Call for Proposals under the IMOS (EIF) Five Year Strategy: Enhancement or extension of IMOS – July 2009 to June 2013

Facility Project Plan template

Proposals should be submitted by 30 October 2009 to:
Tim Moltmann, IMOS Director, University of Tasmania
email: tim.moltmann@imos.org.au

Background:
This template has been provided to allow Facility and Sub-Facility Leaders, and other interested parties to prepare a Facility Project Plan following a call for proposals announced on 18 September 2009, with a closing date of 30 October 2009.

Prior to completing this template, please read the IMOS Five Year Strategy (the 'Strategy'), and Detailed Guidelines for Proposal Development (the 'Guidelines') – see the IMOS website at: http://imos.org.au/eif.html.

The Facility Project Plan must be in the following template and contain the information set out below:

Overview:

Proposed Infrastructure Investment:	Nutrients' Mapping in Australian Regional Seas on SOOP vessels
IMOS Facility:	Enhanced measurements from Ships Of OPportunity (SOOP)
Operating Institution:	CSIRO Marine and Atmospheric Research
Facility Leader (for this Enhancement):	Dr Edward CV Butler, CSIRO Marine and Atmospheric Research, Hobart Ph. (03) 6232 5276; Fax (03) 6232 5000 Edward.Butler@csiro.au
Other(s) key people involved:	A/Prof Ian D McKelvie, Water Studies Centre, School of Chemistry Monash University, Clayton, VIC Ms Lesley A Clementson, CSIRO Marine and Atmospheric Research, Hobart
Collaborating Institutions:	Water Studies Centre, School of Chemistry, Monash University, Clayton, VIC

Please attach:

- Letter from senior person in Operating Institution, confirming that the proposed infrastructure can be developed and operated within that institution
- Resume of Facility Leader
- Letters received from Collaborating Institutions, detailing their support to the Proposal, and indicative level of co-investment

Nature of Investment:

The proposed investment comes under 'Enhance' component of the AusCPR program (see umbrella sub-facility proposal 'Extend and enhance the Australian Continuous Plankton Recorder survey' for more detail). It is in the form of equipment acquisition (underway systems), a salary component for the construction of in-house equipment, the contracting of some laboratory analyses for calibration and validation of the sea-going instruments, and a minor salary component for overseeing data transmission and overall project coordination.

This investment will have appreciable spin-off benefits, because the flow analysers constructed also have the capacity for remote, fixed location monitoring (e.g. on oil rigs, or other marine structures). The context for this proposal has been previously outlined in an 'Underway Biogeochemical Observing System' document (Butler 2005).

Implementation Strategy:

- Summary

This enhancement of the SOOP Facility looks to improve the existing facility by incorporating observations in the biogeochemical realm—an acknowledged deficiency in IMOS. The approach recommended is the installation of automated flow analysers on a ship's intake to monitor surface-water nutrients, while the vessel is underway. For effective integration of our nutrient mapping approach, we are recommending that it is integrated as much as possible with the AusCPR program. In this manner, the condition and characteristics of the base of the surface-water ecosystem are directly related to the extant nutrient distributions.

- Objectives

The prime objective of this proposal is to bring reliable, sensitive, automated measurements of nutrients to IMOS, and at the same time to integrate this activity into relevant IMOS Facilities. Our first choice has been AusCPR program in the SOOP Facility, but there is also opportunity to subsequently integrate nutrient mapping within the CO_2 program, as well.

Our proposal is consistent with several of the strategic priorities of IMOS enunciated in the 'Five Year Strategy'. It will continue the thrust "to build institutional strengths into national capability" and is an example of "partnering for sustained ocean observing". In the first instance, we have looked to dovetail our proposal in the form of an enhancement of an existing facility (AusCPR). Furthermore, Our SOOP Facility enhancement draws on the strength of two institutions to make nutrient mapping a practical and operational reality. The automated sampling on a ships intake, and its evolution, draws on the experience of CMAR beginning with the COOE program in the 1990s. The design, construction and operation of compact, ruggedised flow analysers for nutrients determination is a speciality of the Water Studies Centre at Monash University. The two teams come together in this proposal.

Automated nutrient analysis is also a very good example of a mechanism for "driving down the cost per observation". Most nutrients data in climatologies for the region have been gained by expensive, conventional procedures of sample collection, preservation, and subsequent analysis in a laboratory (either on a large research vessel, or back in a land-based facility). Automated, underway nutrient analyses are not only economic, but they are also better scientifically in that they remove the preservation step — a potential source of error in nutrients' measurement.

- List of major activities – including major party(s) involved, duration, start, finish

Our program will see in the first year the construction of the sampling interface, manifold and controller/logger, incorporating flow-through micro-ST sensor and fluorimeter. This work will be completed at CMAR Hobart in the first 3–6 month's of the project. To this system, at completion, will be added the phosphorus flow analyser. This instrument will be a replicate of one that has already be deployed for underway nutrient mapping by the Water Studies Centre. After a further 3–6 months, and with proven operation of the first-stage instrument, a nitrate flow analyser will be incorporated into the system. This will be followed in a further three months by the extension of nitrogen measurements with a flow analyser dedicated to ammonia determination. In the second and third years of this project, the

underway mapping of nutrients should be in an operational mode. Activities in this time period should be focussed on system maintenance (the Water Studies Centre in Melbourne are well placed for servicing with this city as one of the regular ports on the monitoring vessels route) and efficient data transmission. We suggest a review of this project at the end of Year 3 to evaluate if further enhancements are appropriate (e.g. incorporation of device(s) to measure the micronutrient iron), or extension of routes are favoured (e.g. trans-Tasman, WA/Indian Ocean, GBR lagoon—Cooktown to Gladstone).

Our choice of SOOP vessel for deployment of the nutrient mapping system is initially the existing AusCPR route from Brisbane to Melbourne (see Fig. 1), but we would rapidly look to extend this to Adelaide, consistent with the umbrella facility's extension.

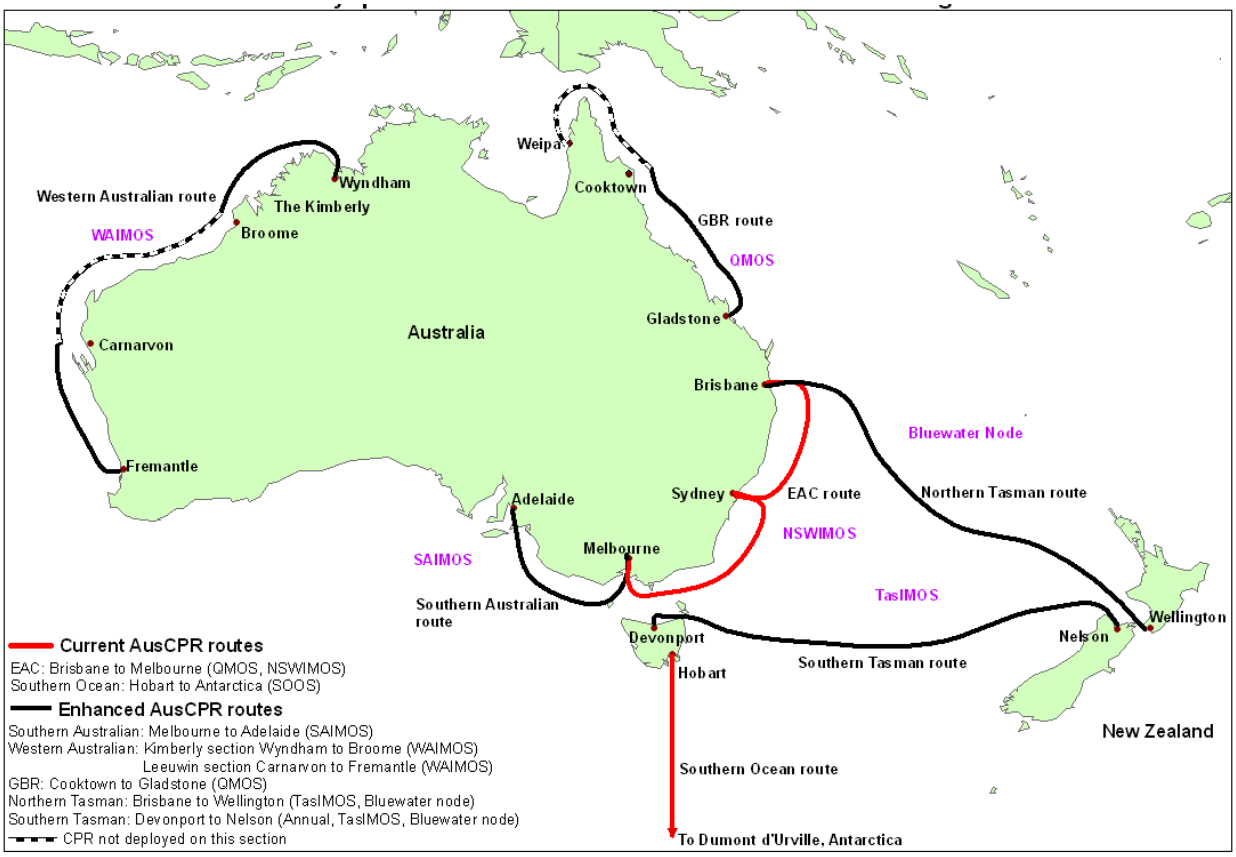

Fig. 1. Map of current AusCPR routes (in red) and enhanced AusCPR routes (in black)

- List of major equipment to be purchased / developed

Various components will be purchased from commercial sources, but the complete instrument systems are constructed in-house— the sampling interface, manifold and controller/logger at CMAR Hobart, and the individual flow analysers (phosphorus, nitrate and ammonia) at the Water Studies Centre, Monash University, Clayton. See examples of operational equipment in Figs 2 and 3.

Commercial components for sampling interface:

- SeaBird SBE45 microTSG sensor ($10k)
- EcoPuck Fluorometer ($7.5k)

Fig. 2. Sampling manifold in engine room of SOOP vessel used in the COOE project. A present-day system could be more compact and potentially relocatable than that depicted.

Fig. 3. Flow-analysis instrument configured for phosphorus determination (Water Studies Centre, Monash University). The dimensions of this instrument are such that it would comfortably fit into a shoebox. This example has been operated in underway mode in the Victorian 'Two Bays' Study (Pelican Foundation), and it is soon to be deployed for a proving voyage across Bass Strait on a 'Spirit of Tasmania' ferry (joint Monash University – Vic EPA project).

Access, pricing regimes:

This enhancement will in general follow the agreed practices of the existing SOOP Facility and AusCPR Sub-facility in this area. Consult the appropriate documentation for further detail.

- How will data access be provided?

The data streams (shipboard underway T, S fluorescence, phosphorus, nitrate and ammonia) will be made accessible through eMII, together with appropriate metadata. In the first instance, this will be via data downloads when the ship is in port. Data from calibration / validation samples obtained by ship-riders will also be provided to eMII after analysis in home laboratory (nutrients and HPLC pigments) within three months of samples being taken.

- How will data and products be managed?

We shall use the SOOP Facility and AusCPR data management protocols as templates for development of underway nutrients' protocols. It is envisaged that data in the first instance will be held in approved databases at CMAR Hobart and/or Water Studies Centre, Monash University before transfer to eMII.

- What are the dependencies on external / other facilities (national and international)?

This proposed enhancement is very much dependent on the umbrella sub-facility, and in turn, its relationship with ANL for use of the SOOP vessel. It also relies on indirectly on the success of the IMOS SOOP Facility.

- Collaborative structures for allocation of priorities

CMAR Hobart and Water Studies Centre at Monash University will work collaboratively throughout this project. The small project team will come together to jointly set and review priorities, referring to the AusCPR Sub-facility and SOOP Facility leadership, where necessary.

Governance

- Performance indicators

Key performance indicators for this proposed enhancement will be the following:

- Successful negotiation for use of SOOP vessel's sea-chest intake with ANL
- Construction of sampling interface, manifold and controller/logger (CMAR Hobart)
- Construction/modification of flow analyser for phosphorus (Water Studies Centre, MoU)
- Integration of phosphorus flow analyser with sampling interface/manifold, and proving of integrated system
- Establishment of full automated operation, and routine and reliable production of data stream
- Construction of nitrate flow analyser, and its integration with existing system (Water Studies Centre, MoU)
- Construction of ammonia flow analyser, and its integration with existing system (Water Studies Centre, MoU)
- Servicing / maintenance program established and delivering regular data stream in Year 2
- Servicing / maintenance program revised, as necessary, and delivering regular data stream in Year 3
- Review of project at the end of Year 3; decision on Expansion/Enhance ments

More detail on Governance and outreach/impact is provided in the umbrella sub-facility enhancement / extension proposal.

- Describe key risks and risk management strategies

Risk	**Risk mitigation**
Loss of access to SOOP vessel	In joining with AusCPR Sub-Facility, we hope to minimise this risk. We will also aim to ensure that our full system is as relocatable and as interchangeable as possible.
Poor rate of data return	We plan to minimise this risk by using already proven equipment and procedures. We will also guard against possible environmental (e.g. engine room conditions) by ensuring that all components are as ruggedised as possible, have appropriate alarm and failsafe systems, and have accessories to protect against poor water quality .

Operator / Crew safety	We do not anticipate any concerns in this regard. Our system will likely be housed within a closed cabinet in the manner of Fig. 2. Reagent chemicals pose very low hazard. We will seek to minimise these further by appropriate substitution, dilution, etc., wherever warranted.
Laboratory safety	Laboratory safety procedures are already well embedded within the operations of both CSIRO (OHSE Health and Safety Assessment of Work) and Monash University
Loss of key staff	We will ensure that this is covered to the extent possible, by identifying other staff, who can substitute where practicable. The skills and experience of key technical staff, who have long-term expertise in the development of instrument systems, are where the more significant risk lies.

Budget: Please complete the spreadsheet provided, and detail here any further information you have available on the background to the Budget: provided separately.

- EIF Funds
  - Categorised as expansion of existing Facility / Sub-Facility
- Co-investments – source and nature

  Coinvestment support in the CMAR component will be sought from the Wealth from Oceans flagship in the form of matching funds for salaried components. Water Studies Centre at Monash University will provide co-investment mostly in-kind via the provision of facilities and earlier instrument development costs.
- Staffing details

  It is anticipated that staffing for this enhancement over the course of its initial lifetime will vary between 1 and 2 FTE, with it being at the upper limit during the first year, and trending toward the lower limit in the second and third years. The precise split of staff between CSIRO and Monash University is yet to be fully decided.
- Description of proposed new infrastructure for Nodes – please complete the Table on the next page, referring to Attachment 1 to the Guidelines for further information

  This has been completed in the Bluewater Node document

Facility budget proforma for IMOS EIF Call for Proposals 2010-2013

Enhancement to Facility / New Facility (*Note 1*)
Macro-Nutrients(SOOP)

		2010/11	2011/12	2012/13	Total
NCRIS/EIF Funding (*Note 2*)		(EIF)	(EIF)	(EIF)	(EIF)
	Maintenance supplies, data transfer, coordination	45,000	145,000	145,000	335,000
	Purchases of equipment + salary	40,000			
	Technician salary +component purchases	150,000			150,000
	Laboratory analyses for cal/val	30,000			30,000
	NCRIS/EIF Funding Total	**265,000**	**145,000**	**145,000**	**555,000**
Cash Co-investment (*Note 3*)		**2010/11**	**2011/12**	**2012/13**	**Total**
CSIRO WfO Oceans	this is the operational proportional cost of providing the facilities and associated software and backup of data	105,000	35,000	35,000	175,000
(enter Organisation)	(insert description, including likelihood)				0
	Cash Co-investment Total	**105,000**	**35,000**	**35,000**	**175,000**
In-kind Co-investment (*Note 3*)		**2010/11**	**2011/12**	**2012/13**	**Total**
	In-kind Co-investment Total				
	TOTAL Resources	**370,000**	**180,000**	**180,000**	**725,000**

Reference

E.C.V. Butler (Ed.) 2005. *Considerations for an Underway Biogeochemistry Observing System: A report for the CSIRO Wealth from Oceans Flagship*. CSIRO Marine Laboratories Report No. 242. 19 pp. <http://www.cmar.csiro.au/publications/cmrreports/mlrs242_full.pdf>

TABLE: Observations required by the Nodes in relation to this Facility

Facility	**Observations required by the Node**			
	NCRIS Funded (already allocated to Jun11)	EIF first $8M funded (already allocated to Jun10)	Extension of existing facility infrastructure out to 2013.	Enhancements of existing Facilities / new infrastructure required 2010-2013
	(see Appendix 1 of the Guidelines)			
Bluewater & Climate				
WAIMOS				
GBROOS				
NSW-IMOS				
SAIMOS				
Other <enter name>				