IMOS EIF ANNUAL BUSINESS PLAN 2010/11

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1. Executive Summary

EIF funding in 2010-11 represents the second, annual $8M increment for IMOS to create and develop new national marine observing infrastructure that builds on NCRIS investment. Seven of the ten technology-based IMOS Facilities will be extended and enhanced by EIF funding in 2010-11, and we expect to deliver tangible improvements in all of these areas over the coming twelve months.

Importantly, these new investments will enable a strong response to the IMOS Five Year Strategy, addressing the requirement for EIF funding to provide enhanced monitoring capability in the Southern Ocean, and extended coverage in northern Australian waters. This Annual Business Plan has been informed by the IMOS EIF planning process conducted during July to December 2009, and is consistent with the documented outcomes of that process as approved by the Advisory Board.

In terms of the Southern Ocean, the Bluewater and Climate Node science community will directly benefit from:

- Provision of a pCO^2 system on the Australian Antarctic Division's *RSV Aurora Australis*, as part of the ships of opportunity Facility's biogeochemical 'underway' network.
- Commissioning of the Antarctic Coast (Polynya) component of the deepwater moorings Facility.
- The ocean gliders Facility commissioning transects from the Southern Ocean Time Series site (at ~47^{o}S) to Hobart, and back.
- Commissioning of the 'Southern Ocean Seals as (oceanographic) Samplers' component of the animal tagging and monitoring Facility.
- Provision of the 'Monitoring Apex Predators in the Southern Ocean' component of the animal tagging and monitoring Facility.
- Improved delivery by the satellite remote sensing Facility, in the areas of satellite altimetry calibration/validation and bias correction, and ocean colour calibration/validation and national products.

In terms of northern Australian waters, the WAIMOS, QIMOS, and Bluewater and Climate Node science communities will directly benefit from:

- An additional continuous plankton recorder line from Cairns to Gladstone, as part of the ships of opportunity Facility.
- The ocean gliders Facility commissioning transects in the Coral Sea.
- Commissioning of a Bonaparte Gulf shelf mooring array as part of the national moorings network, a related Indonesian Through Flow deepwater array, and provision of Kimberley shelf mooring arrays.

It is important to note that the Bluewater and Climate and WAIMOS Node science plans were internationally peer-reviewed in late 2009, and the outcomes of these reviews have influenced the IMOS Advisory Board in setting the above priorities for 2010-11.

Other areas of expected progress in 2010-11 that will directly benefit all Nodes in line with the IMOS Five Year Strategy, through monitoring boundary currents, greater bio-physical integration and enhancing geographical coverage, include:

- Establishment of a new Bio-acoustics activity as part of the ships of opportunity Facility, to estimate critical mid-trophic organism distribution and abundance around Australian EEZ shelf, slope and oceanic environments.
- Provision of the East Australian Current component of the deepwater moorings Facility.
- Provision of coastal ocean gliders in Tasmania, to underpin the establishment of a new Tasmanian Regional Node (TasIMOS).
- Establishment of a national network of representative, benthic sites for repeat surveys by the autonomous underwater vehicle Facility
- Commissioning of enhancements to the National Reference Station component of the national moorings network, relating to increased spatial coverage, and improved monitoring of currents, bio-optical properties, and acidification.

No material variations are expected from the Interim EIF Project Plan submitted in 2009-10.

Key risks include those routinely associated with deployment and retrieval of observing infrastructure in a vast, deep, dynamic marine environment. These are considered in the body of the plan. Specific risks and mitigants for 2010-11 include:

- **RISK** - Successful deployment and retrieval of ocean gliders to and from the Southern Ocean Time Series site (at ~47^{o}S).
    - **MITIGANT** - Risk will be managed by staged implementation i.e. glider deployment by vessel from the Southern Ocean site back to Hobart, then glider deployment from Hobart to vessel at the Southern Ocean site, before stepping up to full deployment and retrieval from Hobart with no on-site vessel support.
- **RISK** - Ability to grow shelf and deepwater mooring capability/capacity in line with substantially increased demand.
    - **MITIGANT** – Staging of deployments and close collaboration with major Operators, including CSIRO and AIMS.
- **RISK** – Data available through the eMII Ocean Portal is not taken up and used to conduct research projects of national significance.
    - **MITIGANT** – The IMOS Nodes, which are strengthening and growing, represent the Australian marine and climate science community, and provide a direct pathway for uptake and use of IMOS data.
- **RISK** – Proposed State Government cash co-investments are not approved within the relevant jurisdictions, meaning that some planned infrastructure will not be established.
    - **MITIGANT** – In most cases, priorities assessed as essential by the Advisory Board have been supported by IMOS, with other, highly-desirable priorities to be brought in if co-investment is available. In one or two cases, reprioritisation will be required is there is no further State Government cash co-investment.
- **RISK** – Over-commitment and failure to deliver as a result of the combination of new EIF commitments and existing NCRIS commitments.

- **MITIGANT** – The IMOS Office and Advisory Board have developed a whole-of-IMOS Five Year Strategy and have overseen an integrated EIF/NCRIS planning process.

In summary, the 2010-11 IMOS EIF Annual Business Plan represents an exciting and achievable addition to the creation and development of Australia's national marine observing system.

2. Status of the Project

In 2009/10 five IMOS Facilities (argo floats, deepwater moorings, ocean gliders, animal tagging and monitoring and national moorings network) were funded to commence new work under EIF, in addition to the work that is on-going under NCRIS. Argo will have completed the initial EIF work by June 2010, and as the full work plan for 2010/11 is funded under NCRIS, no further EIF Argo work will be done until the 2011/12.

Each of the other Facilities which commenced EIF work in 2009/10 (being ocean gliders, animal tagging and monitoring and national moorings network), plus three other Facilities (being ships of opportunity, satellite remote sensing and autonomous underwater vehicles) have been enhanced under IMOS EIF in 2010/11. A summary of the enhancements is provided in the executive summary above, and detailed plans are included as an attachment to the Plan.

In addition eMII and the national project office have agreed, whilst only funded under NCRIS in 2010/11, to also extend their services to oversight of the 2010/11 EIF work. To this end eMII will be providing resources to facilitate the availability of data from the IMOS Ocean Portal for the new EIF datastreams. The IMOS Office will be responsible for ensuring the Plan is implemented and that reporting to DIISR and other stakeholders is completed.

This Plan is the final year that the IMOS EIF and IMOS NCRIS grants will run concurrently. For future years (ie 2011/12 and 2012-13) the Final IMOS EIF Project Plan provides the detail of the work to be done across the ten distinct ocean observing technology Facilities, the national marine information infrastructure facility and the national project management office. Once the Final IMOS EIF Project Plan is approved by DIISR, work will begin on a decadal strategy that addresses the long-term sustainability of IMOS.

3. Project Infrastructure

The new IMOS infrastructure to be purchased from EIF funding in 2010-11 is:

- SOOP – commissioning of three continuous plankton recorder, underway CO_2 monitoring equipment on Aurora Australis, bio-acoustic instrumentation
- ABOS – work will commence towards provisioning of the EAC array, and completion of the commissioning of the ITF and Polynya arrays
- ANFOG – commissioning of two slocum gliders for Tasmanian deployments
- AUV – commissioning of the upgrade to *AUV Sirius* which includes imaging upgrade, improved propulsion and photosynthetically active radiation sensors
- ANMN – commissioning of new shelf arrays for Kimberley and south east

Queensland, the North Stradbroke Island NRS, upgrade of ADCPs all all 9 NRSs and bio-optics on four NRS. Provisioning of pCO_2 Kangaroo Island mooring and south east Queensland shelf array

- AATAMS – commissioning of SOSS and MAPSO bio-loggers
- SRS – commissioning of Bass Strait and Storm Bay satellite altimeter moorings. For the Ocean Colour sub-facility, provisioning of the radiometers data stream, bio-optical database, and MODIS datastreams (including Aqua, Terra L1A and L2) and SeaWIFS archive.

In 2010/11 activities to position researchers, research teams and external users to utilise the IMOS EIF infrastructure will be managed under the existing arrangements in place under the IMOS NCRIS agreement.

4. Management and Implementation

The management and implementation arrangements for IMOS EIF were documented in the Final IMOS EIF Project Plan, which was submitted to DIISR 26 February 2010. No changes are envisaged to that structure during the 2010/11 year. It is noted that resources for management and implementation will come from the NCRIS funding as the final year of that grant is concurrent with the EIF Plan.

The key risks have been outlined in the Executive Summary, with further details for each of the Facilities provided in ***Attachment A***.

5. Milestones

The EIF Milestones for 2010/11 are listed in ***Attachment B.***

6. Project Resources

Budget – please refer to ***Attachment D*** Budget and Financial Tables, which includes detail on:

- Table D.1 – summary anticipated EIF funds at the beginning, during and at the end of 2010/11, estimate of interest income, and expenditure of EIF funds (by both Facility and Operator);
- Table D.2 – detailed proposed expenditure of EIF funds and co-investments by Facility and Sub-facility and therefore the total expected resources to be used in 2010/11.
- Table D.3 – Details of co-investment per Facility
- Table D.4 – Details of co-investment by contributing organisation

Other than the note relating to interest below, there are no significant matters to report.

Interest – In Table D.1 we have advised anticipated interest earnings of $527,520 out to July 2013, however we would expect the actual amount to be much higher than this as, provided conditions of the Funding Agreement are met, payments are normally made annually in advance. Due to the close interactions between the NCRIS finalisation and the EIF planning, a net variance of circa $500,000 was taken into account in making the EIF decisions, and this equates to the amount of interest we have recorded in the financial tables.

Staffing – Under each of the Facilities staffing is required for planning, provisioning and commissioning of the infrastructure. In 2010/11 many of the staffing resources will come under the existing NCRIS arrangements and from co-investment. However EIF funds are required for the following, totalling 15.06 full time equivalent (FTE) staff in 2010/11:

- SOOP – 2.75 FTE
- ABOS – 1.3 FTE
- ANFOG – .6 FTE
- ANMN – Qld &NA .6 FTE; SA 1 FTE; NRS 5.81 FTE; CO_2 .7 FTE
- AATAMS – .6 FTE
- SRS – Colour 2 FTE; Altimetry 1.7 FTE

7. Confidential Material

None of the material is this plan is confidential.

ATTACHMENT A **FACILITY PLANS**

Facility: 2 Enhanced Measurements from Ships of Opportunity (SOOP)		**Facility Leader: Ken Ridgway**
Sub-Facility		**Leader**
2a Underway Network	**2a (i) Expendable Bathythermograph (XBT)** *(Note: NCRIS funded in 2009/10)*	**Ken Ridgway**
	2a (ii) Biogeochemical sensors (BGC)	**Bronte Tilbrook**
	2a (iii) Australian Continuous Plankton Recorder (AusCPR)	**Anthony J. Richardson /Graham Hosie**
	2a (iv) Bio-Acoustics SOOP (BASOOP)	**Rudy Kloser**

Facility:	Enhanced Measurements from Ships of Opportunity (SOOP)
Sub-Facility:	2a Underway Network - Australian Continuous Plankton Recorder (AusCPR)
Sub-Facility Leaders:	Anthony J. Richardson (CSIRO)/Graham Hosie (AAD)
Contact details:	Phone: 07 38267183 Email: anthony.richardson@csiro.au Phone: 03 62323364 Email: graham.hosie@aad.gov.au

Status of the Project

With the EIF funding for 2010/2011, the AusCPR survey will expand into new areas in Australian waters and regional seas:

a. Southern Australia route (Quarterly Melbourne to Adelaide; SAIMOS)
b. The Southern Tasman Sea route (Annual only; Devonport to Nelson; TasIMOS)
c. Quarterly Great Barrier Reef route (from Cairns to Gladstone; Q-IMOS)
d. Adhoc Tasmania east coast route aboard Southern Surveyor (TasIMOS)
e. Quarterly Northern Tasman Sea route (Brisbane to Wellington; Bluewater node)

Note that the existing routes along the EAC (Brisbane to Sydney and Sydney to Melbourne) and in the Southern Ocean south of Australia will be maintained. However, based on consultation with stakeholders, we will change the EAC route from monthly to quarterly sampling (after 1 year of monthly sampling). This is because it will free-up staff to work on samples from other routes in the enhanced phase, and it is logistically challenging to maintain a monthly sampling programme with more routes. A seasonal survey over a larger area enables a greater buy-in from stakeholders and a greater diversity of science than monthly data.

Project infrastructure

See Implementation Plan Table below. The infrastructure to be purchased is 3 CPRs plus the CTD-F and sensors.

Management and Implementation
Key risks and management strategies are defined below.

Risk	Risk mitigation
CPR loss	CPRs have been deployed in the North Atlantic survey since 1931, and in the Southern Ocean since 1991. Over 4000 deployments have been completed in the north and 600 in the Southern Ocean, and only a single unit has been lost during deployment when the tow vessel failed to retrieve the recorder before entering port. As a precaution to loss, CPR towing points on vessels are tested and certified after installation (to 2 tonnes safe working load). We also inspect the towing points on the CPR unit itself after each deployment, and replace when necessary. We replace the towing wire after every 6 tows. CPR loss is considered unlikely.
CPR damage	The CPR is built to withstand the rigours of deployment behind large vessels travelling at >20 knots. However, minor damage is common, usually in the form of damage to the sacrificial fender, which is easily replaced. We inspect the CPR after each deployment and replace any worn components. AusCPR now has considerable experience in maintaining and servicing CPRs, supported by the experience and expertise at the AAD based SO-CPR Survey. The crew aim to retrieve the CPR conditions no greater than Beaufort Scale 7 (near gale), minimising the chance of damage and loss.
CTD-F	They are housed within the box-tail of the CPR, which has a level of protection. The crew has also been trained in the safe and gentle deployment and retrieval of CPRs. The CTD-F that we are using has been used extensively for a decade in the North Atlantic CPR survey with minimal problems.
Crew safety	We use methods that reduce to as small as possible the safety risks to ships' crew. We emphasise that safety is our key concern and ask them not to deploy the device if they have safety concerns (e.g., rough weather, fishing vessels nearby). We have provided a manual for deploying and retrieving the CPR, which emphasises these precautions.
Laboratory safety	Formalin, which is a carcinogen, is used as a fixative in our plankton samples. We have used best practice to reduce exposure to by formalin. We cut the silks in a fume cupboard, conduct phytoplankton counts within a microscope fume hood, and count zooplankton in water without fixative. All samples once counted are preserved in a safer storage chemical and removed from the laboratory as soon as possible. We also check that formalin readings within the lab are below recommended levels using a formaldemeter.

Risk	Risk mitigation
Loss of key staff	AusCPR is dependent on key staff (Anthony Richardson and Graham Hosie; the IMOS AusCPR PIs). Anthony Richardson has just received an ongoing appointment between UQ and CSIRO and has been with the organisation for more than 4 years. Graham Hosie is an ongoing employee of the AAD for 26 years. Frank Coman, the principal technician, has been with CSIRO for 20 years and is unlikely to leave. Claire Davies, Anita Slotwinski and David McLeod have been trained during the first phase of IMOS, which built on their previous plankton identification and sampling skills. The extensive opportunities for training, both nationally and internationally, have not only meant that plankton identification skills of the AusCPR team are extremely high but have kept the team extremely interested. We have manuals in place detailing procedures for CPR repair, database entry and plankton identification. All team members have expressed their interest in helping to build the Survey. Staff loss is thus not considered a serious risk.

IMPLEMENTATION PLAN JULY 2010 TO JUNE 2011

Activity/Deployment/Location	Responsible Organisation(s)	Responsible Person/Support Staff	Start	Finish
Buy 3 new CPRs	CSIRO	Anthony Richardson /Frank Coman	Jul 2010	Dec 2010
Buy 3 RBR-XR420 CTD-Fs, one for each CPR	CSIRO	Anthony Richardson /Frank Coman	Jul 2010	Sep 2010
Buy 3 Chelsea Trilux sensors measuring phytoplankton pigments (chlorophyll-a, phycoerythrin, phycocyanin)	CSIRO	Anthony Richardson /Frank Coman	Jul 2010	Sep 2010
Quarterly Melbourne to Adelaide route	CSIRO	Anthony Richardson /Frank Coman	Sep 2010	
Annual Devonport (Tasmania) to Nelson (New Zealand South Island)	CSIRO	Anthony Richardson /Frank Coman	Winter 2010	
Quarterly GBR route (Cairns to Gladstone)	CSIRO	Anthony Richardson /Frank Coman	Dec 2010	
Tasmania east coast route (ad hoc aboard the Southern Surveyor)	CSIRO	Anthony Richardson /Frank Coman	Jan 2011	
Quarterly Tasman Sea route (from Brisbane) with hydroacoustics – Rudy Kloser)	CSIRO	Anthony Richardson /Frank Coman	Jun 2011	

Facility:	Enhanced Measurements from Ships of Opportunity (SOOP)
Sub-Facility:	2a Underway Network –Biogeochemical sensors (BGC)
Your name:	Bronte Tilbrook
Contact details:	Phone: 03 62325273 Email: bronte.tilbrook@csiro.au

Status of the Project

The project obtained support to purchase and install underway CO_2 monitoring equipment on Aurora Australis from 1 July 2010.

Project infrastructure

The instrumentation will be purchased in early July 2010, when funds are released. The delivery of the equipment is expected in September, with completion of installation and testing on the ship planned for late December 2010. Tests of daily data transmissions using the ship's email system will be attempted in early 2011, pending approval from Australian Antarctic Division.

Management and Implementation

Risk	Risk mitigation
Ship's equipment problems	The Aurora Australis provides ship data including underway sea surface temperature and salinity and meteorological data. Most data are high quality, although there are salinity measurement problems in sea ice. There also appears to be a problem with cavitation in the seawater supply pump that resulted from increasing the pump size and not enlarging the hull inlet. If the cavitation is not corrected, it could degrade the data quality. Requests and suggestions have been made to the Australian Antarctic Division (AAD) to fix these problems.
System failure	The equipment was chosen because it is robust, delivers high quality data, and is proven to work for long periods in harsh conditions at sea. Regular checks and maintenance procedures are carried out to maintain the equipment, and most data lost on ships has been due to ships equipment failure (e.g. seawater supply pump breakdowns and lab flooding). For Aurora Australis, the project will seek approval to use the ship's email system to allow daily file transfers of data from the ship so performance can be monitored, problems diagnosed, and volunteers on the ship contacted rapidly to fix any issues.
Lack of Aurora Australis volunteers	Measurements on long Aurora Australis voyages require volunteers to run the equipment. The volunteers usually come from Antarctic Division personnel. Many are willing to help with about 30 minutes of effort per day, but for some cruises there is no interest. We will not be able to provide data for those cruises without volunteers.
ASAC	The use of equipment on the ship requires approval by the Antarctic Science Assessment Committee (ASAC). There is no reason at present to expect ASAC will prevent the measurements on the ship.

IMPLEMENTATION PLAN JULY 2010 TO JUNE 2011

Activity/Deployment/Location	Responsible Organisation(s)	Responsible Person/Support Staff	Start	Finish
Purchase and deliver equipment	CSIRO	B Tilbrook	1/7/2010	30/9/2010
Install equipment on Aurora Australis and test	CSIRO	B Tilbrook/C. Neill	1/10/2010	31/12/2010
Test feasibility of daily file transmission from ship, pending agreement from AAD	CSIRO	B Tilbrook/C. Neill	1/12/2010	31/3/2011
Submit quality controlled data for 2010/11 field season to eMII	CSIRO	B. Tilbrook/J. Akl	15/1/2011	30/6/2011

Facility:	SOOP
Sub-Facility:	2a Underway Network -Bio-Acoustics SOOP (BASOOP)
Sub-Facility Leader:	Rudy Kloser
Contact details:	Phone: 0409409146 Email: rudy.kloser@csiro.au

Status of the Project

This is a new sub-facility approved for funding from July 2010 to June 2013.

Outlook for the EIF project in 2010/11

The BASOOP project will officially start on the 1/7/10 and at that time we hope to have already addressed several project management issues. Importantly we will progress the employment of a project officer who can carry out the majority of the data collection and quality control operations. With staff already available we will be in a position to ensure the overall data collection, processing and posting procedures are in place as stated in the milestones below and the project proposal.

Project infrastructure

As outlined in the project proposal we are already well advanced with obtaining the data collection and calibration agreements from the research and fishing vessels, these will now be finalized. A start has already been made with regard to developing an internationally accepted data quality, processing and meta data manual. In this regard a first step to establish an international committee will be raised at the next ICES Fisheries Acoustic Science and Technology (FAST) Working Group in late April 2010.

Based on the February IMOS meeting we have already established a dialogue with eMII through Roger Proctor and meetings are planned over the coming months to ensure the activating of data streams proceeds as per our project milestones.

New infrastructure will be installed on a vessel in 2010-11 and progress has already been made on a selected vessel l'Astrolabe. This vessel was discussed at the projects inception given the multiple sensors deployed from the vessel for the Blue Water Node and Tas Node. The French researchers who use the vessel have also indicated an interest in having the instrument on the vessel greatly facilitating the installation process. Given that the cost of installing new infrastructure on vessels is significantly reduced when the vessel is in for a routine dry-dock we will need to match the installation timetable with that process. This may mean we need to install equipment this financial year as the ship is due to dry dock in June 2010.

Management and Implementation

Risk - Delay in employment of a project officer.
Mitigation strategy - We have already commenced discussions regarding the employment of a project officer. With staff already in place we can divert effort to this project to ensure critical components are in place.

Risk - Cost variations to install new infrastructure on the selected vessel
Mitigation strategy - Matching the installation with a planned dry-dock and for the l'Astrolabe

partnering with French researchers will ensure installation plans are supported by vessel owners/management.

IMPLEMENTATION PLAN JULY 2010 TO JUNE 2011

Activity/Deployment/Location	Responsible Organisation(s)	Responsible Person/Support Staff	Start	Finish
Data access and collection procedures in place and calibration schedules for vessels agreed.	CMAR	Ryan	1/7/10	31/9/10
Employment of a data collection/quality officer	CMAR	Kloser/Ryan	1/3/10	1/9/10
Procedures for data quality and data management finalized.	CMAR	Ryan	1/7/10	31/12/10
Posting of quality controlled data from several vessels in eMII.	CMAR	Ryan	1/7/10	1/3/11
New instrument installed on a selected vessel and calibrated with data to eMII	CMAR	Kloser/Ryan	1/7/10	30/6/11

Facility:	Australian Bluewater Observing System (ABOS)
Sub-Facility:	Deepwater Arrays
Sub-Facility Leader:	Bernadette Sloyan
Contact details:	Phone: (03) 6232 5152 Email: Bernadette.Sloyan@csiro.au

Status of the Project

Sub-facility came into existence with the announcement of EIF funding outcomes. The EIF funding allocated $622,421 of the EIF 1st $8m to the Deepwater Arrays Indonesian Throughflow (ITF) array. Since the funding decision was announced the sub-facility has finalized the budget and worked with CMAR and IMOS to initiate the contract between the two parties.

The outlook for the project is to determine the instruments need for the array and initiate the ordering and acquisition of these instruments. This will begin in March 2010 with orders finalized by June 2010.

Project infrastructure

We expect instruments to be ordered by June 2010. Final design of the ITF mooring array will be completed in July 2010 and construction will begin in September 2010 and completed in December 2010. Instrument preparation and calibration will be undertaken from September to December 2010. Planned deployment of the ITF array is early 2011 depending on the scheduled maintenance of the northern coastal array. The ITF array will be deployed for 18 months; therefore recovery and redeployment of the array is planned for mid-2012 and data streams should be at IMOS eMII in late 2012.

In addition, by June 2011 plans for the EAC deepwater array off south-east Queensland will be completed, and approval in place for CSIRO to place the orders.

Management and Implementation

Key risks are the on time build of the mooring array. The risk is being managed by the timely meeting between sub-facility leader and mooring group to actively monitor time management of key personnel amongst ABOS sub-facilities and CMAR projects.

IMPLEMENTATION PLAN JULY 2010 TO JUNE 2011

Activity/Deployment/Location	Responsible Organisations	Responsible Person/Support Staff	Start	Finish
Identification of instruments required for ITF array	CMAR	Bernadette Sloyan	March 2010	April 2010
Purchase order for instruments placed in suppliers	CMAR	Phil Adams	April 2010	June 2010
Construction of ITF mooring array	CMAR	Bernadette Sloyan/ Danny McLaughlin /project officer TBA	September 2010	December 2010
Preparation and calibration of instruments	CMAR	Phil Adams	September 2010	December 2010
Deployment of ITF mooring array	CMAR/AIMS	Bernadette Sloyan	January 2011	January 2011
Planning and mooring design for the EAC deepwater array	CMAR/AIMS	Bernadette Sloyan	Apr 2012	June2012

Facility:	Australian National Facility for Ocean Gliders
Facility Leader:	Prof Charitha Pattiaratchi
Contact details:	Phone: (08) 6488 3179 Email: chari.pattiaratchi@uwa.edu.au

Status of the Project

- ANFOG was awarded funds to purchase 6 Seagliders to be deployed at the SOTS site and in the Coral Sea. The Seagliders have been ordered and are scheduled to be delivered in March 2010.
- The first deployment of a Seaglider at the SOTS site is scheduled during a Southern Surveyor voyage in March 2010.
- The first deployment of a Seaglider in the Coral Sea is scheduled for April 2010.

Outlook for the EIF project in 2010/11

- 1 Seaglider will be deployed at the SOTS site in March 2010 using the Southern Surveyor. The glider will then be piloted to arrive off the south coast of Tasmania for recovery.
- 1 Seaglider will be deployed in the Coral Sea in April 2010.
- In the period September 2010 to March 2011, it is expected that Seagliders will be deployed off Tasmania, traverse to the SOTS site and then return. It is expected that at least 3 Seagliders will be in the water at any given time, with one traversing towards the SOTS site, one at the SOTS site and the other returning to Tasmania. This plan will be reviewed based on the results of the glider deployments.

Project infrastructure

- 6 Seagliders were purchased from the initial EIF funding in 2009/10 and added to the current NCRIS fleet of ocean gliders. As the infrastructure has already been developed for the provision of data streams via eMII these Seagliders will be integrated onto the current fleet. Two new slocum gliders will be purchased in 2010/11 for deployments off Tasmania.

Management and Implementation

Key risks and risk management strategies

	Description of Risk	Rating of Likelihood	Rating of Consequence	Assessment of Net Risk	Proposed Treatment of Risk
1	Loss/damage of glider during deployment and recovery	unlikely	major	medium	Procedures for the deployment and recovery of all gliders have been developed.
2	Loss/damage of glider during extreme weather (e.g. storms)	likely	major	high	Procedures for piloting gliders either to deeper water (or recovery) when adverse weather is forecast have been developed.
3	Loss/damage of glider due to satellite communication failure	unlikely	major	medium	Redundancy in communications has already been built into Slocum gliders. The Argos systems are used to locate the glider if the Iridium system fails.

	Description of Risk	Rating of Likelihood	Rating of Consequence	Assessment of Net Risk	Proposed Treatment of Risk
4	Loss/damage of glider due to system failure	unlikely	major	medium	Gliders are equipped with ballast which is released when a system failure occurs.
5	Unauthorized recovery of glider (say by fishermen, recreational boats etc)	likely	major	high	Labels will be attached to glider informing finders to leave the glider on the ocean and to call the operations centre at UWA.
6	Loss/damage of glider due to adverse weather conditions	likely	major	high	Awareness of the severe weather conditions and undertaking manoeuvres which pilot the glider away from danger – however this cannot be undertaken at all times due to the unpredictable nature of the weather.

IMPLEMENTATION PLAN JULY 2010 TO JUNE 2011

Activity/Deployment/Location	Responsible Organisation(s)	Responsible Person/Support Staff	Start	Finish
Seaglider deployment, Coral Sea	ANFOG/AIMS	Hollings/Doherty	w3 Jul 10	w2 Oct 10
Seaglider deployment, SOTS site	ANFOG/UTas	Hollings/Trull	w1 Sep10	w1 Jan 11
Seaglider deployment, SOTS site	ANFOG/UTas	Hollings/Trull	w2 Oct10	w2 Feb 11
Seaglider deployment, Coral Sea	ANFOG/AIMS	Hollings/Doherty	w2 Nov10	w1 Mar 11
Seaglider deployment, SOTS site	ANFOG/UTas	Hollings/Trull	w4 Nov10	w4 Mar 11
Slocum deployment, Storm Bay, Tas*	ANFOG/CMAR	Hollings/Thompson	w2 Nov10	w2 Dec10
Seaglider deployment, SOTS site	ANFOG/UTas	Hollings/Trull	w1 Jan11	w1 May11
Seaglider deployment, Coral Sea	ANFOG/AIMS	Hollings/Doherty	w2 Apr11	w4 Jul 11
Slocum deployment, Storm Bay, Tas	ANFOG/CMAR	Hollings/Thompson	w2 Jan11	w2 Feb11
Slocum deployment, Storm Bay, Tas	ANFOG/CMAR	Hollings/Thompson	w2 Mar11	w2 Apr11
Slocum deployment, Storm Bay, Tas	ANFOG/CMAR	Hollings/Thompson	w2 May11	w2 Jun11
*Assume that glider is delivered on time				

Facility:	Autonomous Underwater Vehicle (AUV)
Facility Leader:	Stefan B. Williams
Contact details:	Phone: 02 9351 8152 Email: stefanw@acfr.usyd.edu.au

Status of the Project

Outlook for the EIF project in 2010/11

Starting in 2010, the IMOS AUV facility will shift focus from a proposal driven model of supporting deployments to a mode of operation in which we establish precisely navigated time series measurements of benthic imagery using Autonomous Underwater Vehicles (AUVs) at selected reference stations on Australia's shelf. Incorporating a suite of observing programs that capitalize on the unique capabilities of AUVs into IMOS will continue to provide a critical observational link between oceanographic and benthic processes. IMOS has, and will maintain, a strategic focus on the impact of major boundary currents on continental shelf environments, ecosystems and biodiversity. To support a more complete understanding of natural, climate change, and human-induced variability in shelf environments, the facility will generate physical and biological observations of benthic variables that cannot be cost-effectively obtained by other means.

Full details of the AUV workplan, including management and implementation, is provided in the 2010/11 IMOS NCRIS Annual Business Plan. Under the 2010/11 IMOS EIF Annual Business Plan, AUV is funded to do an upgrade of instrumentation as detailed in the Project Infrastructure section below.

Project infrastructure

The following equipment purchases are focused on improving operational aspects of vehicle deployment.

Imaging Upgrade

The volume of data being collected by the current system requires considerable time to transfer the imagery off the vehicle once the AUV is retrieved. This limits the number of dives that are achievable in a single day. We propose to upgrade the imaging system to facilitate a quicker turnaround between dives. We envisage a system that will consist of a pair of cameras permanently mounted in the vehicle with a housing for storage and control of the cameras (i.e. a data pod) that can be quickly swapped out of the vehicle. This design will allow the cameras, which must be calibrated on each cruise, to remain undisturbed while the hard drives are swapped between dives. The data transfer can then take place while the vehicle is underway. The cameras would also be upgraded to a Gigabit Ethernet (GigE) interface, improving transfer speeds by a factor of 4-10. An additional benefit of this design is the redundancy provided by having multiple data pods. In case of failure of one of these modules, we could still operate with short surface intervals (compared to current ones), even if the unit cannot be repaired at sea. We envisage undertaking this upgrade in three phases over the 2010-2011 period. The first upgrade would involve converting the vehicle cabling and internal switches to GigE throughout. Following this, the new camera system would be commissioned. We would then build a second data pod once the system operation has been validated. This timeframe is reflected in the final budget.

Another attractive feature of this design based on GigE will be the ability to add additional, remote cameras to the system. We have had a number of requests from scientists for periodic higher resolution stills or the ability to look around the vehicle, rather than simply straight down at the seafloor. This will allow for more taxonomic resolution or the assessment of fish assemblages in the survey areas. The

current imaging package was not designed to be expanded in this manner and we have not been able to accommodate these requests to date. An additional, wide field of view camera and strobe mounted in the nose of the vehicle and connected to the camera storage unit will allow us to provide imagery around the vehicle while it is underway. This feature would also be added in the third phase of development.

Battery Systems

In addition to an upgrade to the imaging system, the batteries would also to be duplicated to allow these to be swapped at the same time as the imaging storage. These two components are the main sources of lag between dives. Another advantage of sparing these systems is the redundancy introduced. We will construct an additional pressure vessel to house a second battery system and purchase sufficient additional batteries to comprise a complete spare.

Improved Propulsion

Our current operating speed is 1 knot resulting in about 5-8 nautical miles of linear coverage on a typical day of operations. An increase of 50% to 100% of the operating speed would result in a commensurate increase in coverage for the same amount of ship time. The present propellers and gearbox used on the vehicle are optimized to run at 1 knot but there is excess power capacity to drive the vehicle faster. We are requesting funds to purchase a propeller and gearbox combination to increase operating speed. In addition to more efficient use of ship and AUV time, this would also extend our reach into high-current areas.

Photosynthetically Active Radiation

Node plans have requested PAR observations in addition to existing measurements of Conductivity, Temperature and Depth as well as fluorometer based measurements of chlorophyll-a, CDOM, and scattering in red. IMOS support is for an AUV compatible Satlantic multispectral radiometer.

Vehicle

University of Sydney support will be provided to replace the AUV as it is now entering its fifth year of operations. The AUV *Sirius* was originally purchased using a funding provided by the University of Sydney through a Sesqui Major Equipment. The vehicle was built at the Woods Hole Oceanographic Institution and we have subsequently equipped it with a comprehensive suite of oceanographic sensors. Its primary purpose is for near bottom, high-resolution benthic imaging. The vehicle was delivered in 2005 and we have operated it on cruises around the country, completing in excess of 100 dives over the past 4 years.

Although we undertake regular maintenance of the vehicle, it will have a finite life span and 6 to 10 years of operation is what might be expected for such a vehicle. We are therefore proposing to begin the process of replacing the vehicle during the course of this round of IMOS funding. With the increased commitment to survey time, the vehicle will be subject to more wear and we would like to begin this process in 2010/2011. Funds committed by the DVC-Research to facilitate this process represent a substantial co-investment in this facility by the University of Sydney. In addition to addressing the issue of replacement, an additional vehicle may provide us with more flexibility in operation and some level of insurance against loss. Refinement of the design, manufacture and commissioning of the vehicle will take on the order of one and a half years to complete given current commitments.

Facility:	Australian National Mooring Network
Sub-Facility:	Queensland & Northern Australia (QLD & NA)
Sub-Facility Leader:	Craig Steinberg
Contact details:	Phone: 07 4753 4345 Email: c.steinberg@aims.gov.au

Status of the Project

Initial EIF Funding for Qld & NA was provided in 2009/10 to establish the first mooring transect on the northwest shelf in Northern Australia. Four pilot moorings are to be deployed along a JASON-2 altimeter track extending from Bonaparte Gulf towards Timor Leste. The moorings complement a deep water Indonesian Through Flow (ITF) array by the Australian Bluewater Observing System (ABOS) and together they seek to close the volume and heat flux between Australia and Timor Leste (see Figure 1).

Feb 2010	Contract signed between UTAS and AIMS
Mar 2010	Instrumentation ordered, staff engaged and ship time secured
Jun 2010	Deployment

Timelines are very tight and the only significant risk is any delay in supply

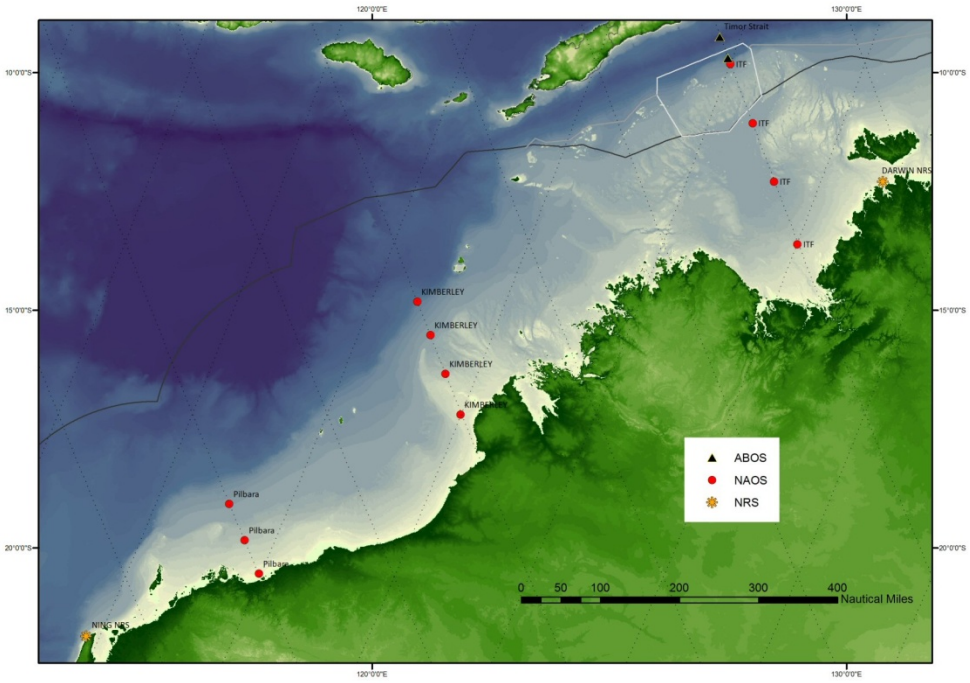

Figure 1 The Northern Australia array consisting of 2 transects (Pilbara, Kimberley and ITF) and 2 National Reference Stations at Ningaloo and Darwin.

Outlook for the EIF project in 2010/11

Additional funding has been budgeted from 2010/11-2012/13 to allow for up to 2 more mooring transects on the northwest shelf off the Pilbara and Kimberley. Work will commence on the Kimberley in 2010/11 and on the Pilbara in 2011/12. It must be noted that the full plan for the mooring array assumes significant co-investment from the WA state government that was still under consideration at the time of writing this document. If this funding is not forthcoming then a reduction and potential delays will occur in the roll out of the additional transects.

The Ningaloo NRS mooring servicing will also be formally transferred from CSIRO to AIMS by July 2010. This will produce operating efficiencies if the Pilbara transect is funded as the RV Solander will be operating in neighbouring waters. Otherwise chartering may be necessary.

Project infrastructure

This is new funding for infrastructure for Northern Australia to enhance the ANMN. Focus for the next year will be to secure the necessary state government funding, consult WAIMOS and ABOS on instrumentation, mooring design and placement, then to purchase and perform the initial deployments. The RV Solander will be tasked to deploy and recover the mooring array and a team of 4 technical and experimental scientists will be engaged to carry out the work under the guidance of experienced research scientists.

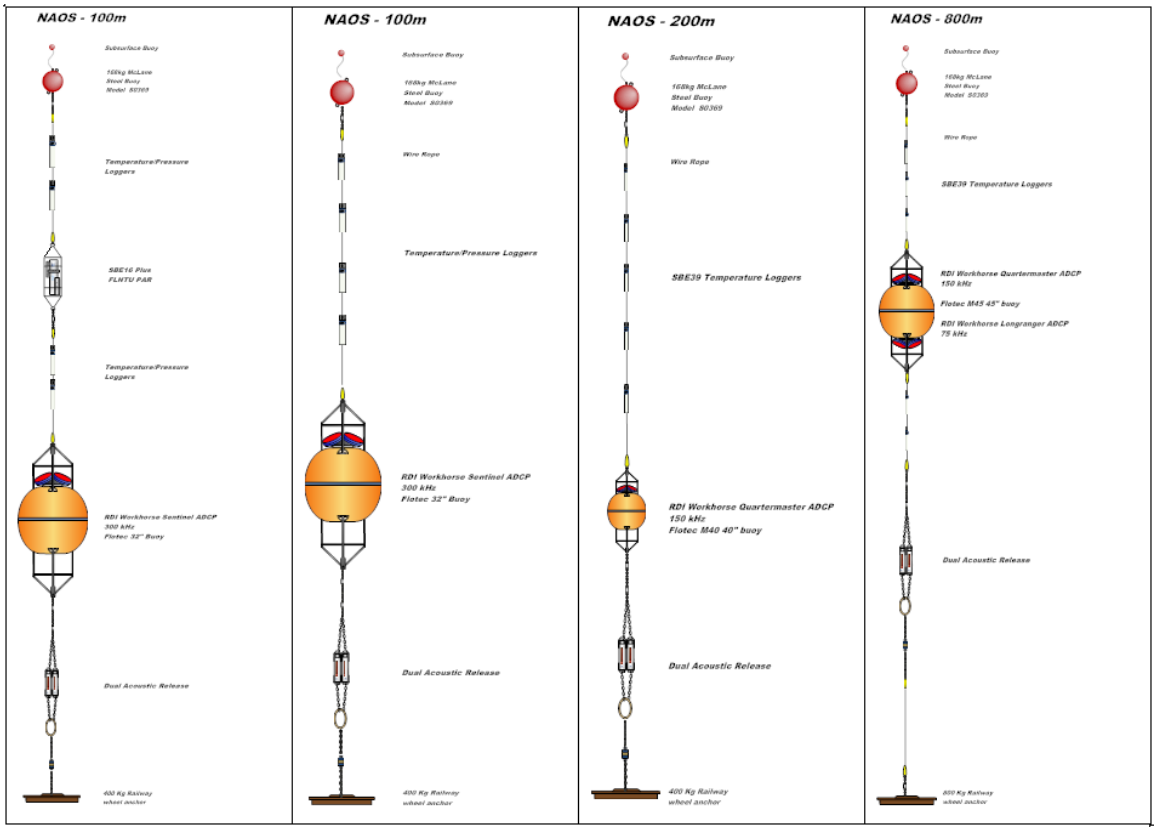

Figure 2 Northern Australia Moorings designs to be used for the shelf arrays.

All data from the Northern Australia moorings will be delayed mode. This means instrumentation will log data for the period of the deployment, with data uploaded every 6 months on a servicing cruise. AIMS also operates Q-IMOS GBROOS and the same QA QC procedures that have been developed together with the ANMN and eMII will be applied to the Northern Australia data streams.

Management and Implementation

Key risks and risk management strategies for the 2010/11 year

The risks and corresponding management plans for mooring deployments in tropical waters will be as described for GBROOS in previous years.

The risks currently identified and managed include:

- Loss of equipment through storms and cyclones:
    - The equipment is installed utilising proven designs and the moorings are all sub-surface so direct impact by atmospheric forcing is reduced. In the event of a loss AIMS carries insurance for oceanographic equipment so in the event of a major cyclone any lost equipment will be replaced under insurance or from spares.
- Loss of equipment through interference:
    - The moorings are sub-surface so will not be obvious. Notices to Mariners will be made to inform the marine industry. Trawling areas will be avoided where possible.
- Loss of key staff:
    - Skill shortages still exist in this area and often significant long term training (~2 years) is required before staff can operate in their own right. While any loss of staff from a small project will have an impact, the general size of AIMS and the spread of expertise means that this will be minimal.
- Lack of uptake of data:
    - Efforts are underway to make the data easier to access and use, the project will continue to work with the AIMS Data Centre and eMII. As operators of the mooring project we aim to ensure there is regular and detailed consultation with the science nodes WAIMOS and ABOS.

IMPLEMENTATION PLAN JULY 2010 TO JUNE 2011

Activity/Deployment/Location	**Responsible Organisation(s)**	**Responsible Person/Support Staff**	**Start**	**Finish**
Upgrade Ningaloo NRS with WQM	AIMS	Steinberg	01/7/2010	30/9/2010
Design Kimberley array	AIMS	Steinberg, WAIMOS	01/7/2010	30/9/2010
Develop Darwin NRS real time data stream with ADCP	AIMS	Steinberg, ADC, eMII	1/10/2010	30/12/2010
Purchase Kimberley instrumentation	AIMS	Steinberg	1/10/2010	30/12/2010
Service ITF pilot moorings and Ningaloo NRS	AIMS	Steinberg	1/12/2010	28/2/2011
Submit QA data streams to eMII	AIMS	Steinberg	1/3/2011	31/3/2011
Deploy pilot Kimberley array	AIMS	Steinberg	1/4/2011	30/6/2011
Service ITF transect	AIMS	Steinberg	1/4/2011	30/6/2011

Facility:	Australian National Mooring Network
Sub-Facility:	6b New South Wales (NSW)
Sub-Facility Leader:	Moninya Roughan
Contact details:	Phone: 02 9385 7067 Email: mroughan@unsw.edu.au

Status of the Project

The $50K EIF funding received for an ADCP current meter for the Sydney National Reference Station has been spent. ADCP were ordered in late 2009 and were delivered early 2010.

It is intended that by June 2011 a 0.25 FTE Mooring technician is employed to be an extension for Roughan from 0.5 FTE to 0.75 FTE starting in June 2011. This will allow the sub-facility to be ready for the extended work to commence in 2011-12

Facility:	Australian National Mooring Network
Sub-Facility:	6c Southern Australia (SA)
Sub-Facility Leader:	John Middleton
Contact details:	Phone: 08 8207 Email: john.middleton@sa.gov.au

Status of the Project

- The $50K EIF funding received for an ADCP current meter for the Kangaroo Is National Reference Station has been spent.
- EIF enhancement funding of $109,464 for 2010/2011 will, as requested, be spent in hiring a SAIMOS Mooring technician. The position will be advertised in August 2010 and to start September - October 2010.
- These EIF developments will assist in enhancing and sustaining the NCRIS and EIF funded development of mooring research infrastructure.

Facility:	Australian National Mooring Network
Sub-Facility:	6d Western Australia (WA)
Sub-Facility Leader:	Ming Feng
Contact details:	Phone: 93336512 Email: ming.feng@csiro.au

Status of the Project

ADCP for the NRS stations are being purchased. In 2010/11, the ADCP moorings for the Rottnest and Esperance NRS stations will be designed and deployed in high priority.

Project infrastructure

Ian Darby from CMAR will be getting quotes on the ADCP instrument for the NRS stations. The ADCP mooring will be built in CMAR Floreat, under supervision of senior technicians from Hobart.

Ian Darby will also be responsible to coordinate the deployment and service of the ADCP moorings.

Ian Darby and Ming Feng will be responsible to ensure that the ADCP data be submitted to eMII in time.

Management and Implementation

Key risks and risk management strategies for the 2010/11 year

Please refer to ANMN facility strategies.

IMPLEMENTATION PLAN JULY 2010 TO JUNE 2011

Activity/Deployment/Location	**Responsible Organisation(s)**	**Responsible Person/Support Staff**	**Start**	**Finish**
Purchase of ADCP instrument for WA NRS stations	CMAR	Ian Darby	January 2010	December 2010
Build ADCP moorings for WA NRS stations	CMAR	Ian Darby	June 2010	December 2010
Deploy and service ADCP moorings for WA NRS stations	CMAR	Ian Darby	July 2010	June 2011
Download data from ADCP and submit to eMII	CMAR	Ian Darby Ming Feng	July 2010	June 2011

Facility:	Australian National Mooring Network
Sub-Facility:	6f National Reference Stations - Coordination & Analysis
Leaders:	Tim Lynch, David Hughes, Anthony Richardson, Bronte Tilbrook, Dave Terhell
Contact details:	Phone: 0416 089 749 Email: tim.lynch@csiro.au

Status of the Project

The National Reference Stations - Coordination & Analysis sub-facility status in terms of EIF1 includes:

1. A strong research and development focus with the Maria Island National Reference Station, which the facility services, and has been used as a test bed for the national system. EIF 1 systems being developed at Maria include pCO_2 moorings and ADCP deployments.

2. The sub-facility also is responsible for the North Stradbroke Island (NSI) NRS which is currently in a design phase. Servicing and budget responsibility for all other NRS, BGC sampling and regional arrays are with regional sub-facilities (eg Rottnest NRS is serviced by the Western Australian sub-facility).

All EIF1 milestones so far have been met. Highlights include configuration of purchases, the purchase of all capital equipment for NRS NSI, pCO2 and ADCP, employment of technicians and delivery of all equipment.

Matching scope and resources:

Extensive budget modelling was undertaken for this proposal with the full cost of moorings established. The proposal and budget submitted for ANMN (including NRS) were not fully-supported by the IMOS Advisory Board who also capped the budget. This has resulted in the need to match the scope of ANMN, and the NRS in particular, to resources available under NCRIS and EIF. This is being done with the Board's guidance.

Variations proposed to decrease costs in relation to EIF1, which incorporates advice from the IMOS board are outlined below:

1) No development of ADCP telemetry.
2) There will be no additional ADCPs to allow servicing hot-swaps for continual measurements and calibration or funds to build moorings that will hold telemetering ADCP

The NRS sub-facility does not have adequate ADCPs to undertake continuous sampling at Maria, NSI NRS and the SEQ shelf array. This may either result in gaps in some dataset as ADCPs are rotated through deployments or only one sites need to be chosen as a sub-set to provide continuous measurements. Alternatively additional funds, as co-investment, will be sort.

Describe the outlook for the EIF project in 2010/11
The National Reference Stations - Coordination & Analysis sub-facility has multiple roles within the AMN during the EIF year 2010/11:

1) A centralised contingency budget for self insurance of capital and unbudgeted cost over-runs will be replenished.

2) The pCO_2 moorings and ADCP moorings will move through the design phase towards implementation at Maria, Yongala and Kangaroo Island NRS.

3) The North Stradbroke Island (NSI) NRS will be move from designed, through a build process, to test for deployments and telemetry to a final bedded in system.

4) The South East Queensland (SEQ) regional arrays will move through the design phase.

5) Bio-optics will be purchased and deployed at four NRS sites.

Project infrastructure
Description of expected progress with the provisioning and commissioning of the EIF infrastructure during 2010/11
The ANMN had a strong existing relationship with deepwater moorings or the Australian Bluewater Observing System (ABOS). In particular, ANMN infrastructure deployed as the NSI NRS and South East Queensland array needs to be brought into alignment with an array further offshore being planned by ABOS. Bringing these facilities together to plan these arrays needs to occur in the 2010/11 year as both facilities have milestones for completing their designs by June 30th 2011.

The NSI NRS located in South East Queensland will be a fully-configured real-time system moored near a wave rider buoy operated by DERM. This feature is well known to fisherman and should minimise the likelihood of trawl damage. Investment in the moored instrumentation will allow fine temporal investigation of short-term physics and nutrients and provide the context to interpret the monthly biological (plankton) sampling.

The mooring will include Wetlabs instrument packages at two depths with sensors for salinity (conductivity), temperature, dissolved oxygen, chlorophyll and turbidity. In addition, it will have a Acoustic Doppler Current Profiler (ADCPs) for currents. Data from the NSI NRS will be linked to a pair of shelf moorings (200 m and 400 m) along a transect offshore from Brisbane. This array will provide data on the strength and variability of the East Australia Current (EAC) where it is strongest and most coherent off Southeast Queensland.

The NSI NRS will be augmented by two extra shelf moorings (at 200 m and 400 m). These two delayed mode moorings will provide a cross-shelf transect from the NRS reference station. The proposed configuration of the 200 m and 400 m mooring is shown in Figure 1.

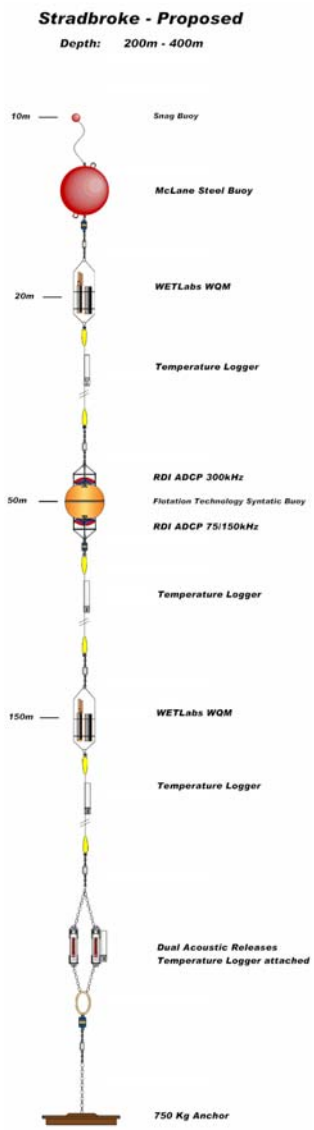

Figure 1. Schematic of shelf moorings to be located at 200 m and 400 m depth offshore from SEQ.

This facility also has strong links with the Satellite Remote Sensing Facility (SRS). The SRS facility will deploy moorings along satellite paths to calibrate sea level elevation and other parameters with remote sensed data. The NRS sub-facility will purchase and deploy bio-optical instruments that will be used to calibrate remotely sensed data from the SRS facility. This will augment the bio-optical observations currently performed at the National Reference Stations moorings by measuring CDOM fluorescence and scattering at BLUE & GREEN bands, complementing the Chlorophyll fluorescence and RED scattering measurement acquired with the WQMs at each NRS mooring, thereby providing nationally consistent validation data for the 4 primary Ocean Colour Products of Chlorophyll, coloured dissolved organic matter, particulate matter and vertical attenuation of light.

Each NRS operator will receive calibrated instruments, deploy them and send them back to Dr Vittorio Brando lab, where data will be downloaded, QA/QC-ed, and then uploaded to eMII; the instruments will

then be calibrated and then sent back for deployment. A pool of bio-optical instruments (WETLabs ECO triplet B with internal Battery, data-logger and eco-wipers), will be acquired during FY 2010/11 and 2011/12. The instruments would be deployed as stand-alone to avoid delays due to R&D for real-time telemetry with acoustic or inductive modems.

Sensors and mooring components for the Yongala and Maria Island CO2/acidification moorings were ordered in November 2009, when funds became available. All components are due for delivery by the end of March 2010. Staff were trained in sensor maintenance and mooring construction in October 2009 with NOAA. Work has commenced in Jan 2010 to modify a laboratory for maintenance and calibration of the sensors.

All work is on track for Yongala and Maria Island deployments during regular mooring turnarounds at the reference sites. The extent of biofouling will determine the frequency of turnarounds, with 6 month turnarounds of the sensors are planned initially. The deployments will occur during regular visits for mooring turnarounds at the two National Reference Sites.

All of the activities for the 2010/11 financial year are for provisioning, which includes designs, builds and deployments. Commissioning, which will involve up-load of QC and QA data will begin to occur in the 2011/12 financial year.

Management and Implementation

Key risks and risk management strategies for the 2010/11 year

A major aim of IMOS is to build time series of observations; the implication of this is that all increases in deployments are cumulative in terms of servicing. The biggest risk to the sub-facility is not being able to grow at the rate projected to build and service moorings.

The potential projected growth of the entire facility to June 2013 for deployed and serviced moorings is 68%. This includes a 75% growth for the CSIRO controlled aspects of the ANMN, which are mostly in the NRS sub-facility. All moorings serviced by CSIRO, which include ABOS and SRS as well as other projects has a potential to grow by 229%.

To manage this risk the CSIRO moorings team will be grown, with the employment of 2-8 additional staff and divided into three teams: Western Australia, Deep water and Coastal. The Coastal team will be responsible for deployments for the NRS sub-facility. Mr David Hughes will be the team leader for the coastal group.

To further manage this risk, principle investigators will be grouped into working groups matched to each team and will be engaged in workplace planning.

Table 1 IMPLEMENTATION PLAN JULY 2010 TO JUNE 2011

Activity/Deployment/Location /Milestones*	Responsible Organisation(s)	Responsible Person/Support Staff	Start	Finish
Meet regularly with PI groups and Mooring teams	CSIRO	Tim Lynch	30/4/2010	30/6/2013
Align designs for ABOS and NRS sub-facility moorings	CSIRO	Tim Lynch, Bernadette Sloyan, Anthony Richardson	30/4/2010	30/6/2011
Finalise design of ADCP mooring ESP and ROT*	CSIRO	Dave Hughes, Phil de Boer, Lindsay Pender Andreas Marouchas	30/6/2010	30/9/2010
Deploy NSI NRS*	CSIRO	Brendan Dando, Phil de Boer	30/6/2010	30/12/2010
Purchase Bio-optics Triplet sensors*	CSIRO	Vittorio Brando	30/6/2010	30/12/2010
Finalise Design pCO2 KAI*	CSIRO	Bronte Tilbrook, Phil de Boer, Lindsay Pender, Andreas Marouchas	30/4/2010	31/3/2011
Finalise design of SEQ shelf array*	CSIRO	Anthony Richardson, Bernadette Sloyan, Phil de Boer, Lindsay Pender, Andreas Marouchas	30/4/2010	30/6/2011
Deploy Bio-optic sensors on 4 NRS*	CSIRO	Vittorio Brando	30/12/2010	30/6/2011

Facility:	Australian Acoustic Tagging and Monitoring System
Facility Leader:	Rob Harcourt
Contact details:	Phone: 0298507970 Email:rharcour@gse.mq.edu.au

Status of the Project

Highlights

- Seals as Oceanographic samplers: purchase
- Seals as Oceanographic samplers: CTD Transmitters deployed on seven male Australian sea lions starting November 3 2009. As of 27 Jan 2010 **3100 CTD profiles** had been collected and uploaded to Coriolis database with sea lions diving surface to sea bottom (complete vertical casts) from the shore to the edge of the continental slope at locations between 37.10°S, 138°E to 32°S, 133°E
- Seals as Oceanographic samplers: CTD Transmitters deployed on 15 elephant seals as of Feb 5 2010, **508 CTD profiles** have been collected within a large area of the southern ocean spanning a triangle approximately between 53°S, 158°E; 60°S, 156°E and 62°S, 175°E to depths of 1225m.
- GBROOS Acoustic receivers purchased for North Queensland.

Difficulties

- Acoustic receiver deployments in Northern Queensland are still being considered by the Great Barrier Reef Marine Park permitting department.
- Functionality of eMII for AATAMS community still needs considerable refining and debugging

Outlook for the EIF project in 2010/11

- Continue strategic deployment of Seals as Oceanographic Samplers along the southern coast/shelf area of Australia (SAIMOS) and in the Southern Ocean (BW Node).
- Commence observations of predator responses to ecosystem change in areas of ecological significance in the Southern Ocean (BW Node)
- Enhance existing AATAMS infrastructure and enhance coverage by addition of lines and arrays placed strategically Queensland (QIMOS) and Southern NSW (NSWIMOS)

Project infrastructure

See implementation plan.

Management and Implementation

Key risks and risk management strategies for the 2010/11 year

	Description of Risk	Rating of Likelihood	Rating of Consequence	Assessment of Net Risk	Proposed Treatment of Risk
1.	Loss/damage of equipment	Highly Likely	Minor	Medium	Extensive work towards robust mooring design and equipment. Provide spares for replacement. Deploy replacements at key sites. CTD tags transmit in real time- expendable once data uploaded.
2.	Partners leaves joint venture within initial time frame	Unlikely	Moderate	Low	Reduce network and / or redeploy to other regions
3.	Operating $ within initial framework	Unlikely	Moderate	Low	Reduce spatial extent of network and/or seek external funding from client base.
4.	Receivers not getting detections due to lack of tagged fish in the area	Likely (in some areas)	Moderate	Medium	Design deployments for areas where fish are being tagged. Provide incentives to researchers to tag organisms in areas where receivers are deployed.
5.	eMII not providing suitable access to data resulting in user community not using eMII	Likely	Major	High	Ensure that eMII can provide AATAMS data in a way that user can obtain relevant information/data easily. Discussions with eMII and possible subcontracting of staff or INTERSECT
6.	IP issues between receivers (AATAMS/IMOS) and tags bought by researchers	Unlikely	Moderate	Low	Communication with user community to discuss these potential issues. Provide a data policy. Quarantine aspects of non-IMOS information (ie. details of fish tagged) for a negotiated period.
7.	Loss of staff	Unlikely	Major	Medium	Enhanced staff development and incentive schemes, ensure continuity of data with overlap if staff decide to leave

IMPLEMENTATION PLAN JULY 2010 TO JUNE 2011

Activity/Deployment/Location	Responsible Organisation(s)	Responsible Person/Support Staff	Start	Finish
Southern Seals as Oceanographic Samplers (SSOS) Purchase CTD transmitters, deploy on seals – southern ocean and southern Australia, upload data	SIMS / MQ /UTAS / SARDI	Rob Harcourt, Iain Field, Mark Hindell / Simon Goldsworthy	July 2010	June 2011
Monitoring Apex Predators of the Southern Ocean Apply AAD logistic support, deploy instruments on seals and birds, upload data	SIMS/MQ/UTAS/ AAD	Rob Harcourt, Iain Field, Mark Hindell, Colin Southwell, AAD logistics	July 2010	June 2011
Deployment, servicing and downloading GBROOS AATAMS receivers	SIMS/AATAMS/JCU/AIMS	Andrew Boomer	July 2010	June 2011
Data and Scientific Committee meetings	AATAMS	Andrew Boomer	July 2010	June 2011

Facility:	Satellite Remote Sensing
Sub-Facility:	11d. Satellite Ocean Colour
Sub-Facility:	Vittorio Brando
Contact details:	Phone: 02-62465716 Email: vittorio.brando@csiro.au

Status of the Project

Outlook for the EIF project in 2010/11

This sub-facility aims to establish foundational infrastructure for a system that will deliver National Ocean Colour products with a characterized uncertainty specific to the Australian context (i.e. continental shelf and surrounding oceans).Whilst the focus is on Case 1 waters, the system will be designed to enable future support of validated data production for Case 2 waters, but these will be implemented as a second priority and only to the extent that the balance of the available resources permit.

The sub facility is structured in 4 sub-sub-facilities

- **Lucinda jetty Coastal Observatory (SRS-OC-LJCO)**
  LJCO was established with NCRIS funding to carry-out Calibration and Validation activities of remotely-sensed satellite ocean colour products. To this aim, The Lucinda Jetty Coastal Observatory generates two different data streams - above water measurements of the water radiance and in water measurement of the optical properties.
- **Support cal/val activities specifically for Case 1 products using radiometers mounted on ships of opportunity (SRS-OC-SOOP_Rad)**
  In order to extend the footprint of the Calibration and Validation activities of remotely-sensed satellite ocean colour products carried out at LJCO, two spectroradiometers will be installed on ships of opportunity to acquire continuous measurements of the water radiance in the Australian sector of the Indian, Pacific and Southern Oceans
- **Establish bio-optical data base of Australian Waters (SRS-OC-BODBAW)**
  This database will be used to assess accuracy of satellite ocean colour products for current and forthcoming satellite missions for the Australian Waters. The match-up dataset is essential to assess ocean colour products in the Australian region (e.g. chlorophyll a concentrations, phytoplankton species composition and primary production). Such a data set is crucial to quantify the uncertainty in the ocean colour products in our region.
- **Process and Validate Ocean Colour products (SRS-OC-PVOC)**
  This activity will see the implementation of the processing chain for NASA/ESA standard OC products and of Primary Productivity algorithms for the entire Australian sector to enable delivery through AoDAAC/eMII of ocean colour data products for the Australian region with a characterized uncertainty.

The primary research areas supported by this infrastructure investment are improved monitoring and understanding of the open ocean, and future research and development of advanced algorithms tailored to Australian near-coastal conditions.

Project infrastructure

The expected progress is described for each of the four sub-sub-facilities

- **Lucinda Jetty Coastal Observatory (SRS-OC-LJCO)**
  In 2010/11 the activities at LJCO are still supported by NCRIS funds. Please refer to the IMOS NCRIS ABP.
- **Support cal/val activities specifically for Case 1 products using radiometers mounted on ships of opportunity (SRS-OC-SOOP_Rad)**
  In 2010/11 the provisioning of SOOP-Radiometers data stream will involve:
  - Acquire first radiometer;
  - Demonstrate data stream using LJCO as a platform
  - Preparation towards installation of radiometers on the two vessels.
  - Acquire second radiometer and start deployment on vessel for radiometer 1
- **Establish bio-optical data base of Australian Waters (SRS-OC-BODBAW)**
  In 2010/11 the provisioning of the bio-optical data base will involve:
  - Establish structure of the database to be compliant with the specifications of calibration/validation databases already in place at the international space agencies
  - Initiate the population of the bio-optical database by harvesting existing measurements (for both Case 1 and 2 waters) from within agencies and organisations that have them;
- **Process and Validate Ocean Colour products (SRS-OC-PVOC)**
  Implementation and processing chain for NASA/ESA standard OC products and of Primary Productivity algorithms for the entire Australian sector
  In 2010/11 the activity of SRS-OC-PVOC will aim at establishing a data handling and processing chain, focusing on using standard NASA/ESA algorithms for Case 1 waters and utilizing wherever possible the resources managed by ARCS (part of the NCRIS Platforms for Collaboration capability). Moreover the Implementation of existing published primary productivity algorithms will produce a first estimate of this parameter for the Southern Ocean.

Management and Implementation

Key risks and risk management strategies for the 2010/11 year

- **Lucinda Jetty Coastal Observatory (SRS-OC-LJCO)**
  In 2010/11 the activities at LJCO are still supported by NCRIS funds. Please refer to the IMOS NCRIS ABP.
- **Support cal/val activities specifically for Case 1 products using radiometers mounted on ships of opportunity (SRS-OC-SOOP_Rad)**
  - Instrument reliability and data stream continuity:
    the instrument setup will be designed and procured following advice from US and EU Arctic going community.
  - Difficulties in installation of radiometers on board of the research vessels:
    We will seek assistance by the SOOP facility leadership for facilitating access and installation of radiometers on board of the research vessels
- **Establish bio-optical data base of Australian Waters (SRS-OC-BODBAW)**
  - Dependence of data custodians timely delivery of legacy bio-optical data for the establishment of the bio-optical data base of Australian Waters
    The database will be populated by collating measurements performed by several members of the Australian biological oceanography community

- By seeking endorsement by the bio-optical working group we aim to persuade all members of the community to commit to contribute their datasets to the database.
- To ensure timely delivery of the legacy (i.e. non-IMOS-funded) data by all parties we will enter in contractual arrangements with each custodian. These contracts will include staging gates milestones.

IMPLEMENTATION PLAN JULY 2010 TO JUNE 2011

Activity/Deployment/Location	**Responsible Organisation(s)**	**Responsible Person/Support Staff**	**Start**	**Finish**
Provisioning of SOOP-Radiometers data stream: Demonstrate data stream from LJCO: Acquire first radiometer; start testing using LJCO as a platform	CLW	Vittorio Brando, Paul Daniel	1-7-2010	31-12-2010
Provisioning of SOOP-Radiometers data stream: Preparation towards installation of radiometers on the two vessels.	CLW	Vittorio Brando, Paul Daniel	1-10-2010	31-3-2011
Provisioning of SOOP-Radiometers data stream: Acquire second radiometer and start deployment on vessel for radiometer 1	CLW	Paul Daniel	1-1-2011	30-6-2011
Provisioning of bio-optical data base of Australian Waters: Establish structure of the database to compliant to the specifications of calibration/validation databases already in place at the international space agencies	CMAR	Lesley Clementson	1-7-2010	31-3-2011
Provisioning of MODIS AQUA and MODIS TERRA L1A data stream and archives from NASA to ARCS infrastructures	CUT, GA	Vittorio Brando, Edward King, Mark Gary,		
Provisioning of MODIS L2 data streams for primary productivity products: Implementation of published algorithms upon consultation with the Bio-optical working group and the Nodes	CLW +CUT	Nagur Cherukuru, Mark Gary	1-7-2010	31-3-2011
Provisioning of SeaWIFS L1A data Archives from CMAR and AIMS to ARCS infrastructures	CUT, GA	Vittorio Brando, Edward King, Mark Gary,	1-11-2010	30-6-2011

Facility:	Satellite Remote Sensing
Sub-Facility:	11e: Altimetry Calibration and Validation
Sub-Facility Leader:	Dr Christopher Watson
Contact details:	Phone: (03) 6226 2489 Email: cwatson@utas.edu.au

Status of the Project

The new altimetry calibration and validation sub-facility will commence activities July 1 2010. The outlook for the project remains identical to that stated in the project-plan. The sub-facility will be structured around the regular provision of two data streams for the calibration and validation of the NASA/CNES/NOAA/EUMETSAT Jason-2/OSTM satellite mission. The two data streams including the absolute bias stream, and the bias drift stream, will be provided directly to the mission science team on a regular basis, thus contributing to the international user community accessing altimeter sea surface height (SSH) data and related products. The primary mode of dissemination of the two data streams will be via the annual OSTST meetings, with intermediate releases made available via the internet (see project milestones). The project is designed on an annual repeat cycle such that the data streams are augmented and refined as new data is collected from the hardware/infrastructure deployed previously. A major early requirement within year 1 will therefore be the procurement of hardware and efficient deployment of the oceanographic instruments that will facilitate the generation of the calibration and validation data streams. There is a medium-high risk that the moored oceanographic instruments will be delayed in their deployment due to the high demand on the CMAR mooring group. We address this potential risk in the management and implementation section below.

Project infrastructure

Following commencement of this sub-facility on July 1, 2010, effort will be concentrated on procuring all hardware and personnel required to produce the calibration and validation data streams. This includes the procurement of hardware and construction of two GPS equipped buoys that will be subsequently deployed episodically in Bass Strait and Storm Bay over the project duration. Additionally, we will procure hardware and consumable items for the oceanographic instrument moorings, to be deployed in the same locations. In terms of personnel, a field support person (0.5 FTE) will be engaged at UTAS.

Key components for early action following commencement will be the deployment of oceanographic instrument moorings in Bass Strait, followed by Storm Bay. The early deployment of these instrument moorings is considered vital as it begins the annual cycle of data that will provide for the absolute bias data stream. We address the risk of delay to this component of the project below.

Following the early procurement and deployment phases of 2010/11, the project team will focus on the generation of land motion estimates at global sites of interest. These will be combined with tide gauge data to generate the bias drift data stream. Dissemination of intermediate data products will be via the internet. The provision of these data will be disseminated at the OSTST meeting in October 2010.

Management and Implementation

The key risks and management strategies for 2010/11 are provided below:

1. Fouling of ocean based moorings (very low risk, high impact). This will be mitigated by adopting sufficiently short deployment periods to prevent the accumulation of growth. The use of two sites for absolute calibration also provides redundancy.
2. Failure of GPS buoys (very low risk, low impact). The GPS units are well tested and unlikely to fail. Two buoys are deployed at each mooring location in order to provide redundancy and quality assurance.

3. Failure of tide gauges (very low risk, medium impact). The tide gauges used form part of the National baseline array, and are therefore expected to be maintained on a regular basis with few if any interruptions to the supply of data. The impact on the bias drift calibration scheme is very low as the number of tide gauges used for this stream is very high and hence the method is highly redundant.
4. Loss of coastal Moorings (low risk, medium impact). There is a low level of risk that a mooring(s) may be lost (for example, due to being snagged by an anchor or net). This risk is minimised as none of the deployment regions are within active fishing grounds, and the appropriate level of notification is provided by following the guidelines of the relevant Marine and Safety authority. Given the multiple deployments and six monthly cycle, sufficient redundancy is built in to ensure a calibration data stream can still be produced.
5. Delay of mooring deployments (medium-high risk, medium impact). Given the considerable growth in demand from the CMAR mooring team (driven largely from IMOS projects) there is medium-high risk of some delay in mooring schedules. We will engage in the Coastal Waters PI working group (led by Dave Hughes, CMAR) in order to set priorities and ensure the most efficient mooring schedule during the period that the moorings team engage new staff and build capacity. We are able to minimise impact of any delay through the use of tide gauge data although this will result in a contribution at lower precision. We anticipate revisiting specific milestones accordingly once deployment dates can be set by the CMAR moorings team.

IMPLEMENTATION PLAN JULY 2010 TO JUNE 2011

Activity/Deployment/Location	**Responsible Organisation(s)**	**Responsible Person/Support Staff**	**Start**	**Finish**
Procure GPS receivers and hardware; construct GPS buoys	UTAS	Christopher Watson	1 July	30 Sep
Engage field/data support person 0.5 FTE	UTAS	Christopher Watson	1 July	30 Sep
Procure oceanographic instrumentation; mooring consumables	CMAR	Neil White / Coastal mooring group	1 July	30 July
Engage with the coastal moorings PI group within CMAR to set priorities for oceanographic instrumentation moorings	UTAS	Christopher Watson	1 July	Ongoing
Build and deploy oceanographic instrumentation moorings in Bass Strait and Storm Bay as soon as possible	CMAR	Neil White / Coastal mooring group	1 July	Ongoing
Deploy/retrieve GPS quipped buoys; processing to facilitate absolute bias data stream	UTAS	Christopher Watson	Various episodic deployments	
Begin the process of generating estimates of land motion	UTAS	Christopher Watson	30 Sep	Ongoing
Attend OSTST meeting, disseminate plans and initial data streams	UTAS/CMAR	Christopher Watson / Neil White	Late Oct (TBA)	Late Oct (TBA)
Begin the process of generating bias drift data stream	CMAR/UTAS	Neil White / John Church	1 Nov	Ongoing

ATTACHMENT B **MILESTONES**

Milestones for 2010-2011 are:

Facility	Sub-Facility	Operator	Due by 30 Sep 2010	Due by 31 Dec 2010	Due by 31 Mar 2011	Due by 30 Jun 2011
SOOP	CPR	CSIRO	Initiate quarterly Melbourne to Adelaide route Initiate annual Devonport (Tasmania) to Nelson (New Zealand South Island)	Initiate Quarterly GBR route (Cairns to Gladstone) Annual evaluation of progress, strengths, weaknesses and opportunities for the AusCPR survey, plus review budget, staff performance and development.	Initiate ad hoc Tasmania east coast route	Initiate quarterly Tasman Sea route (from Brisbane) Data delivered to eMII.
	BGC	CSIRO		Complete purchase and initial testing of pCO_2 system for *Aurora Australis*(AA)		
	Bio-acoustics	CSIRO	Data access and collection procedures in place and calibration schedules for vessels agreed.	Procedures for data quality and data management finalized.	Posting of quality controlled data from several vessels in eMII.	New instrument installed on a selected vessel and calibrated with data streaming to eMII
ABOS	DA	CSIRO	Design of Polynya and ITF mooring arrays completed. Construction of mooring arrays begun.	Completed construction and deployment of the Polynya mooring array. Construction of ITF mooring array completed	Deployment of ITF mooring array	Finalize design of EAC mooring array.

Facility	Sub-Facility	Operator	Due by 30 Sep 2010	Due by 31 Dec 2010	Due by 31 Mar 2011	Due by 30 Jun 2011
	ASFS	BOM				Subject to successful deployment of SOFS#1 and board approval, ensure WHOI contract in place to construct SOFS#2 mooring
ANFOG		UWA	Deployment of Seagliders at SOTS site and Coral Sea. Slocum gliders for Tasmania on order	First deployment of Slocum gliders in Tasmania.	All ocean gliders in the ANFOG fleet (6 Slocums and 11 Seagliders) deployed on missions at least once.	Successful deployment of a Seaglider, south of Tasmania, traverse to SOTS site and return.
AUV		SIMS	Hire of additional staff	Deployment in NSW & Qld	Start of vehicle redesign	Repeat of reference sites in Tasmania and temperate WA Data delivered to eMII.
ANMN	Qld and Northern Australia	AIMS	Upgrade Ningaloo NRS and WQM sensors; Upgrade Darwin NRS with ADCP; Develop Yongala real time data stream; Submit QA Qld&NA data to eMII	Purchase Kimberley instrumentation; Service shelf ITF array & Darwin NRS; Service Qld&NA array and Yongala NRS	Submit QA Qld&NA datastreams to eMII; Service Ningaloo NRS	Deploy Kimberley transects; Service ITF transect and Darwin NRS; Service Qld&NA array and Yongala NRS
	NSW	SIMS	Appoint a Mooring Technician (0.25FTE)to develop NSW shelf mooring infrastructure			
	SA	SARDI	Appoint Mooring Technician to develop SAIMOS shelf mooring infrastructure			

Facility	Sub-Facility	Operator	Due by 30 Sep 2010	Due by 31 Dec 2010	Due by 31 Mar 2011	Due by 30 Jun 2011
	WA	CSIRO	Appoint a Mooring Technician to develop WAIMOS shelf mooring infrastructure			
	NRS	CSIRO	Finalise design of ADCP mooring ESP and ROT	Deploy NSI NRS Purchase Bio-optics Triplet sensors.	Finalise Design pCO2 KAI	Finalise design of SEQ shelf array. Deploy Bio-optic sensors on 4 NRS.
AATAMS		SIMS	Employ a Technical Officer to develop AATAMS infrastructure		Continuation of SOSS and commencement of MAPSO: Biologgers deployed.	
SRS	Ocean colour	CSIRO		Provisioning of MODIS AQUA and MODIS TERRA L1A data stream and archives from NASA to ARCS infrastructures. Provisioning of SOOP-Radiometers data stream.	Provisioning of MODIS L2 data streams for primary productivity products. Provisioning of bio-optical data base of Australian Waters. Provisioning of SOOP-Radiometers data stream.	Provisioning of SeaWIFS L1A data Archives from CMAR and AIMS to ARCS infrastructures. Provisioning of SOOP-Radiometers data stream.
	Satellite Altimetry	UTAS	Procure infrastructure hardware: GPS buoys and oceanographic instruments. Deploy Bass Strait and Storm Bay oceanographic instrument moorings.	Present plans for IMOS altimetry cal/val contributions to the international community.	Complete GPS buoy deployments at Bass Strait and Storm Bay sites.	Generate estimates of land motion at global sites for the production of the bias drift data stream.
IMOS Office		UTAS	Annual Report 1; Milestone Report 5	Milestone Report 6	Annual Business Plan 2; Milestone Report 7	Milestone Report 8

ATTACHMENT C

List of Acronyms

Acronym	Full Title
AAD	Australian Antarctic Division
AATAMS	Australian Acoustic Tagging and Monitoring System (Facility 8)
ABOS	Australian Bluewater Observing System
ADCP	Acoustic Doppler Current Profiler
AIMS	Australian Institute of Marine Science
ANFOG	Australian National Facility for Ocean Gliders (Facility 4)
ANMN	Australian National Mooring Network (Facility 6)
ANU	Australian National University
AO-DAAC	Australian Ocean [Remote Sensing Data] Distributed Active Archive Centre
ARCS	Australian Research Collaboration Service
Argo	Argo Australia (Facility 1)
AusCPR	Australian Continuous Plankton Recorder
AUV	Autonomous Underwater Vehicle Facility (Facility 5)
BASOOP	Bio-Acoustics SOOP
BGC	Biogeochemical
BoM	Bureau of Meteorology
BWN	Bluewater and Climate Node
CDOM	dissolved organic matter
CLW	CSIRO Land and Water
CMAR	CSIRO Marine and Atmospheric Research
CPR	Continuous Plankton Recorder
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CTD	Conductivity Temperature Depth
CUT	Curtin University of Technology
EAC	Eastern Australian Current
EIF	Education Investment Fund
eMII	electronic Marine Information Infrastructure (Facility 10)
ESA	European Space Agency
GA	Geoscience Australia
GBR	Great Barrier Reef
GBROOS	Great Barrier Reef Ocean Observing System (Node)
GigE	Gigabit Ethernet
GPS	Global Positioning System
IMOS	Integrated Marine Observing System
ITF	Indonesian Through Flow
LJCO	Lucinda Jetty Coastal Observatory
MAPSO	Monitoring Apex Predators in the Southern Ocean
MODIS	Moderate Resolution Imaging Spectro-radiometer
MPA	Marine Protected Area
MQ	Macquarie University
NA	Northern Australia

Acronym	Full Title
NASA	National Aeronautics and Space Administration
NCRIS	National Collaborative Research Infrastructure Strategy
NOAA	National Oceans and Atmospheric Administration (USA)
NRS	National Reference Station mooring
NSWIMOS	New South Wales Integrated Marine Observing System (Node)
OSTST	Ocean Surface Topography Science Team
PAR	Photosynthetically Active Radiation
QA	Quality Assurance
QC	Quality Control
QIMOS	Queensland Integrated Marine Observing System (Node)
SAIMOS	South Australian Integrated Marine Observing System (Node)
SARDI	South Australian Research and Development Institute
SEQ	South East Queensland
SIMS	Sydney Institute of Marine Science (was SHIMS)
SOFS	Southern Ocean Flux Station Meteorological Mooring
SOOP	Enhancing Measurement Programs from Ships of Opportunity (Facility 2)
SOTS	Southern Ocean Time Series (Facility 3)
SRS	Satellite Remote Sensing (Facility 11)
SSH	Sea Surface Height
SSOS	Southern Seals as Oceanographic Samplers
TasIMOS	Tasmanian Integrated Marine Observing System (Node)
UNSW	University of New South Wales
UQ	University of Queensland
UTAS	University of Tasmania
UWA	University of Western Australia
WAIMOS	Western Australia Integrated Marine Observing System (Node)
WHOI	Woods Hole Oceanographic Institute
WQM	Water Quality Meter
XBT	Expendable bathy-thermograph

ATTACHMENT D - BUDGET AND FINANCIAL TABLES

D.1 Anticipated receipt and expenditure of EIF funds

	Past (a) (Jul09-Jun10)	**ABP Period (Jul10-Jun11)**	Future (Jul11-Jun13)	Total (Jul09-Jun13)
Expected opening balance	0	**8,125,000**	250,000	0
Expected Income:				
EIF	16,000,000	**0**	36,000,000	52,000,000
Interest (see Note)	125,000	**125,000**	277,520	527,520
	16,125,000	**125,000**	36,277,520	52,527,520
Expected Expenditure **(Note 1&2)**	8,000,000	**8,000,000**	36,527,520	52,527,520
Expected funds at end of Period	8,125,000	**250,000**	0	0
1. Expenditure by Facility				
01 Argo	1,800,000	**0**	3,667,233	5,467,233
02 SOOP	0	**1,036,152**	2,839,167	3,875,319
03 ABOS	622,421	**1,368,676**	3,869,712	5,860,809
04 ANFOG	1,500,000	**723,640**	2,595,245	4,818,885
05 AUV	0	**227,500**	655,000	882,500
06 ANMN	2,877,579	**2,680,309**	11,094,908	16,652,796
07 ACORN	0	**0**	1,442,617	1,442,617
08 AATAMS	1,200,000	**963,214**	2,807,423	4,970,637
09 FAIMMS	0	**0**	589,430	589,430
10 eMII	0	**0**	3,280,000	3,280,000
11 SRS	0	**1,000,509**	2,095,785	3,096,294
12 Office	0	**0**	1,591,000	1,591,000
	8,000,000	**8,000,000**	36,527,520	52,527,520
2. Expenditure by Operator				
AIMS	1,177,579	**776,877**	3,571,835	5,526,291
BOM	0	**0**	2,564,003	2,564,003
CSIRO	4,022,421	**4,712,911**	13,263,516	21,998,848
CUT	0	**0**	357,706	357,706
JCU	0	**0**	1,442,617	1,442,617
SARDI	50,000	**109,464**	1,263,754	1,423,218
SIMS	1,250,000	**1,190,714**	5,181,002	7,621,716
UTAS	0	**486,394**	6,287,842	6,774,236
UWA	1,500,000	**723,640**	2,595,245	4,818,885
	8,000,000	**8,000,000**	36,527,520	52,527,520

Note: - interest nominally allocated at this stage, but expectations are a far higher amount to be earnt over the period of EIF, given that funding is normally provided a year in advance subject to meeting the conditions of the Funding Agreement.

D.2 Detailed EIF Facility budgets

Facility / Sub-facility	DIISR	Cash CoInv	InKind CoInv	Total
02 SOOP				
DIISR	1,036,152	0	0	1,036,152
Austral Fisheries	0	0	35,000	35,000
Australian Antarctic Division	0	0	110,000	110,000
CSIRO	0	0	608,940	608,940
Marine National Facility	0	0	42,000	42,000
Petuna Sealords	0	0	35,000	35,000
2a Underway Network Total	**1,036,152**	**0**	**830,940**	**1,867,092**
02 SOOP Total	**1,036,152**	**0**	**830,940**	**1,867,092**
03 ABOS				
DIISR	1,368,676	0	0	1,368,676
Antarctic Climate & Ecosystems CRC	0	448,019	70,668	518,687
Australian Antarctic Division	0	0	500,000	500,000
Australian Institute of Marine Science	0	0	100,000	100,000
CSIRO	0	974,000	144,782	1,118,782
NOAA, USA	0	612,000	0	612,000
3c Deepwater Arrays Total	**1,368,676**	**2,034,019**	**815,450**	**4,218,145**
03 ABOS Total	**1,368,676**	**2,034,019**	**815,450**	**4,218,145**
04 ANFOG				
DIISR	723,640	0	0	723,640
NSW Government	0	34,000	0	34,000
04 ANFOG Total	**723,640**	**34,000**	**0**	**757,640**
05 AUV				
DIISR	227,500	0	0	227,500
NSW Government	0	50,000	0	50,000
05 AUV Total	**227,500**	**50,000**	**0**	**277,500**
06 ANMN				
DIISR	776,877	0	0	776,877
Australian Institute of Marine Science	0	0	1,046,906	1,046,906
6a Qld&NA Total	**776,877**	**0**	**1,046,906**	**1,823,783**
NSW Government	0	50,000	0	50,000

Facility / Sub-facility	DIISR	Cash CoInv	InKind CoInv	Total
Sydney Institute of Marine Science	0	220,000	0	220,000
6b New South Wales Total	**0**	**270,000**	**0**	**270,000**
DIISR	109,464	0	0	109,464
South Australian Research & Development Institute	0	0	42,188	42,188
6c Southern Australia Total	**109,464**	**0**	**42,188**	**151,652**
DIISR	1,395,203			1,395,203
CSIRO		0	525,715	525,715
Queensland Government	0	311,428	0	311,428
6f National Reference Stations Total	**1,395,203**	**311,428**	**525,715**	**2,232,346**
DIISR	398,765	0	0	398,765
CSIRO	0	0	66,069	66,069
6g CO2 Acidification moorings Total	**398,765**	**0**	**66,069**	**464,834**
06 ANMN Total	**2,680,309**	**581,428**	**1,680,878**	**4,942,615**
07 ACORN				
NSW Government	0	33,000	0	33,000
07 ACORN Total	**0**	**33,000**	**0**	**33,000**
08 AATAMS				
DIISR	963,214	0	0	963,214
Apache	0	50,000	0	50,000
Australian Antarctic Division	0	0	1,394,000	1,394,000
Australian Institute of Marine Science	0	180,000	10,000	190,000
Chevron	0	0	232,667	232,667
CSIRO	0	457,800	0	457,800
Flinders University	0	0	123,000	123,000
Macquarie University	0	20,000	129,000	149,000
Marine Park Authority	0	0	16,360	16,360
NSW Government	0	33,000	0	33,000
Queensland Department Environment & Resource Management	0	0	2,500	2,500
Queensland Government	0	301,000	0	301,000
SA Department Environment & Heritage	0	65,000	0	65,000
South Australian Research & Development Institute	0	0	339,000	339,000
Sydney Institute of Marine Science	0	40,000	0	40,000
University of Tasmania	0	0	57,000	57,000
08 AATAMS Total	**963,214**	**1,146,800**	**2,303,527**	**4,413,541**

Facility / Sub-facility	DIISR	Cash CoInv	InKind CoInv	Total
11 SRS				
DIISR	514,115	0	0	514,115
CSIRO	0	0	149,939	149,939
Other	0	0	105,833	105,833
11d Satellite Ocean Colour Total	**514,115**	**0**	**255,772**	**769,887**
DIISR	486,394	0	0	486,394
CSIRO	0	0	148,000	148,000
University of Tasmania	0	0	252,000	252,000
11e Satellite Altimetry CalVal Total	**486,394**	**0**	**400,000**	**886,394**
11 SRS Total	**1,000,509**	**0**	**655,772**	**1,656,281**
Grand Total	**8,000,000**	**3,879,247**	**6,286,567**	**18,165,814**

D.3 Details of EIF Co-investment – by Facility

Facility	Cash CoInv	InKind CoInv	Total
02 SOOP		830,940	830,940
03 ABOS	2,034,019	815,450	2,849,469
04 ANFOG	34,000		34,000
05 AUV	50,000		50,000
06 ANMN	581,428	1,680,878	2,262,306
07 ACORN	33,000		33,000
08 AATAMS	1,146,800	2,303,527	3,450,327
11 SRS		655,772	655,772
Grand Total	**3,879,247**	**6,286,567**	**10,165,814**

D.4 Details of EIF Co-investment – by Organisation

Organisation	Cash CoInv	InKind CoInv	Total
Antarctic Climate & Ecosystems CRC	448,019	70,668	518,687
Apache	50,000		50,000
Austral Fisheries		35,000	35,000
Australian Antarctic Division		2,004,000	2,004,000
Australian Institute of Marine Science	180,000	1,156,906	1,336,906
Chevron		232,667	232,667
CSIRO	1,431,800	1,643,445	3,075,245
Flinders University		123,000	123,000
Macquarie University	20,000	129,000	149,000
Marine National Facility		42,000	42,000
Marine Park Authority		16,360	16,360
NOAA, USA	612,000		612,000
NSW Government	200,000		200,000
Other		105,833	105,833
Petuna Sealords		35,000	35,000
Queensland Department Environment & Resource Management		2,500	2,500
Queensland Government	612,428		612,428
SA Department Environment & Heritage	65,000		65,000
South Australian Research & Development Institute		381,188	381,188
Sydney Institute of Marine Science	260,000		260,000
University of Tasmania		309,000	309,000
Grand Total	**3,879,247**	**6,286,567**	**10,165,814**