Marine Facilities Advisory Board 30th November 2021

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)
Professor Kerry Howell, Plymouth University (KHo)
Dr Joanne Hopkins, National Oceanography Centre (JH)
Dr Christopher McGonigle, Ulster University (CMc)
Professor Mark Moore, University of Southampton (MM)
Dr Tim Smyth, Plymouth Marine Laboratory (TS)
Dr Natalie Powney, Head of Marine Planning, NERC

Dr Mark James, MASTS (MJ) - 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)
Ian Moores, Head of the British Oceanographic Data Centre (IM)
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

Jackie Pearson, Secretary (JP)

Apologies

Dr Kate Hendry, University of Bristol
Dr Clara Manno, British Antarctic Survey
Professor Nick Wright, University of Newcastle

Item One: Actions from March 2021

1.1 Action 11.7 (rock store) delegated to Dr Angus Best who will be invited to provide an update at the next MFAB meeting. **Action JP**

1.2 CR invited the Board to provide feedback on MFAB meetings.

Item Two: Marine Autonomous Systems Working Group – Matthew Palmer

2.1 Hope to bring in early career colleagues; meetings will be arranged in the New Year. An international perspective has been discussed and will be an agenda item at the first meeting. CR commented on the strong linkage with MFAB (Kerry Howell, Kate Hendry and Adrian Baker). Meetings will precede MFAB meetings. Add agenda item on update for Spring MFAB. **Action: JP**

Item Three: Data Working Group (DWG) – update from Ian Moores

3.1 In 2021 the DWG worked to develop an integrated data pipeline from ship to shore. Work has been led by Lou Darroch and Juan Ward. Two standardised formats have been agreed - primary net CDF and human-readable CSV formats which have been reviewed by the Ship Underway Working Group and the DWG. Python package has been created. On-going work to make QC data available through the BODC service. NRC pipeline is being set up. Detailed update on page 10 of November meeting papers. Update Board at March meeting. **Action: JP**

3.2 TS asked if volunteers are ready to look at the data when it is produced. Lou Darroch has organised some of the data managers to cover this but was grateful for TS's offer of help. IM to mention Tim's offer to LD. **Action: IM**

Item Four: Ship Underway Users Group – update from Helen Oldridge

4.1 SUWUG met in May and identified SST as most appropriate variable. Will focus on this as want to bring PCO2 system on line next year. Are cross-calibrating the CTD data with SST and working with PML to work back through the PCO2 data streams to check for any bias. Report progress at next MFAB meeting. **Action: JP**

4.2 HO confirmed it is intended to have multibeam as underway data. Network upgrades planned in summer. Will update at next MFAB. The PCO2 system will be refitted to both vessels next summer. Add update to next agenda. **Action: JP**

4.3 CR thanked HO for the update for the CPEB meeting.

Item Five - NMEP database – Equipment state/usage/retirements and capital purchases.

5.1 Item arose from reviewing the requirements of the MFAB ToRs, one of which is to provide advice about equipment in the National Marine Equipment Pool, e.g. how much items are used etc. We have invited Dr Mark James, MASTS, to talk about the MASTS resource map and HO to talk about the NMEP.

5.2 HO talked about the report that she produced for the MFAB papers, hyperlinked here. [Add this in]. JB asked if all the equipment listed is available on both vessels? HO advised that for the most part with the exception of seismics which is best suited to the RRS *James Cook.* A GI air gun array has been deployed on RRS *Discovery* but this was for a smaller array but this information can be made available. Autosub 5 will replace Autosub 6000 which will be retired and we will add statistics on glider usage. The NIOZ box core will be retired. This decision was made in consultation. Will replace with something with similar capability.

5.3 JH is interested to know if the scan fish SeaSore platforms haven't been requested either and whether gliders can do those types of jobs now. HO noted that although SeaSore have been requested, gliders are now more in demand.

5.4 Capital call progress – trace metal free marine snow catchers requested in 2019 - these have been redesigned and will be trialled on the PAP site this year. If trials are successful and the safety concerns overcome, they will be brought into the NMEP. Note, this design is not trace metal free.

5.5 The Active Heave Compensation on the Deep Tow Wince System on the RRS *James Cook* has been bought and will be trialled, post-refit, in 2022.

5.6 Hydrophone arrays requested in three proposals over last three years. All were well scored by MFAB but involved different frequency spectrums and different deployment methods. A towed approach is preferred with a wide frequency spectrum for broadest community application. We will proceed with a deep-sea hydrophone array but not until 2023/24 programme year.

5.7 A Seismics Working Group is working to address the concerns about the seismic suite. NMF doesn't have a separate funding stream for this so it will have to be acquired by piece-meal. Tim Henstock and Tim Minshull are helping decide the priority order for purchases. Both the multi-channel streamer and the upgrade to the seismic source are planned.

5.8 The long-range ADCP that was requested last year – we have a different model but it has the same range and accuracy. Need to make the community aware that this is in the pool.

5.8 TS commented it would be good to know the age of equipment and its level of wear and tear. We need a risk matrix of when items might break down. HO commented that we can say when things are reaching the end of life but when items are mid-life, predicting the end of life is difficult. Agreed to think about this. **Action: HO**

5.9 CR thanked HO for this update and for explaining how items are prioritised after MFAB. Thank you too for the update on the seismic WG. The community don't see how the decisions are made so regular updates are really useful. At some point, we should explain to the community about all the competing pressures on funding.

5.9.1 LS cautioned about MFAB getting too involved in inventory management of the NMEP. It is MFAB's role to advise whether equipment is still necessary so MFAB needs to maintain the broader perspective.

5.9.2 MM encourages MFAB to continue to revisit the ToRs and maybe communicate them more broadly to the community and also explain the process in acquiring new equipment. Should we revisit the prioritisation exercise every few years to ensure we are providing up to date advice? CR agreed we need to think about this risk. **Action: HO**

5.9.3 There is a weakness in getting advice on smaller sensors for gliders and AUVs. Items that don't hit the capital requirement but, for example, it would be useful to have an RBR sensor on a glider but there may be a whole suite of other sensors that would be useful but we won't be aware of these. There is no mechanism for informing us these. CR suggested a call two months before an MFAB meeting that tasks either the Marine Autonomy WG or CR to get feedback on the most appropriate sensors to buy and discuss these at the same time as the capital bids. This is a task for the Marine Autonomy WG although this may not capture all of NMF's requirements. It was agreed that a group of Board members should discuss this before the next MFAB meeting. **ACTION CR/MP/HO/JP**

5.9.4 IM said remember the end to end process with data which is an additional cost.

5.9.5 JH returned to sensors – we exposed recently a problem in how a sensor in the NMEP could be requested but without the use of a AUV behind it. How is this type of request dealt with?

5.9.6 HO spoke about cost of the data stream that goes to BODC. Is there a line in the MFAB capital call that includes this cost? Needs prompt on the form. **Action: JP**

5.9.7 AB queried how useful the equipment usage table is. LS reminded group to keep in mind the question about where the science is going; what might be important in the future, how will it be impacted by new technology etc. AB responded by asking whether NMF is generating a table that may not help make decisions - it's not clear how to interpret the table.

5.9.8 The MASTS resource map – Dr Mark James

We coordinate activity across Scotland and facilitate network and coordinate activities amongst researchers. We developed the resource map in 2009. We know that there is a lot of redundant equipment that could be used by other groups so we are working to enable more collaboration. We have 18 HEIs and government bodies involved. We developed an inventory which is being updated and we check if groups are willing to share. Presently, if people have a need for an item, we put out a call across the community. We have 22 vessels in Scotland and we try to coordinate their use. We don't supply equipment or submit capital bids. Not sure that collecting information on all equipment is useful. Also, there are changes now in the perception of equipment e.g. ROVs and AUVs. Items have changed from being iconic to items that can be bought off the shelf.

ME commented that MASTS is a great model to follow and is better than that currently achieved by the Welsh and especially the English communities. Does MASTS have a role in prompting HEIs to submit expressions of interest? MJ confirmed that MASTS have done this in the past. CR asked for examples of best practice that we might adapt.

CM explained that in Ireland, there is an emerging National Marine Equipment Pool. It would be good to think about to harmonise practice across the UK. MJ agreed to chat with CM off-line. **Action: MJ/CM**

5.9.9 Autosub5 - Slides presented by Alex Phillips

CR asked that we allocate more time for these overviews in future meetings. **Action JP**

Item Six - MFAB report to and feedback from CPEB

6.1 CR thanked the contributors to the CPEB report. In reference to NZOC, CPEB had commented on the need for the MFAB ToRs to clarify how MFAB considers the sustainability impact of infrastructure and asked for a further update for the January CPEB meeting. There had been discussion on seismic applications and there was a concern that this has been on the agenda for several years now. It is highly ranked but hasn't progressed to being funded. It was asked whether we could use other capital calls to fund this and will update CR at the next CPEB meeting. They may consider adding the seismic equipment to the pipeline report. LS advised there is a NOC report that goes to NERC. We are presenting a request from the community for seismic upgrade, including the costs and explain how we

are trying to upgrade capability. This goes through NOC's Julie Pringle-Stewart to NERC. *[Post meeting note – the January 2022 CPEB was cancelled]*.

6.2 LS added that in 2013 NERC Council decided they would flat fund NC Large Research Infrastructure (Research ships and the equipment pool). In effect, the budget to run the ships and the NMEP and the staff hasn't increased since 2017. The remit of the CPEB is to look at the implications of this decision from NERC Council. Each time CPEB is presented with a programme, it must decide whether the science is prioritised or whether we prioritise revenue generating charters to support the funding shortfall. NMF has generated sufficient funding to meet the short fall and CPEB has also supported inclusion of revenue generating opportunities, sometimes over the science expeditions to enable us to manage the gap which is continuing to grow. It is important that MFAB advises the CEO NOC and CR so that CR can make the case for the equipment to be maintained properly to support the science. The MFAB report was well received by the CPEB which has been slightly distracted by COVID over the last 12 months.

6.3 NP agreed that the CPEB has been focused on COVID over the last 12 months. Professor Susan Waldron is steering the CPEB back to its ToRs and there has been a mapping exercise, similar to what MFAB is doing, to ensure that the CPEB is meeting all its responsibilities.

Item Seven - NZOC Key Recommendations

7.1 From UKRI's perspective, their ability to comment on the climate crisis and how that is approached from a scientific perspective is undermined if the science they are undertaking is contributing to the carbon footprint. It is accepted that research vessels will be part of a Net Zero Oceanographic Capability by 2040 but only if they are not contributing carbon dioxide. The IMO has just had a meeting but unfortunately are not able to commit to any targets at this stage. The CEO of Maersk has commented that the IMO won't discuss this until summer 2022. It must be born in mind that research ships do not operate in isolation - they need people, the ability to bunker, design of engines etc. Maersk are pushing forward to make their fleet net zero but will be hampered if the IMO are not able to even commit to a deadline of 2050.

7.2 With the NERC fleet, the alternatives to marine gas oil aren't as energy dense so we estimate that, for example, 30% by volume of RRS *Discovery*, is fuel tanks which will give a specific level of endurance. To avoid building a huge ship and maintain this level of endurance, if we replace our current fuel with hydrogen fuel cells or ammonia, we would need to allocate about 45% of the vessel to store energy which means loss of people and capability.

7.3 Four key challenges ahead

1.) NERC needs to work to mitigate the carbon footprint of the current fleet which will have implications around planning and usage and for how we update and upgrade the vessels so that they can operate differently.
2.) Develop around 120 new sensors for the new capability.
3.) Continue to develop sensor platforms, e.g. bespoke AUVs.

4.) Scale up the number of gliders to 450, as a minimum.

Costs

Running the RRS *Discovery* costs ~ £7m per year. If we want a capital replacement programme for 250 - 350 gliders, plus their associated costs, this is also ~ £7m per year so we need to work out how to do this effectively. Scaling up is costly and is in line with running a research ship. The pace of change is fast so the Board's advice will be particularly important, going forward.

There followed a discussion about how NMF will ensure that it selects the correct new type of ship to deliver NZOC because it's a complex process to design and commission a new ship. At the moment, we know that we will need more autonomy in the future and so this is where our focus should be over the next five years.

LS suggested it would be good if Board members could speak to their communities about NZOC issues between the MFAB meetings and then provide feedback to Technology Roadmap. A survey was also suggested. The NZOC report recommends that NERC sets up groups to look at how we prioritise sensor development. Going forward, we should first get the NZOC report circulated to the community widely. NZOC issues will be reflected in the next version of the TRM which will be available for the Spring 2022 MFAB. JH noted that previously, MFAB members had a section of the TRM to review which worked well. Maybe repeat this exercise but with NZOC style questions? It was agreed to wait for the next version of TRM at the Spring 2022 MFAB meeting, then go back to our communities to feed into the TRM update. Action now to send the Summary NZOC Report to Board members after this meeting to share as appropriate. **Action: JP**

Item Eight Capital Expenditure Proposal form for Autumn 2022

8.1 JP provided overview of the revised capital expenditure proposal form. Main changes are to boxes six and 24. There is also a template to consider that JP will discuss with ED. Include reference to BODC/data streaming.

8.2 MF commented on wording for box 6 – "*item may be used for a project at the start".* This sounds like if it's approved, the project owns it for the first couple of years. This isn't correct - items bought are not to be aligned to projects. Revise wording in preamble and revise text in box six.

8.3 ME added it would be good for applicants to indicate what discussions they have had with the wider community. We should also ask applicants to highlight the sustainability and human health aspects of using the item.

8.4 Re: boxes 23, 24. Would be good to know more about the information that applicants aim to gather. Include need for context in the preamble. **Actions: revise form and send for review to CR/MF/ME/CM/HO: JP**

8.5 CM recommended removing reference to trying to align to existing projects and to keep applications generic. Avoid items that are vendor specific which would involve procurement. This could reduce the amount of email correspondence with applicants to check these details. Important applicants have equal opportunity to provide the necessary information so that they get the same

degree of scrutiny. **Action: JP**

8.6 JP to talk to LS about timing of next call. **Action: JP**

Item Nine - MFAB agendas aligned to ToR

9.1 We visited previous agendas to check that the ToRs have been addressed. The community may be interested in usage of equipment in the NMEP. Concluded that the ToRs need to be adapted to be at a higher strategic level.

9.2. In terms of capital expenditure proposals, the key questions are what equipment is available, does it need to be replaced and is it in working order? For smaller items, how does NMF know if there is a need for a different sensor, for example? CR advised an individual P.I would contact HO via the SME process to see if an item is available. Although there isn't an option in the SME process to advise about a need for an item that the NMEP doesn't currently have, there is a free text box to add details. In the ADF form, whilst we list the standard/optional/user-supplied sensors, currently, the MFP software can't provide the extra details that applicants may want. It would be good to link items to their data sheets.

9.3 KH said there is a need for MFAB to advise the community about why, for example, certain items are rotated off the NMEP but agreed that great detail isn't needed. The MFAB minutes are added to the web site so perhaps they could include an overview about the process of equipment retiral.

9.4 Teams comment from CM: *Could there also be an opportunity to repurpose some of the obsolete, or retired items of infrastructure within the wider community? Particularly for smaller items of infrastructure that could readily be used by individual groups across the jurisdictions. This may already be in place, but it would be good as a strategy in terms of wider sustainability.*

HO responded by explaining the NOC asset disposal procedure which includes offering items to the community which is part of NOC's sustainability pledge.

There needs to be more information for the community about the work of the MFAB and also how NMF makes decisions about assets, for example, in the minutes, which eventually go on-line. **Action: CR/JP**

Post meeting note

Disposal of assets

In accordance with the NOC Asset Disposal Policy, if an item in the National Marine Equipment Pool remains functional it is advertised internally within NOC for use, then externally to the community. If there is no interest, the asset will be disposed of. It will be sold as scrap or disposed of in the appropriate way using the Waste Management Policy.

9.5 There was a question about who ensures that the governance structure of NMF is working. There was a Teams comment from LS: *wrt MM's comment - CPRG is the other part of how NERC take evidence regards how NMF is delivering on its remit - CPRG see's all of the PCAs and reviews over a two day meeting which NMF has to answer to.*

9.6 MFAB ToRs are monitored by the NOCA and CPEB. Suggest creating a Google doc with comments and talk to NOCA Board and CPEB, and highlight the areas that we may want to revise. **Action: CR/JFP**

Item 10 MFAB membership

10.1 Ten members started in 2019 so technically, ten should rotate off now but this isn't sensible. Suggest allocate each member with either three, two or one year left and do this at the same time as an open call. Bear in mind that there are disciplines that we don't cover at the moment. This might also generate a waiting list **Action: CR/JP**

Teams note from LS - *might we attempt to address equity and diversity during this process? - I have some suggestions that I can make to Carol separately. [Post meeting note: Advised to CR on 28 Feb 2022.]*

AoB

ED commented that on the Marine Facilities Planning web site, expeditions are planned to March 2023. We work on a six month planning window for expeditions, to let the FCDO know our activities. We would encourage the Board to see what is programmed to March 2023. MFP | Voyage Programme (marinefacilitiesplanning.com)

e.g There is an expedition coming up to the Labrador Sea which will be interesting for several disciplines. We would like to encourage colleagues to check the MFP so that we can maximise the benefits of expeditions. This will also help the NZOC project. We do advertise available science berths. We now need to raise awareness of the opportunities that are on the MFP. JP to draft text for the community. **Action JP/ED**

NMF has received funding to help raise awareness of spare capacity in the programme and is looking at opportunities where community can 'piggy-back' research ideas on top of other research proposals. Another idea is that, as the bandwidth of ships is increasing, could be a 'virtual' science party. Will come on stream in next few years.

MP asked about further thoughts on the sensors going forwards – possibly a subsection of the Autonomous Working Group? We need to ensure an action here. Paragraph 5.9.3. refers **Action: JP**

Table of actions

1.3	Rock store item - Dr Angus Best to provide an update at the next MFAB meeting.	JP
2.2	Add agenda item for next MFAB meeting on update on Marine Autonomous Systems Working Group	JP
3.1	Add agenda item for next MFAB meeting on update on the Data Working Group	JP
3.2	Mention Tim Smyth's offer of help to LD.	IM
4.1	Add agenda item for next MFAB meeting on update about the SUWUG.	JP
4.2	Re: multibeam/underway data. Network	JP

	upgrades planned in summer. PCO2 system will be refitted to both vessels next summer. Add updates to next agenda.	
5.8	Think about items in the NMEP that are reaching end of life and how we might predict this.	HO
5.9.2	Consider revisiting the prioritisation exercise every few years to ensure we are providing up to date advice.	HO
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 NMEP.	CR/MP/HO/JP
5.9.6	Add line about cost of data stream that goes to BODC, to the capital expenditure form.	JP
5.9.8	Discuss the harmonisation of practice relating to the UK's Marine Equipment Pools	MJ and CM
5.9.9	Allow more time in the agenda for technology overviews.	JP
8.4	Capital Expenditure Form – revise and share with colleagues to check.	CR/MF/ME/CM/HO/JP
8.5	Capital Expenditure Form - avoid items that are vendor specific which would involve procurement.	JP
8.6	Discuss timing of next call.	LS/JP
9.4	Provide more information for the community about the work of the MFAB and how NMF makes decisions about assets, for example, in the minutes, which eventually go on-line.	CR/JP
9.6	ToRs - create a Google doc with comments and talk to NOCA Board and CPEB, and highlight the areas that we may want to revise.	CR/JFP
10.1	Allocate members of MFAB with either three, two or one year left and do this at the same time as an open call.	CR/JP
AoB	Raise awareness of opportunities for the community on the Marine Facilities Planning page. Draft text for the community.	JP/ED