

# UNITED KINGDOM RESEARCH AND INNOVATION

Application for Consent to conduct  
Marine Scientific Research  
**ICELAND**

Date: 04 December 2023

## 1. General Information

1.1 Cruise name and/or number: DY181
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1.2 Sponsoring Institution(s):	
Name:	National Oceanography Centre
Address:	European Way, Southampton, SO14 3ZH
Name of Director:	Prof. Ed Hill

1.3 Principal Investigator in charge of the Project :	
Name:	Prof. N. Penny Holiday
Country:	UK
Affiliation:	National Oceanography Centre
Address:	European Way, Southampton, SO14 3ZH
Telephone:	
Fax:	
Email:	<a href="mailto:Penny.Holliday@noc.ac.uk">Penny.Holliday@noc.ac.uk</a>
Website (for CV and photo):	<a href="https://noc.ac.uk/n/Penny+Holliday">https://noc.ac.uk/n/Penny+Holliday</a>

1.4 Entity(ies)/Participant(s) from Coastal State involved in the planning of the project:	
Name:	N/A
Affiliation:	
Address:	
Telephone:	
Fax:	
Email:	
Website (for CV and photo):	

## 2. Description of Project

2.1 Nature and objectives of the project:
DY181 is a physical oceanography research expedition, and the objectives are:
<ol style="list-style-type: none"><li>1. Recover/redeploy Ellett Array moorings (EB1, WB1, WB2, ADCP lander) and remote data recovery from EB1L</li><li>2. CTD/water-sample section between Iceland, Iceland Basin and Scottish continental shelf</li><li>3. Deploy a new drift-free pressure recorder (IB5L) at location of mooring IB5</li><li>4. Recover/redeploy Darwin Mounds sediment trap mooring</li><li>5. Recover UK OSNAP moorings (IB3, IB4, IB5)</li><li>6. Redeploy IB4, IB5 as part of the Ellett Array</li><li>7. Deploy two UK Argo floats</li><li>8. Deploy/recover 2 telemetry test moorings (RAPID-Evolution)</li></ol>

2.2 If designated as part of a larger scale project, then provide the name of the project and the Organisation responsible for coordinating the project:
The objectives 1-4 and 6 are part of the UK National Capability programme AtlantiS (Atlantic Climate and Environment Strategic Science) coordinated by the National Oceanography Centre. Specifically they relate to a long-term ocean observing programme called the Ellett Array (1-4, 6) and a Marine Protected Area study (4). Objective 6 is funded by NERC grant UK OSNAP Decade, led by the National Oceanography

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Centre.

Objective 8 is funded by NERC grant RAPID-Evolution, led by the National Oceanography Centre.

## 2.3 Relevant previous or future research projects:

The Ellett Array has been active since 1975, funding by NERC through multiple 5 year grants.

The Ellett Array and the UK OSNAP Decade moorings are a major component of the international OSNAP array that is in water from 2014 to 2024.

RAPID evolution is a contribution to the RAPID array along 26.5°N which is maintained since 2004.

## 2.4 Previous publications relating to the project:

Recent publications from OSNAP and the Ellett Array are:

Fu, Y. et al. (2023). Seasonality of the Meridional Overturning Circulation in the Subpolar North Atlantic. *Communications Earth & Environment*, 4(1), 181.

McCarthy, G.D., Burmeister, K., Cunningham, S.A., Düsterhus, A., Frajka-Williams, E., Graham, J.A., Hodge, K.R., Holliday, N.P., Inall, M., Jackson, L.C., Menary, M.B., Moat, B.I., Moffa-Sanchez, P., Oltmanns, M., Polton, J.A., Rabe, B., Robson, J. and Thornalley, D.J.R. (2023) Climate change impacts on ocean circulation relevant to the UK and Ireland. *MCCIP Science Review 2023*, 29pp. doi: 10.14465/2023.reu05.cir

Jones, S.C., Fraser, N.J., Cunningham, S.A., Fox, A.D., Inall, M.E. (2023). Observation-based estimates of volume, heat and freshwater exchanges between the subpolar North Atlantic interior, its boundary currents and the atmosphere. *Ocean Science*, 19(1), pp.169–192, doi:10.5194/os-19-169-2023.

Fraser, N. J., Cunningham, S. A., Drysdale, L. A., Inall, M. E., Johnson, C., Jones, S. C., Burmeister, K., Fox, A. D., Dumont, E., Porter, M., Holliday, N. P. (2022). North Atlantic Current and European Slope Current circulation in the Rockall Trough observed using moorings and gliders. *JGR: Oceans*, 127, e2022JC019291. <https://doi.org/10.1029/2022JC019291>

Fox, Alan D., Patricia Handmann, Christina Schmidt, Neil Fraser, Siren Rühs, Alejandra Sanchez-Franks, Torge Martin, Marilena Oltmanns, Clare Johnson, Willi Rath, N. Penny Holliday, Arne Biastoch, Stuart A. Cunningham, and Igor Yashayaev (2022) Exceptional freshening and cooling in the eastern subpolar North Atlantic caused by reduced Labrador Sea surface heat loss. *Ocean Sci.* 1-35. <https://doi.org/10.5194/os-18-1507-2022> (Highlight Article).

Chafik, L., Holliday, N. P., Bacon, S., & Rossby, T. (2022). Irminger Sea is the center of action for subpolar AMOC variability. *Geophysical Research Letters*, 49, e2022GL099133.

Moat, B., Burmeister, K. and Firing, Y. (2022) CLASS and OSNAP report for JC238, 12 – 31 July 2022

Cunningham, S. A. (2020). Cruise Report No. 298 for RRS Discovery Cruise DY120, 8 – 24 Oct 2020



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More publications can be found here: <https://www.ukosnap.org/results-and-publications> and here <https://projects.noc.ac.uk/ExtendedElettLine/publications/journal-articles>

## 3. Geographical Areas

3.1 Indicate geographical areas in which the project is to be conducted (with reference in Latitude and longitude, including coordinates of cruise/track/way points)

Operations will be carried out in the box 56.5-63.4N, 6-25W

Moorings and hydrographic operations will be conducted along the line between these waypoints:

Station Type	Name	Latitude (°N)	Longitude (°E)
Mooring	DMLTM	59.860825	-7.04438
Sampling Station	DM	59.853417	-7.056017
Sampling Station	3G	56.708167	-6.366667
Sampling Station	7G	56.7345	-6.999833
Sampling Station	10G	56.733167	-7.501333
Sampling Station	T	56.837167	-8.332667
Sampling Station	test	56.770517	-9.172017
Sampling Station	R	56.999417	-8.996767
Sampling Station	Q	57.051167	-9.217783
Sampling Station	P	57.101183	-9.417917
Sampling Station	EB1 pre	57.0878	-9.546667
Mooring Test	Telem Test 1	57.10013	-9.56415
BPR – data download	RTEB1L	57.098354	-9.552655
Mooring	RTEB1	57.10013	-9.56415
Sampling Station	EB1 post	57.111517	-9.5786
Sampling Station	O	57.149833	-9.699767
Sampling Station	N	57.232317	-10.047467
Sampling Station	M	57.301667	-10.381667
Sampling Station	L	57.367033	-10.666433
Sampling Station	K	57.3992	-10.8674
Sampling Station	J	57.448033	-11.0861
Sampling Station	I	57.4682	-11.318467
Sampling Station	H	57.4826	-11.532067
Sampling Station	G	57.492567	-11.849217
Sampling Station	F	57.507917	-12.246
Mooring	RTWB2	57.470734	-12.31159
Mooring	RTWB1	57.46958	-12.70479
Sampling Station	E	57.533	-12.633
Sampling Station	D	57.542067	-12.866133
Sampling Station	C	57.5491	-12.999467

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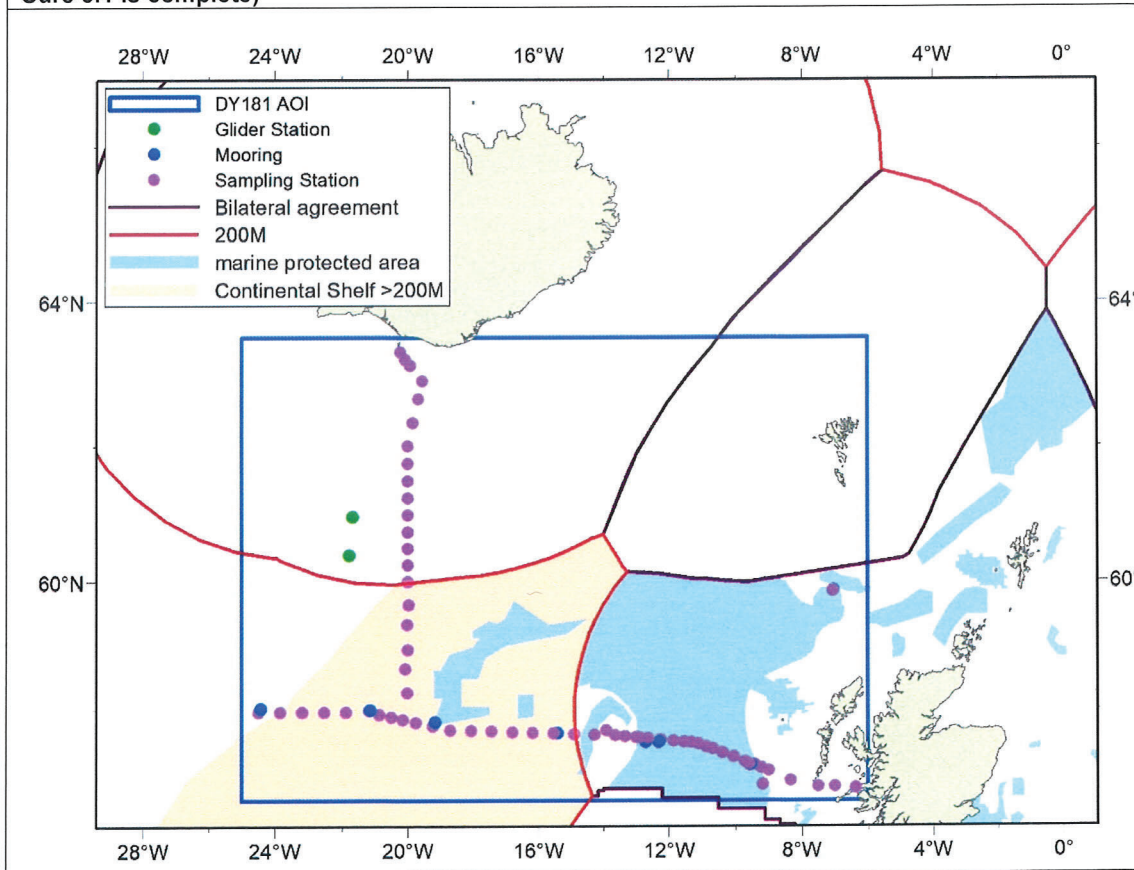
Sampling Station	B	57.5672	-13.3327
Sampling Station	A	57.583383	-13.631483
Sampling Station	IB1	57.667	-13.9
Sampling Station	RAG 160	57.592483	-14.266983
Sampling Station	RAG 159	57.604017	-14.8989
Mooring	RHADCP	57.614566	-15.41162
Sampling Station	RAG 158	57.614083	-15.530417
Sampling Station	RAG 156	57.6234	-16.1663
Sampling Station	RAG 157	57.634717	-16.794583
Sampling Station	RAG 155	57.646667	-17.431967
Sampling Station	RAG 154	57.656567	-18.064083
Sampling Station	O17	57.665817	-18.697733
Sampling Station	O18	57.728817	-19.227417
Mooring	IB5	57.800956	-19.1695
BPR deploy	IB5L	57.800956	-19.1695
Sampling Station	O19	57.791467	-19.745867
Sampling Station	O20	57.835683	-20.1417
Sampling Station	O21	57.877983	-20.496867
Sampling Station	O22	57.915217	-20.853517
Sampling Station	O24	57.9575	-21.857517
Sampling Station	O25	57.957717	-22.513583
Sampling Station	O26	57.960433	-23.173233
Sampling Station	O27	57.958733	-23.8354
Sampling Station	O28	57.960933	-24.487733
Mooring	IB3	58.015508	-24.42199
Mooring Test	Telem Test 2	58.015508	-24.42199
Sampling Station	IB4 pre	57.980633	-21.163867
Sampling Station	IB4 post	57.981717	-21.1628
Mooring	IB4	57.98896	-21.14654
Sampling Station	CTD - 2	58.273651	-20.010175
Sampling Station	CTD - 3	58.657958	-20.065321
Sampling Station	CTD - 4	58.953375	-19.991793
Sampling Station	CTD - 5	59.349087	-20.010175
Sampling Station	CTD - 6	59.647627	-19.955028
Sampling Station	IB12	60	-20
Sampling Station	IB12A	60.25	-20
Argo float deployment	UK-ARGO 1	60.393106	-21.776137
Argo float deployment	UK-ARGO 2	60.97045	-21.671327
Sampling Station	IB13	60.5	-20
Sampling Station	IB13A	60.75	-20
Sampling Station	IB14	61	-20
Sampling Station	IB15	61.25	-20
Sampling Station	IB16	61.5	-20
Sampling Station	IB16A	61.75	-20
Sampling Station	IB17	62	-20
Sampling Station	IB18S	62.333	-19.834



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Sampling Station	IB19S	62.667	-19.668
Sampling Station	IB20S	62.917	-19.551
Sampling Station	IB21S	63.133	-19.916
Sampling Station	IB22S	63.216	-20.067
Sampling Station	IB23S	63.317	-20.215

3.2 Attach chart(s) at an appropriate scale (1 page, high-resolution) showing the geographical Areas of the intended work and, as far as practicable, the location and depth of sampling Stations, the tracks of survey lines, and the locations of installations and equipment. **(NB: make Sure 3.1 is complete)**



## 4. Methods and means to be used

4.1 Particulars of vessel:	
Name:	RRS Discovery
Type/Class:	Lloyds Register Lloyd's +100A1 Oceanographic Research Vessel, IWS, Ice Class 1D +LMC, UMS, DP(AM), Green Passport, Shipwright (SERS)
Nationality (Flag State):	British
Identification Number (IMO/Lloyds No.):	9588029
Owner:	United Kingdom Research & Innovation
Operator:	National Marine Facilities
Overall length (meters):	99.70 Metres
Maximum draft:	6.60 Metres
Displacement/Gross Tonnage:	Net Tonnage: 1785 Gross Tonnage: 5952
Propulsion:	Diesel Electric
Cruising & maximum speed:	12 Knots & 15 Knots Max Speed
Call sign:	2FGX5

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INMARSAT number and method and capability of communication (including emergency frequencies):	773238856 – Voice 783255483 – Fax 423593533 – Sat C
Name of Master:	TBA
Number of Crew:	24
Number of Scientists on board:	30

4.2 Particulars of Aircraft:	
Name:	N/A
Make/Model:	
Nationality (flag State):	
Website for diagram & Specifications:	
Owner:	
Operator:	
Overall Length (meters):	
Propulsion:	
Cruising & Maximum speed:	
Registration No.:	
Call Sign:	
Method and capability of communication (including emergency frequencies):	
Name of Pilot:	
Number of crew:	
Number of scientists on board:	
Details of sensor packages:	
Other relevant information:	

4.3 Particulars of Autonomous Underwater Vehicle (AUV):	
Name:	N/A
Manufacturer and make/model:	
Nationality (Flag State):	
Website for diagram & Specifications:	
Owner:	
Operator:	
Overall length (meters):	
Displacement/Gross tonnage:	
Cruising & Maximum speed:	
Range/Endurance:	
Method and capability of communication (including emergency frequencies):	
Details of sensor packages:	
Other relevant information:	

4.4 Particulars of Unmanned Surface Vehicles (USV):	
Name:	N/A
Manufacturer and make/model:	
Nationality (Flag State):	
Website for diagram & Specifications:	
Owner:	
Operator:	
Overall length (meters):	
Displacement/Gross tonnage:	
Cruising & Maximum speed:	
Range/Endurance:	
Method and capability of communication (including emergency frequencies):	
Details of sensor packages:	
Other relevant information:	

4.5 Particulars of Unmanned Air Vehicles (UAV) :	
Name:	N/A
Make/Model:	
Nationality (flag State):	
Website for diagram & Specifications:	



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Owner:	
Operator:	
Overall Length (meters):	
Propulsion:	
Cruising & Maximum speed:	
Registration No.:	
Call Sign:	
Method and capability of communication (including emergency frequencies):	
Name of Pilot:	
Number of crew:	
Number of scientists on board:	
Details of sensor packages:	
Other relevant information:	

4.6 other craft in the project, including its use:

N/A

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4.7 Particulars of methods and scientific instruments:		
Types of samples and Measurements:	Methods to be used:	Instruments to be used:
Water properties including temperature, salinity, velocity, oxygen, nutrients, carbonate chemistry	Instrument and water bottles lowered on frame  Oxygen and salinity samples to be analysed onboard  Nutrient and carbon chemistry samples to be preserved and analysed ashore.	CTD-O  Lowered ADCP
Underway sampling (acoustic, atmospheric and sea surface water sampling)	Ship-fitted instruments	ADCPs, echo sounders, thermosalinograph, met package
Water properties including temperature, salinity, velocity, oxygen and pH	Recover and redeploy moorings	Microcats, ODOs, current meters, ADCPs,

4.8 Indicate nature and quantity of substances to be released into the marine environment:  
N/A

4.9 Indicate whether drilling will be carried out. If yes, please specify:  
N/A

4.9.1 Indicate whether explosives will be used. If yes, please specify type and trade name, Chemical content, depth of trade class and stowage, size, depth of detonation, frequency of Detonation, and position in latitude and longitude:  
N/A

## 5. Installations and Equipment

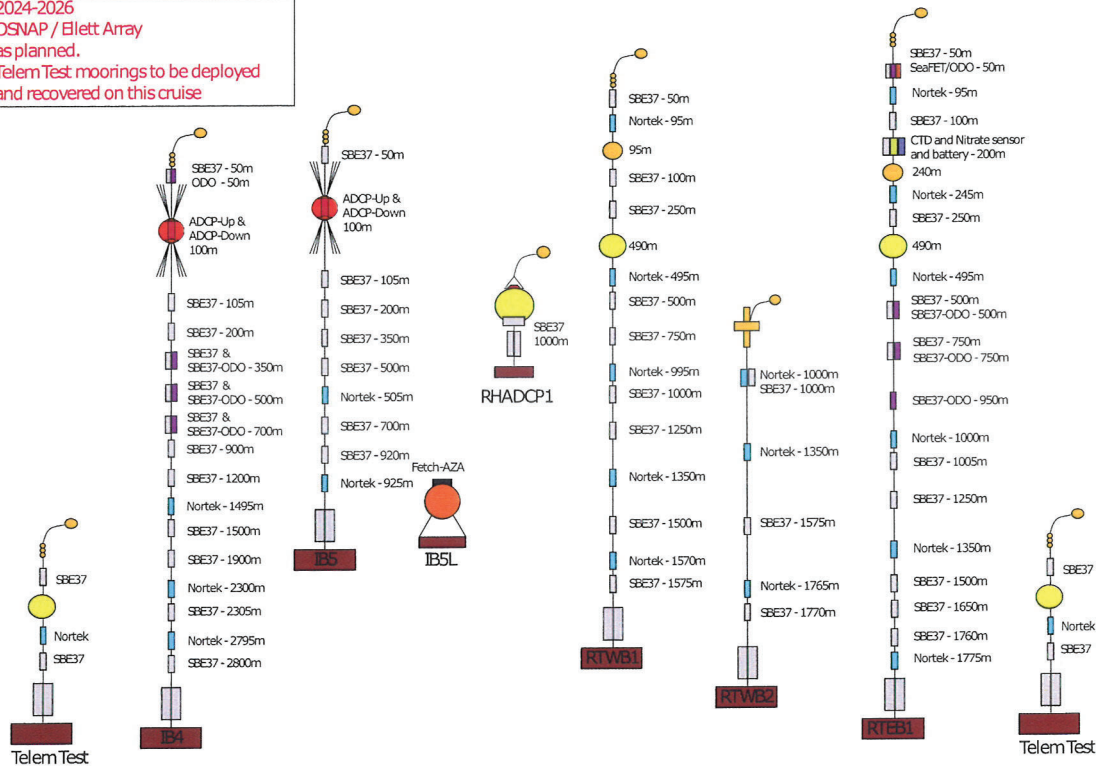
Details of installations and equipment (including dates of laying, servicing, method and Anticipated timeframe for recover, as far as possible exact locations and depth, and Measurements):				
Six tall wire moorings seabed to 50m will be deployed. Moorings will be deployed at various depths and will be instrumented with CTDs and current meters as detailed in the diagrams below. One ADCP Lander and one Bottom Pressure Recorder Lander will be deployed as well as 2 telemetry test moorings which will be recovered within a few days of deployment.				
Mooring Name	Deploy Date	Recover	Lat (N)	Lon (W)
Telem Test 1	Jul-24	Jul-24	57.10000	9.55953
Telem Test 2	Jul-24	Jul-24	57.98982	21.14619
IB4	Jul-24	Jul-26	57.98982	21.14619
IB5	Jul-24	Jul-26	57.80140	19.17136



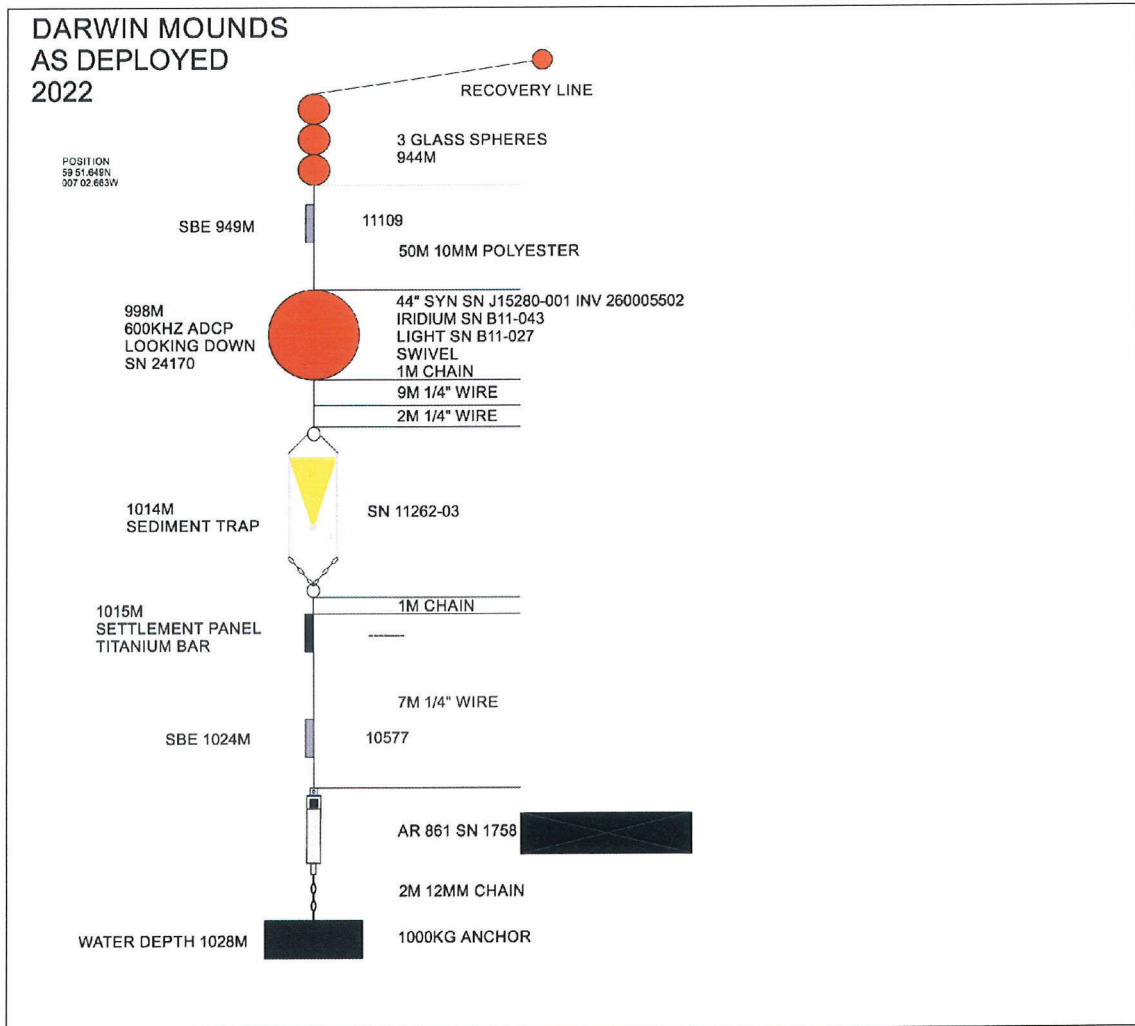
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IB5L	Jul-24	Jul-26	57.80000	19.18000
RTWB1	Jul-24	Jul-26	57.47000	12.70291
RTWB2	Jul-24	Jul-26	57.47000	12.31432
RTEB1	Jul-24	Jul-26	57.10000	9.55953
DMLTM	Jul-24	Jul-26	59.8600	7.0400

2024-2026  
OSNAP / Elett Array  
as planned.  
Telem Test moorings to be deployed  
and recovered on this cruise



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## 6. Dates

6.1 Expected dates of first entry into and final departure from the research area by the research vessel and/or other platforms:

First entry: 3 July 2024

Final departure: 28 July 2024

6.2 Indicate if multiple entries are expected:

No

## 7. Port Calls

7.1 Dates and Names of intended ports of call:

27 June – 03 July 2024: Aberdeen, UK

28 July - 02 Aug 2024: Reykjavik, IS

7.2 Any special logistical requirements at ports of call:

None



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7.3 Name/Address/Telephone of shipping agent (if available):

Nesskip HF  
Nesskip's House  
Austurstrond 1  
172 Seltjarnarnes  
Reykjavik  
PC101  
Tel: 00 354 5639900  
Email: operations@nesskip.is

## 8. Participation of the representative of the Coastal State

8.1 Modalities of the participation of the representative of the Coastal State in the research Project:

N/A

8.2 Proposed dates and ports for embarkation/disembarkation:

27 June – 03 July 2024: Aberdeen, UK  
28 July - 02 Aug 2024: Reykjavik, IS

## 9. Access to Data, Samples and Research Results

9.1 Expected dates of submission to Coastal State of preliminary report, which should include The expected dates of submission of the data and research results:

N/A

9.2 Anticipated dates of submission to the Coastal State of the final report (**This must be within 1 year of completion of the cruise**)

N/A

9.3 Proposed means for access by Coastal State to data (including formal) and samples as per BODC Weblink:

<https://www.bodc.ac.uk/resources/inventories/cruiseinventory/search/>

9.4 Proposed means to provide Coastal State with assessment of data, samples and Research results:

N/A

9.5 Proposed means to provide assistance in assessment or interpretation of data, samples And research results:

<https://www.bodc.ac.uk/resources/inventories/cruiseinventory/search/>

9.6 Proposed means of making results internationally available (to obtain cruise reports these Can be obtained via the BODC weblink see below:

N/A

## 10. Other permits Submitted

10.1 Indicate other types of Coastal State permits anticipated for this research (received or Pending):

N/A

## 11. List of Supporting Documentation

11.1 List of attachments, such as additional forms required by the Coastal State, etc.:

N/A

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Signature: K. Burmeister

Contact information of the focal point:

Name: Dr Kristin Burmeister

Country: United Kingdom

Affiliation: Scottish Association for Marine Science

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Telephone: +44 (0)1631 559 349

Email: kristin.burmeister@sams.ac.uk

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