. It will include ~7 days of tow-yo and multibeam operations in Area B before ~4 day transit to Puntarenas, Costa Rica for the port call.

Existing partial bathymetric data coverage along the ridge is available for this area. Primary operations during this period will focus on CTD/tow-yo operations over a subset of the ridge section.

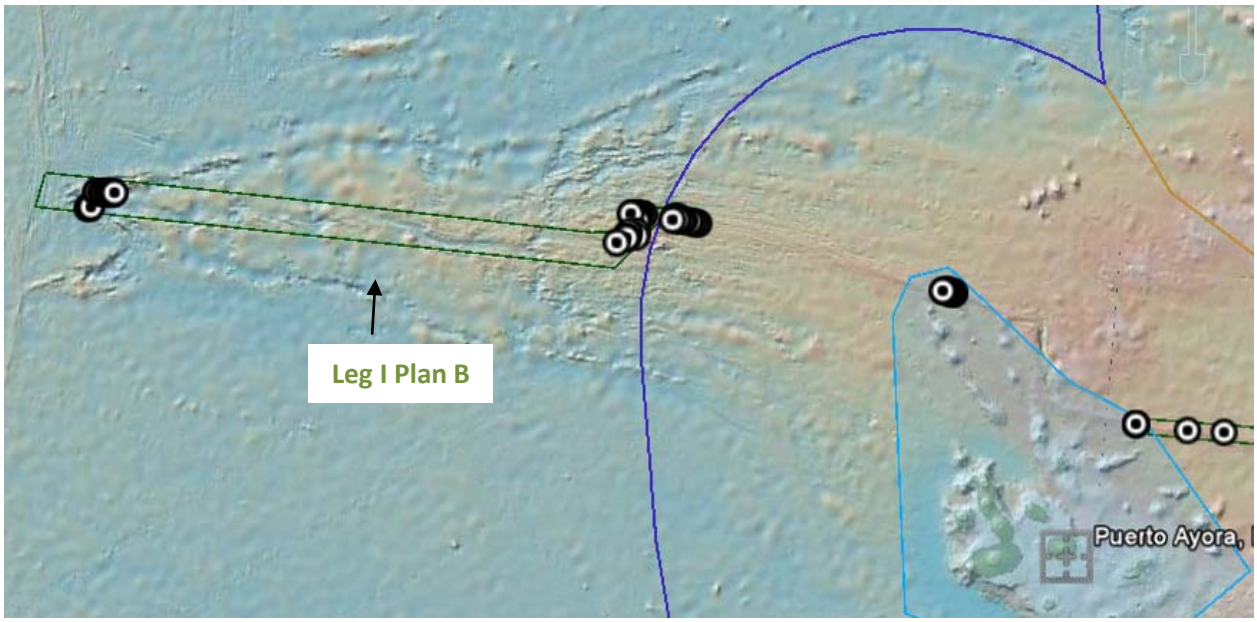

Figure 5. Google Earth image of GSC region. Green box indicates the Leg I Plan B contingency area in which multibeam and tow-yo operations will be conducted if Ecuador rejects the MSR request. The polygon is much larger than what can be mapped during the four days. Icons indicate locations of past ALVIN dives.

AREA B (Contingency)	Latitude (N)	Longitude (W)
1 (NW corner)	2.117°	-102.199°
2 (SW corner)	1.717°	-102.207°
3 (SE corner)	2.02°	-95.642°
4	2.55°	-95.206°
5	2.71°	-95.169°
6	2.725°	-95.477°
7	2.409°	-95.704°

Table 5: Lat/Longs of Area B (Figure 5) in which multibeam and tow-yow operations occur. Area is much larger than what can be mapped during the available time.

Leg II: Leg II contingency operations will be finalized based on data and information collected during Leg I. The following are dive targets and operations already under consideration:

- ROV dives at
    - New targets located in Area B during Leg I
    - If no promising targets located during Leg I, then transit to ~ 86W the location of sulfide mounds outside of the Ecuador EEZ. Off axis vents, Inca Fracture Zone, and Ecuador Rift are other possibilities. Information about these locations is provided in Plan A.
- Tow-yo operations off the J-frame. These are a prerequisite for any dives on the sulfide mounts ~86W
- NOTE: Science Team is interested in the feasibility of a few 'fast' ROV tows ~1.5knots or tows using only the camera sled.

Appendix C: PMEL Tow-yo Protocol

1. Scope

This document specifies how CTD tow-yo's should be undertaken. The aim is to:

- identify the risks involved by undertaking tow-yo's
- provide operational guidelines

2. Overview

Tow-yo operations involve using the CTD package to search the water column for indicators of temperature and other hydrothermal anomalies. The CTD is lowered and raised through the water column repeatedly while the ship steams slowly forward over the search area. Often additional sensors (e.g., light scattering, ORP) are included with the CTD package to assist in the search for anomalies and Niskin bottles are used to sample interesting water bodies.

3. Operating Techniques

It is essential that a good understanding of the sea floor topography be gained before undertaking tow-yo operations. If detailed bathymetry of the area is not known, then multibeam mapping of the survey area will be required before commencing tow-yo operations.

Optimal tow speed is generally between 1.5 and 1.7 kts, depending on the weather. At lower speeds the tow is an inefficient use of ship time. At higher speeds the wire out becomes excessive. At optimal speeds, the wire out length is typically ~1.6x the CTD depth. This ratio is normally lower at the start of a tow and may gradually increase during a long tow. Variability of ±20% in this ratio is common.

Seafloor topographic features and targets will primarily determine tow tracklines, although wind and surface currents must also be considered. When conducting a tow off a starboard-side location, operations are generally undertaken with the prevailing wind coming across the starboard side. This assists the bridge watch in maintaining vessel position and prevents the ship drifting over the CTD wire in the event of ship handling difficulties. This complication is eliminated when towing off the stern. Tows should be conducted into the prevailing wind/sea when conditions make it impossible to maintain the trackline at normal tow-yo speeds with a following wind or sea.

CTD payout and haul in speeds are similar or less than that used for standard CTD operations, i.e., less than or equal to 60 m/min.

The vessel should hold position at the starting waypoint until the CTD is about half-way to the seafloor before moving along the trackline. Waiting until the CTD nears the bottom to begin moving will result in the first several up-down cycles occurring at almost the same location. Starting to move too soon after the CTD is in the water will result in excessive wire out early in

the tow.

Once tow-yo operations have commenced, the prime danger is that the CTD will make contact with the seafloor. Care and vigilance are required to avoid this. Section 4 provides guidelines and requirements to reduce the risks.

It is important to have a good idea of the position of the CTD relative to both the ship and the bathymetry at all times. Normally two people staff a CTD tow-yo watch: one to concentrate on CTD altitude, sensor responses and communications with the winch operator, and a second to record navigation data. The position of the CTD should be estimated and plotted frequently (at the top and bottom of each tow cycle and whenever a bottle is tripped). As a good approximation, the horizontal distance of the CTD behind the ship can be calculated from the CTD depth and wire out, using Pythagoras:

$$\text{Setback Distance} = \sqrt{\text{Wireout}^2 - \text{CTD depth}^2}$$

PMEL supplies an Excel spreadsheet that automatically calculates CTD position when wireout, CTD depth, and ship position values are entered. It is good practice to be aware of the how the bathymetry changes ahead of the CTD position so that the tow-yo cycle can be adjusted to avoid problems over steeply rising slopes or any unusual obstacles.

A typical tow-yo cycle ranges from ~20 m above bottom to high enough to detect plumes characteristic of the area being studied. Along most midocean ridges (i.e., bottom depths <~2500 m) plume rise is unlikely to exceed ~300 m. As the seafloor deepens, weak density gradients can permit increasingly higher plume rise, sometimes >1 km. As the CTD nears the seafloor on a descending cycle (within ~50 m above bottom), watchstanders should alert the winch driver and receive a confirming reply. It is good practice to slow the winch speed (to ~30 m/min depending on circumstance) before reaching the stopping point at ~20 m above bottom. Upon giving the command to haul in, always pay close attention to the CTD depth to insure that the winch is hauling in and not paying out, as the repeated tow-yo cycling can easily lead to a mistake by the winch driver—or the watchstander (e.g., asking to go down rather than up again).

Horizontally, the CTD will tend to follow the course of the ship, provided the ship is steaming in a straight line over ground and there are no crosscurrents. Vertically, the CTD will tend to follow a saw-tooth profile, making less forward progress during the downcast than during the upcast.

Tow tracklines should be planned with only minor changes of vessel course (less than ~10°-20°) at any waypoint. If major course changes are required, the CTD package should be retrieved and the ship repositioned. Remember that during sharper turns the CTD will sink as slack in the wire is created. The bridge must advise the CTD watch of any difficulty maintaining the course along the trackline and coordinate with the CTD watch to make sure the CTD is coming up and wire out is not excessive (relative to water depth) before making course adjustments.

At the end of a tow-yo line, the vessel should maintain tow-yo speed until the wire out is less than the local water depth. It is preferable that the ship stays as close to the trackline as possible while stopping and preparing to recover the CTD,

4. Risks

There are a number of risks associated with tow-yo operations.

The CTD package could inadvertently make contact with the seafloor while being lowered.

The CTD should be kept greater than 20 m above the sea floor at all times. (If it is important to go closer than 20 m to the sea floor, then a standard CTD vertical cast operation should be performed).

Note: Be aware that often the CTD package does not hang vertically in the water and the acoustic signal from the altimeter will be transmitted to the seafloor at an angle. In this case the CTD's altimeter reading will be slightly inaccurate. This is most likely in regions of very rugged bathymetry, especially when the CTD is travelling up a steep slope.

The CTD package could be dragged into the seafloor or onto a feature on the seafloor due to the progress of the ship.

a) The topography of the seafloor will play an important role when determining the minimum altitude of the CTD package. If the seafloor topography is rough or varying, then there is uncertainty in knowing seafloor features immediately ahead of the CTD. In these cases, tow-yo operators should be more conservative and allow for a minimum altitude greater than 20 m. CTD altitude can decrease more quickly than expected when towing upslope.

b) When operating in areas where the seafloor is shelving to deeper water on a large scale, the tow-yo transects should be done from shallow water to deep water.

c) The information on water depth and seafloor roughness coming from the echosounder may not always indicate of the bathymetric conditions that the CTD package will experience. The CTD forms a high-drag payload on the end of the cable and will not always track accurately behind the vessel. This will be exacerbated if the vessel is changing course or if there are any deep cross currents to contend with. These factors should contribute towards making conservative estimates for critical operating parameters for tow-yo operations.

Too much cable paid out.

It is possible to have too much cable paid out to permit reasonable control of the tow-yo operations. For example, having 4000 m of cable out in a water depth of only 1000 m. This will increase the danger of the CTD coming in contact with the sea floor, as well as reduce the effective control the operator has over the CTD location. Having excessive wire out normally indicates that the vessel speed to too high, perhaps >2kts.

In general, not more than twice the water depth of cable should be deployed during the tow-yo. Normally, at a speed of ~1.5-1.7kts, wire out will be ~1.6x the CTD depth.

Loss of Vessel Power

It is obvious that if there is substantially more cable paid out than the depth of the water and the vessel stops moving (or reduces speed significantly) there is the danger that the CTD will contact the sea floor by sinking faster than the excess wire can be hauled in. If this happens and the CTD has not already hit the bottom, an upcast should be commenced immediately to prevent the CTD from sinking to the seafloor, provided there is power for the winch and the CTD cable is not in danger of fouling the propeller.

Winch problems or failure

If the winch fails during a tow-yo and the wire out is greater than the water depth, the most important thing is for the bridge to maintain the ship's course and speed so the CTD does not sink to the seafloor. If it is feasible to do so, the ship might consider heading towards deeper water or increasing speed (which will increase drag and slow CTD sinking). Any problems with the winch must be conveyed to the CTD watch standers promptly, and the winch operator must confirm that the CTD is far enough above the seafloor (and the seafloor is not getting shallower) to safely allow the winch to stop or reverse direction to fix the problem.

Vessel Control

It is important that the bridge has a full understanding that the vessel's course and speed need to be well controlled to protect the CTD package.

Appendix D

Document Purpose
This document is an addendum to the overarching Okeanos Explorer FY11 Data Management Plan (EX_FY11_DMP.doc) and is specific to the EX-11-03 mission entitled "Exploration and Mapping, Galapagos Spreading Center" For more detailed information on the data management effort for the Okeanos Explorer in FY11, please refer to that document.

Data Management Overview
The third *Okeanos Explorer (EX)* mission of the FY11 field season will involve two legs and will take the ship from San Diego, CA to Balboa, Panama. During leg one, mapping will be performed during the transit from San Diego to the area of operations in the Galapagos Spreading Center. There, multibeam, CTD, and tow-yo operations will be conducted. A port call and science party change will be made in Puntarenas, Costa Rica. Leg two will focus on daytime ROV operations to explore targets identified in the first leg of the cruise, and nighttime operations including vertical CTD casts and multibeam data collection. Cruise EX-11- 03 will include data collection in U.S. and International waters, as well as territorial waters of France, Ecuador, Costa Rica and Panama. OER is obligated to provide a copy of all data collected in territorial waters to the corresponding country. Post-mission procedures will ensure that the territorial data are segmented and bundled appropriately with ISO metadata, the International standard.

Assumptions
All data from the entire mission will be publicly releasable. No protected sites have been identified.

EX-11-03
- ***Leg 1: Mapping, CTD and Tow-yo (June 8 – July 2, 2011)***
- ***Leg 2: ROV, Mapping and CTD (July 7 – July 28, 2011)***

Data Management Objectives
The DMT's objectives for this mission are:
- *Mapping, CTD and Tow-yo (June 6 – July 2, 2011)*
  - Train Data Management Team member, Brendan Reser, on multibeam survey operations, CTD operations, and other procedures as deemed necessary by the Mapping Team Lead.
  - Gather metadata for new altimeter/sensor package including a Light Scattering Sensor (LSS), Oxidation-Reduction Potential (ORP) and Dissolved Oxygen (DO) sensor.
  - Refine ISO metadata templates for collection-level and dataset-level records (multibeam, CTD, SCS) for NOAA and for delivery with foreign data sets.
  - Review Standard Operating Procedures (SOP) documentation filed onboard and refine as necessary for Data Management efforts.

- Ensure the near real-time update of the *Okeanos Atlas* with
  - Ship track and hourly observations received via email.
  - CTD launch sites and profiles received via URI SRS. DMT will post-process and thin the profiles for quicker display on the site.
  - Daily logs pulled from URI through RSS feeds and links to related images on oceanexplorer.noaa.gov website.
  - Daily cumulative bathymetric image overlays received via URI SRS.
  - Test new ship track KML received via URI SRS, if applicable.
  - Cross train backup personnel in SOPs.

- *ROV, Mapping and CTD (July 7 – July 28, 2011)*
  - During the mission:
    - Generate metadata for video clips as soon as possible after the clip is transmitted to the URI SRS and upload to the URI SRS to be available for download with the clip.
    - Ensure the near real-time update of the *Okeanos Atlas* with
      - Ship track and hourly observations received via email.
      - ROV dive tracks from new kml format
      - ROV and Camera Sled images linked to dive tracks
      - CTD launch sites and profiles received via URI SRS. DMT will post-process and thin the profiles for quicker display on the site.
      - Daily logs pulled from URI through RSS feeds and links to related images on oceanexplorer.noaa.gov website.
      - Daily cumulative bathymetric image overlays received via URI SRS.
      - Test new ship track KML received via URI SRS, if applicable.
  - Post-Mission:
    - Execute multibeam data, METOC data, and video/image data pipelines.

Expedition Principals for Data Management

Catalina Martinez, OER Expedition Coordinator
Lt. Megan Nadeau, OMAO, Okeanos Explorer Operations Officer
Webb Pinner, OER Telepresence, EX Data and Information Lead
Sharon Mesick, NCDDC, Federal Program Manager, IPT Chair
Brendan Reser, NCDDC, OER Data Management Project Team Member, Data Manager
Susan Gottfried, NCDDC, OER Data Management Coordinator
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