



**Marine Facilities Advisory Board
Monday 4th April 2022**

Members

Professor Carol Robinson, University of East Anglia (CR) - Chair
 Dr Adrian Baker, Dstl (AB)
 Dr Joerg Bialas, GEOMAR (JB)
 Professor Mike Elliott, University of Hull (ME)
 Dr Kate Hendry, British Antarctic Survey (KHe)
 Professor Kerry Howell, Plymouth University (KHo)
 Dr Joanne Hopkins, National Oceanography Centre (JH)
 Dr Christopher McGonigle, Ulster University (CM)
 Professor Mark Moore, University of Southampton (MM)
 Dr Tim Smyth, Plymouth Marine Laboratory (TS)
 Dr Natalie Powney, Head of Marine Planning, NERC (NP)

Dr Emma Defew, MASTS (EDe) - guest

National Oceanography Centre

Dr Eleanor Darlington, Group Head, Programme Management, NMF (ED)
 Dr Maaten Furlong, Group Head, Marine Autonomous and Robotic Systems (MARS) (MF)
 Helen Oldridge, Head of Scientific Engineering, NMF (HO)
 Dr Matthew Palmer, Chief Scientist, MARS, Science Community Engagement (MP)
 Dr Alex Phillips, Head of MARS Development, NMF (AP)
 Leigh Storey, Associate Director, National Marine Facilities (LS)
 Julie Pringle Stewart, Chief Operating Officer (JPS)

Jackie Pearson, Secretary (JP)

Apologies

Dr Mike Webb, Natural Environment Research Council
 Dr Angus Best, National Oceanography Centre
 Dr Ian Moores, National Oceanography Centre
 Dr Clara Manno, British Antarctic Survey
 Professor Nick Wright, University of Newcastle.

Item 1 Actions update

Ref:	Item	Who	Status
1f	Create infographic on NMF investment/budget and size of user groups.	LS	Pending – but will be included in the next version of the TRM.
3.2	Mention Tim Smyth’s offer of help to LD.	IM	JP to check on this.

5.9.3	Three or four members of MFAB to have discussion before next MFAB meeting about how we establish the most appropriate sensors to acquire for the MEP.	CR/MP/ HO/JP	Pending
5.9.8	Discuss the harmonisation of practice relating to the UK's Marine Equipment Pools.	MJ and CMc	CMc advised a Teams call had involved discussing replicating across Northern Ireland and the border; staffing and finance. May think about a post for ~ 18 months. It is difficult to get colleagues to respond. Will explore different funding routes so this has opened up a channel of communication between Scotland and Northern Ireland.
9.4	Provide more information for the community about the work of the MFAB, in the minutes, which eventually go on-line. Include how NMF makes decisions about assets.	CR/JP	Need ensure minutes are as accessible as possible. JP to draft something about MFAB for Challenger Wave. Action JP Add text about asset disposal into the November minutes before these will be published. Action: JP
9.6	MFAB ToRs: Create a Google doc (<i>suggest document to be shared via Microsoft Teams</i>) with comments and talk to NOCA Board and CPEB, and highlight the areas that we may want to revise.	CR/JFP	Ensure that the MFAB ToRs are available on a Teams link and added this as agenda item to June NOCA Board meeting, to discuss any areas that need revising. There is a need to include more detail about how we are addressing the issue of sustainability. Action to invite Carol to NOCA Board on 10 June. Action: JP
AoB	Raise awareness of opportunities for the community on the Marine Facilities Planning page. Draft text for the community.	JP/ED	ED explained there will be, by the next MFAB, a viewable table of funded cruises (SMEs, ADFs) and will be enhanced visibility about those that are waiting to be programmed. People will be able to tag onto cruises, to highlight opportunities for

			colleagues to tag on their research or join as a researcher. Will be advertised when ready. This has links to the “Find a science berth” project which is highlighting science berths that are available and is part of EDI objectives.
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2. NERC Marine Capital Update

2.1 CR talked through the latest purchases by NERC.

3. Rock Store Working Group

3.1 AB was not able to attend so will be asked for a few sentences to be included in these minutes. **Action: JP/AB**

Post meeting note: this activity has been delegated to Dr Suzanne MacLachlan, Curator of the British Ocean Sediment Core Research Facility (BOSCORF)

4 Marine Autonomous Systems Working Group – Dr Matthew Palmer (link to slides here)

4.1 The MARS-WG met for the first time on the 18th January 2022. The meeting provided a first opportunity for the group to meet and introduce their own interests and relationship with marine autonomy. The group consists of science and technologists and has a range of expert users through to those that are just considering marine autonomous systems (MAS) as potential solutions to meet their science needs.

4.2 Maaten Furlong and Alex Phillips presented overviews of MARS objectives, operations which prompted a round of Q&A covering subjects from funding through to science prioritisation. There was considerable interest in the role of autonomy in future UKRI net zero aspirations, prompted by the recent release of the NZOC summary. There was also considerable interest in aligned MAS/sensor development inc. those related to carbonate chemistry and biological applications, which were seen as currently difficult to achieve with autonomous systems and presented a future development priority. Further interests inc. imagery and related autonomous/AI processing solutions; increased endurance and power to enhance data collection capabilities; and consideration of cross-sector applications.

4.3 Our next meeting will start development of a MARS priorities list for delivery 2023 to provide recommendations for future TRMs. This will be assisted by invited talks from WG members to highlight specific discipline requirements and opportunities for marine autonomy. We also expect to advertise for at least one other ECR member to join the group through NOC-Association.

- 4.4 CR suggested that the Challenger Society might be a better route to attract ECRs than the NOCA. KH asked how this group links with the Upscaling Autonomy Working Group recently announced by the NOCA. LS responded that the NOCA WG will be taking a national rather than institutional view. Although there is overlap, the NOCA WG will be about national scaling up and what this will look like in ten – 15 years. There are international efforts (EU programmes) also looking at this where MARS is well embedded. CR recommended that members of MFAB give presentations on the activities of this Working Group to their local groups. MP agreed that this would be a good idea. **Action: MP**
- 4.5 There are new Horizon projects where marine biodiversity and climate change are topics. The UK Marine Strategy monitoring programme is being revised and there is a push to find smarter ways to monitor good environmental status. MFAB members are encouraged to advise colleagues when there is a role for smart monitoring technologies. MP is on a Defra Advisory Board that is looking at this and will ensure a link up. Although the Autonomy WG isn't a sensors group as such, there is still a lot of sensors discussion covered. In addition to sensors, there's a need to think about how autonomous platforms can be used to take samples.

5 Data Working Group – Dr Ian Moores

- 5.1 Since the last MFAB meeting, BODC and NMF have been developing the near real-time pipeline of routine underway variables from ships to BODC as part of the I/Ocean project.
- 5.2 The base infrastructure is now in place. Cross group collaboration of the pipeline will occur on a trials cruise in July 2022. Data and comprehensive sensor metadata will be automatically transmitted from ships and fed into the BODC near real-time data system. Completion of the pipeline - which will include transfer to the I/Ocean NetCDF format (<https://github.com/I-Ocean/netcdf-specification>) and external exposure through a public-facing Application Programming Interface (API) (<https://linkedsystems.uk/erddap/info/index.html>) - will occur in August 2022. The infrastructure to expose BODC's holdings of quality-controlled, delayed-mode routine underway variables through the Application Programme Interface (API) will also be completed in August 2022. Exposure through the API will allow end-users to aggregate and subset data in their own ways.
- 5.3 No comments received. CR thanked Dr Moores for his update and looks forward to progress at the next meeting.

6 Seismics Working Group – Helen Oldridge

- 6.1 JC236 had been postponed due to rising fuel prices. NMF will now look to procure and trial the replacement acoustic source. JC228 in 2023 will be an opportunity to get feedback on whether NMF should acquire a seismic suite navigation system. With the cancellation of the 2022 trials, the timescales in the paper are still intended but will be reviewed in April with anticipated

trials periods in 2023.

6.2 Estimate per item and timescale

Cost estimate ~ £3.7m, one item per year, over five to six years but HO agreed to confirm the costs and time frame. Funding will come from NMEP capital funding.

CR wondered whether there might be scientific impact because of the five year time frame and suggested asking scientists for their view. HO talked about the extension of the streamer and replacement of the guns (items one to three) – the community feels strongly about replacing the seismic source. As long as there is ability to have a longer streamer, either through a commercial route or another partner, this won't change capability but changes the nature of the project. The PAM will enable 24-hour operation.

HO agreed to establish a community view on the possible impact of the time frame to acquire these items. Natalie Powney would also like to know the outcome of Helen's enquiry as this will help NERC's need to achieve a balance between funding and capability. **Action: HO**

JB asked, regards replacement of the seismic sources, if NMF had looked into the new blue pulse technology now available. HO confirmed yes and agreed to send information to JB after the meeting. **Action: HO.** NMF decided that this wasn't viable at this time but this will be reviewed.

7. Ship Underway Working Group

7.1 There is work ongoing to standardise the process for the cross calibration of onboard sensors with CTD cast data; the commissioning of the second wave height sensors installed during the 2021 refits to provide a reference data set to provide a useful wave radar capability; the installation, commissioning and process establishment for the pCO₂ system. There is also a review ongoing of the underway sampling capabilities in terms of both supporting EOVs and community request, to inform development/capital priorities.

7.2 Alongside the work articulated above, the group has two focus areas for the foreseeable future – development of the processes to support continuous underway monitoring, specifically focused on passage periods; and the development of service levels within appropriate data products to better inform both the science party and technician planning.

8. [Technology Roadmap \(TRM\)](#)

8.1 Scientific Engineering – summary points

- Capital call from 2019 - Active heave compensation on RRS *James Cook* completed February 2022.
- Sub-Bottom Profilers (SBP) upgraded on both vessels in summer 2021 and commissioning completed February 2022.
- Installed second Sea Surface Temperature probe on drop keel (need to

identify any warming effect, given location of first probe in the hull; will also provide input needed for the pCO₂ installation.)

- Second wave height sensor installed on both vessels, not yet commissioned.
- pCO₂ hopefully to be installed in 2022.
- Major refit work is upgrading IT networks on both vessels, as per requirements for cyber security and to support future plans for data sharing.

8.2 Autonomous Underwater Vehicles – summary points

- Autosub6000, which achieved 17 expeditions, has gone and is being replaced by Autosub 5, formerly Autosub2KUI.
- Autosub5 – three trials in Loch Ness, gone well and is being transitioned into NMEP.
- DY152 is MARS NMEP trial that will complete final acceptance testing for Autosub 5 after which it will be in the NMEP and will be used on its first science cruise on JC238, to the Whittard Canyon.
- Two following cruises to Pacific (228a) and the Clarion Clipperton Zone (JC241 – [Smartex Project](#)).
- NMF is planning to build Autosub 6 which will be a copy of Autosub 5.
- ALR Obstacle Avoidance System testing work completed in Loch Ness.
- Several missions involving ALR1 subsequently achieved under Dobson Glacier. 193 km under ice achieved over 90 hours.
- Further upcoming ALR campaigns are detailed in MF's presentation.
- High-speed ship communications will increase link speeds to our ships. This will, for example, enable 'remote P.I.s'.
- Augmented Reality – can enable real-time support for complex tasks. This will enable NMF to support cruises from shore.

8.4 Towed profilers have been associated with large shelf-seas campaigns. Ho last used data from these about ten years ago. It would be good to understand the reasons behind people's requests for the three systems. Should we keep one of these operational? Perhaps we should approach the contacts why they made those choices? MM advised that these items don't directly overlap but we are transitioning to newer capabilities and are likely to conduct these surveys in the future using autonomous platforms. The community may opt for a phased retirement. HO confirmed data presented is captured for all funding streams, including ERC fellowship requests. HO will create a community survey/paper around this for MFAB members to circulate to the community and this could be flagged at the Challenger Society in September, though is not urgent. **Action: HO**

8.5 Review of Capital Prioritisation Exercise

HO asked if the Board still agreed with the way the list is currently prioritised. JB asked why NMF is looking to buy a PAM system. HO advised this was a community request. It will make permit applications easier in some parts of the world and we can operate in darkness. JB advised that if in foreign waters, a PAM system must be operated by an independent operator. HO advised permits are not required in UK waters but added that NMF hadn't considered the independent requirement issue for a PAM operator.

- 8.6 Several sensors could be on this list but a decision is needed on which to buy; a prioritised list would help. [*Post meeting note – this is being discussed through a small MFAB sub-group, also see 8.8*]
- 8.7 TS asked if the smoke beacon is being developed in-house or whether it will be off the shelf? NMF not sure at the moment. TS added that the analysis should reference the amount of time that would be saved in using this item.
- 8.8 Some items are from capital calls, some are aspirations from the Technology Road Map (TRM). We should prioritise new items against previous items and also consider the TRM wish list. CR asked if the sensors ideas could come through recommendations from the autonomous working group? Should there be a sub-group from MFAB to help with the prioritisation exercise? HO explained that the < £50K sensors list doesn't apply solely to autonomy so the WG would not be suitable. A sensors meeting is, however, being arranged. HO recommended a paper at the next meeting to show each item of equipment, including those from the TRM to enable a grading comparison. CR suggested creating lists using scenarios, as practiced by the Cruise Programme Executive Board (CPEB). **Action: HO/MF**

TS referred to the fast Internet links to the ship and asked if there is likely to be technical limitation with, for example, Starlink? There is a high latitude cut-off for ships that go outside the receiving range. MF answered that, in principal, there should be no problem - there are lots of polar orbits.

- 8.9 NMF is working on the next release of the TRM and this version will include time frames and reflect sustainability issues. A first draft will be made available for MFAB and then a next draft will be made available for the community to view, in an interactive way, at the September meeting of the *Challenger* Society. MF/HO to come back to CR & KH if further engagement with *Challenger* is needed first. It would be good to link the TRM to the NZOC session at *Challenger*. ED agreed to check with *Challenger* about linking the TRM to a session **Action: MF/HO/ED.**
- 8.9 LS reminded the group that NERC commissioned large research infrastructure to 2028. This can be tweaked and MFAB is key to this, however, there is only so much we can do to change this now. In terms of capability that has not been used for years, NOC is still obligated to maintain this as part of the commissioned programme. LRI funding hasn't changed for five years; capital funding to the NMEP has remained flat for eight years. The Board can, however, look at this more closely in 2028 but for now, we need to keep in mind that we are operating within constraints.

9. **MFAB membership**

- 9.1 A refresh of the Board is planned. Current members have been allocated extensions from April 2022 for one to three years. A call for new members, to start in April 2023, will be announced in Autumn 2022. New members will replace those allocated a one-year extension. The call will reflect best practice in Equality, Diversity and Inclusion. CR suggested having a Chair Elect who would start in April 2024 and shadow her before she steps down. CR suggested appointing a Deputy Chair, in case of illness. CR and JP to word a

call for the MFAB to review and provide comment. **Action: CR/JP**

9.3 Ensure that Ed Hill and Mark Inall (Chair, NOCA) are aware of the membership table and the need to appoint a Chair Elect by 2023 to shadow CR until CR steps down. **Action JP**

9.4 ME asked that the new membership maintains a link with the MSCC. CM also suggested that someone from the Marine Mammals Group at St Andrews would be a helpful appointment for the Panel. CR commented that when the call is written, it should highlight areas where there are gaps and areas of expertise needed. NP advised that the CPRG are seeking new members by open call. NP would be happy to discuss the draft MFAB call paperwork to help MFAB apply best practice **Action: CR/NP/JP**

10. Revised capital expenditure form

10.1 Following some misunderstandings from the community about suggesting items for inclusion in the National Marine Equipment Pool, the Board completed an extensive review of the capital expenditure proposals form and the revised version will be launched at the next call, scheduled for Autumn 2023. The revised form also refers to sustainability issues.

10.2 It was agreed that the form should reflect community input at a level appropriate to the size of the item requested. We should also ask applicants to show when equipment can be used in other disciplines. The cost for development should be included and CR suggested including MF and HO's email addresses to help applicants with this part of the form. There is also a need to think about commissioning costs, so again applicants should be encouraged to contact HO or MF first for advice. **Action: MF/HO/JP**

10.3 Referring to the introduction to the application form, MM recommended changing the following bullet point:

“It is also possible to fund equipment through NERC’s grant proposal process.” to: “for individual project needs the most appropriate route is within a research grant proposal to NERC” **Action: JP**

10.4 Print the form and circulate to the MFAB membership. **Action JP**

Actions

1	(1f) Create infographic on NMF investment/budget and size of user groups.	MF/HO
	(3d) Mention Tim Smyth’s offer of help to LD.	JP
	(5.9.3) Three or four members of MFAB to have discussion before next MFAB about how we establish the most appropriate sensors to acquire for the MEP.	JP
	(9.4) JP to draft article about MFAB for Challenger Wave. Add text about asset disposal into the November minutes before these will be published.	JP

	(9.6) MFAB ToRs: invite CR to NOCA Board on 10 June.	JP
3.1	Rock Store Working Group - AB not able to attend so will be asked for a few sentences to be included in these minutes.	JP/AB
4.4	Create presentation about the MAS WG for MFAB members to share with their groups.	MP
6.2	Seismic Working Group - establish community view on the possible impact of the time frame to acquire these items. Ensure Natalie Powney is updated on the outcome. Send info on blue pulse technology to JB.	HO
8.4	Create community-wide survey to gain feedback on the towed profilers. Create paper for MFAB members to circulate to the community. Could flag at the Challenger Society in September.	HO, JP
8.8	Write paper on the capital equipment items that includes those on the TRM wish-list for a further grading exercise by MFAB. Include scenarios around use that will help the exercise – as practised by CPEB.	HO/MF
8.9	Complete next draft of the TRM to include time frames and reflect sustainability issues. Make available to MFAB and then next draft to be made available for the community to view, in an interactive way, at the September meeting of the <i>Challenger</i> Society. Ask Challenger about linking the NZOC session to the TRM at the September meeting.	MF/HO/ED
9.1	Write call for new members for MFAB to review.	CR/JP
9.3	Ensure Ed Hill and Mark Inall (Chair, NOCA) are aware of membership table and the need to appoint a Chair Elect by 2023 to shadow CR until CR steps down.	JP
9.4	Ensure new membership maintains a link with the MSCC. Ensure that when the call is written that it highlights gaps in expertise needed. Liaise with NP to ensure that the call meets best practice.	CR/NP/JP
10.2	Ensure the form reflects community input at a level appropriate to the size of the item requested. Ask applicants to show when equipment can be used in other disciplines. Cost for development should be included; including MF and HO's email addresses to help applicants with this part of the form.	MF/HO/JP

	Ensure that commissioning costs are included. Contact HO or MF first for advice.	
10.3	Replace “It is also possible to fund equipment through NERC’s grant proposal process.” with: “for individual project needs the most appropriate route is within a research grant proposal to NERC”	JP
10.4	Print the capital expenditure proposal form and circulate to the MFAB membership.	JP