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:	Extend and Enhance the Australian Acoustic Tagging and Monitoring System
IMOS Facility:	**AATAMS**
Operating Institution:	Sydney Institute for Marine Science (SIMS)
Facility Leader (for this Proposal):	Prof. Rob Harcourt, Macquarie University, 02 9850 7970, rharcour@gse.mq.edu.au, Graduate School of the Environment, Macquarie University, Sydney, 2109, NSW

Other(s) key people involved:	Andrew Boomer SIMS Iain Field Macquarie University Scott Bainbridge Australian Institute of Marine Science (AIMS) Peter Doherty Mark Meekan Chris Cocklin James Cook University (JCU) Michelle Heupel Colin Simpfendorfer Bruce Wallner Great Barrier Reef Marine Park Authority (GBRMPA) David Wachenfelt Jayson Semmens University of Tasmania, TAFI Colin Buxton Ray Williams Mark Hindell Keith Sainsbury CSIRO Greg Timms Steve Rintoul Barry Bruce Alistair Hopday Russ Babcock Anthony Richardson Simon Goldsworthy SARDI Charlie Huveneers John Arnould Deakin University Hugh Pederson Myriax Software P/L Charles Gray NSW DII Vic Peddemors Will Robbins Nicholas Otway Stephen Kennelly
Collaborating Institutions:	Macquarie University (MQ) Australian Institute of Marine Science (AIMS) CSIRO Marine and Atmospheric Research SARDI Aquatic Sciences Department of Environment and Heritage SA Department of Industry and Innovation (DII) NSW Department of Environment, Climate Change and Water (DECCW) NSW Flinders University University of Tasmania Australian Antarctic Division James Cook University (JCU) Ocean Tracking Network (International)

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

Overview:

This proposal is to extend and enhance the Australian Acoustic Tagging and Monitoring System (AATAMS). For the extend option, which is maintaining in WA the Ningaloo Array and the Perth cross shelf line: In Southern Australia the Glenelg line and the Bass Strait Gates; in NSW the Sydney and Coffs Harbour cross shelf lines; in Queensland the GBROOS arrays as well as continuing the Seals as Oceanographic Samplers (EIF funded) program the EIF cost is $4,061k from 2010 to 2013.

For the enhanced option, the following have been added:
Bluewater: Monitoring Apex Predators of the Southern Ocean
WAIMOS: Turtles as Oceanographic Samplers, Rowley Shoals Array
SAIMOS: Predator Responses to Ecosystem Change, AATAMS Curtain
QIMOS: South-East Queensland Curtains
NSWIMOS: Southern NSW Curtains
TasIMOS: AATAMS Curtains
National Backbone: Bottom Temperature loggers for all cross-shelf lines

The cost to EIF of the enhanced option is $4,806k, giving a total EIF cost of $8,867k (2010 to 2013)

Data from AATAMS is being used across a wide range of fields in pure and applied research including understanding oceanographic modelling, climate variability, documenting climate change impacts, providing indices of ecosystem change, understanding trophic linkages, understanding spatial dynamics of habitat selection, marine park planning, understanding anthropogenic influences such as fisheries.

Nature of Investment:
The proposed investment comprises two components with budgets presented separately

A. ***Extend***: Extend from mid-2010 to mid 2013 the existing AATAMS arrays and curtains and annual deployments of Seals as Oceanographic Samplers along the southern coast/shelf area of Australia and the Southern Ocean

B. ***Enhance***: Enhance the existing AATAMS infrastructure and enhance coverage by 1) adding high resolution bottom temperature loggers to existing curtains that extend across continental shelves; addition of lines and arrays placed strategically in South Australia, Queensland, Southern NSW and Tasmania. Enhance by the addition of observations of predator responses to ecosystem change, in particular, in areas of ecological significance (AES), as well as enhancing oceanographic measurements of North-West Australian boundary currents by adding Turtles as Oceanographic Samplers.

Implementation Strategy:

- ***Summary***
- ***Extend***: Maintain the existing AATAMS arrays and curtains and extend from mid-2010 to mid 2013. Continue strategic deployment of Seals as Oceanographic Samplers along the southern coast/shelf area of Australia (SAIMOS) and in the Southern Ocean (BWN), continue through to 2013.
- ***Enhance***: Enhance the existing AATAMS infrastructure and enhance coverage by 1) adding high resolution bottom temperature loggers to existing curtains that extend across continental shelves; 2) addition of lines and arrays placed strategically in South Australia (SAIMOS), Queensland (QIMOS), Southern NSW (NSWIMOS) and Tasmania (TASIMOS); 3) the addition of observations of predator responses to ecosystem change, in particular, areas of ecological significance (AES) in Southern Australia (SAIMOS) and the Southern

Ocean (BWN), as well as enhancing oceanographic measurements of North-West Australian waters with Turtles as Oceanographic Samplers (WAIMOS/BWN)

- **Objectives**

The objectives of AATAMS are twofold.
First is to create a national acoustic receiver network for the Australian research community thereby facilitating large scale, collaborative research using acoustic tagging methods. Acoustic monitoring is a powerful tool for observing animals in coastal and continental shelf ecosystems. Networks of receivers, allow animals to be monitored over scales of 100s of metres to 100s of kilometres. Tracking animals using these tags has been invaluable for monitoring, for example, habitat use, home range size, timing of long-term movements and migratory patterns, and examining biotic and abiotic factors that dictate animal distribution and movements. We have deployed an array of submerged receiving stations that form a national network and have further value added to this network by AATAMS making an important contribution to the Ocean Tracking Network (OTN), a global partnership and co-investor in AATAMS. The array has been strategically developed to facilitate research on movements of animals in relation to the major boundary currents complementing physical measurements made with other IMOS infrastructure.
Second is to enhance the Australian research community's ability to detect ecosystem responses to change in the marine environment by measuring key demographic parameters and foraging movements of select top predators. Miniaturized loggers with high resolutions sensors are deployed on large marine vertebrates. This directly enhances collection of oceanographic data in the Southern Ocean and in Australian boundary currents by providing profiles of temperature and salinity from regions of the Southern Ocean and coastal shelf regions that are difficult to sample by other means (eg beneath the winter sea ice and across cross shelf currents), and by relating predator movements and behaviour to fine-scale ocean structure and variability.

National Backbone for Observing Boundary Currents

AATAMS contributes to the national backbone in two ways. First the national network of acoustic receivers have been strategically placed to traverse the continental shelves across the Leeuwin current in the west (Ningaloo, Perth Line and South West WA), The Flinders Current and the Leeuwin extension in the South (South Australia and the Bass Strait Gate, Portland), and the East Australian Current in the East (GBROOS, Coffs Harbour, Sydney Line and the Bass Strait Gate, Mallacouta). The proposed enhancements, ie new lines in southern NSW, southern Queensland, SA and Tasmania will greatly augment this capacity. With the addition of non AATAMS receivers from the community network developed by AATAMS there are already over 1000 receivers nationally that contribute data on movements of fish, sharks and other aquatic organisms. The AATAMS curtains share spatial overlap with IMOS Moorings at several locations. AATAMS also contributes to the national backbone with the use of Seals as Oceanographic Sensors with deployment of CTD-SRDLS on top predators across the southern portion of Australia, providing cross-shelf transects with vertical CTD profiles with high resolution and broad temporal and spatial coverage. Most of the predators in this extension will be used to observe shelf waters, but some of the predators will be used to extend observations to other boundary current and frontal systems such as the subtropical front. The proposed enhancements for WAIMOS with Turtles as Oceanographic Samplers will provide similar high resolution data for Northwest Australia.

Build institutional strengths into national capability

AATAMS has from the outset worked with the research community to develop a national facility that serves the needs of the community. A national acoustic telemetry network was created by AATAMS that includes 110 research groups across 34 Institutions. These researchers are conducting over 50 projects on approximately 100 different animal species for which approximately 1200 acoustic receivers have been deployed. These acoustic telemetry users have expressed

great interest in the AATAMS project. Data from the non-AATAMS receivers owned by these users are being negotiated for access to data. AATAMS hosted two national workshops (2007 and 2009) at the Sydney Institute for Marine Science and will continue to do so biannually. AATAMS is the lead component of the Ocean Tracking Network and now with SOSS has become a major contributor to the Marine Mammal Exploration of the Oceans Pole to Pole (MEOP) Program.

Whole-of-system approaches

AATAMS provides the opportunity to observe marine animals across a range or spatial and temporal scales in both vertical and horizontal space. Observation of predator movements, foraging ecology and vital rate responses integrates the influence variability in the lower trophic levels and natural and anthropogenic physical environmental changes within whole-system approach. Such studies have not only revealed the dynamic variability of oceanographic features such as fronts and eddies (e.g., Charrassin et al. 2009), but also how important this environmental variability is in regulating biological systems (Loots et al. 2007) and its consequences to population dynamics of top predators (McMahon et al. 2009). Monitoring predators is preferable to monitoring lower trophic levels because predators response rapidly to changes in the distribution and abundance of prey at lower trophic levels leading to more accurate measures of ecosystem changes.

Cost per observation

Biologging of marine predators provides a means to sample the marine environment at unsurpassed resolution and spatial scales, at a fraction of the cost of other platforms. Ecological performance indicators of marine predators provide a cost-efficient ways to monitor whole-of-system response to oceanographic change. With increasing numbers of studies worldwide the cost per tracking unit continues to decrease with the economies of scale. The data that are collected are simple metrics that require little post collection processing and filtering reducing data handling costs. Furthermore with increased use the unit manufacturers are continually redeveloping the technology, size and shape of the unit reducing the overall costs. The strategic deployment of AATAMS equipment and tracking devices also reduces the cost per deployment. Collaborative research efforts with partner institutions and their contribution of independently collected data to the total data pool suggest that co-investment in AATAMS is a highly attractive and cost effective approach for sustainable observation of biological and environmental marine systems.

Charrassin, et al. (2008) Southern Ocean frontal structure and sea-ice formation rates revealed by elephant seals. Proceedings of the National Academy of Sciences of the United States of America 105:11634-11639

Lootset al.(2007) Habitat modelling of Electrona antarctica (Myctophidae, Pisces) in Kerguelen by generalized additive models and geographic information systems. Polar Biology 30:951-959

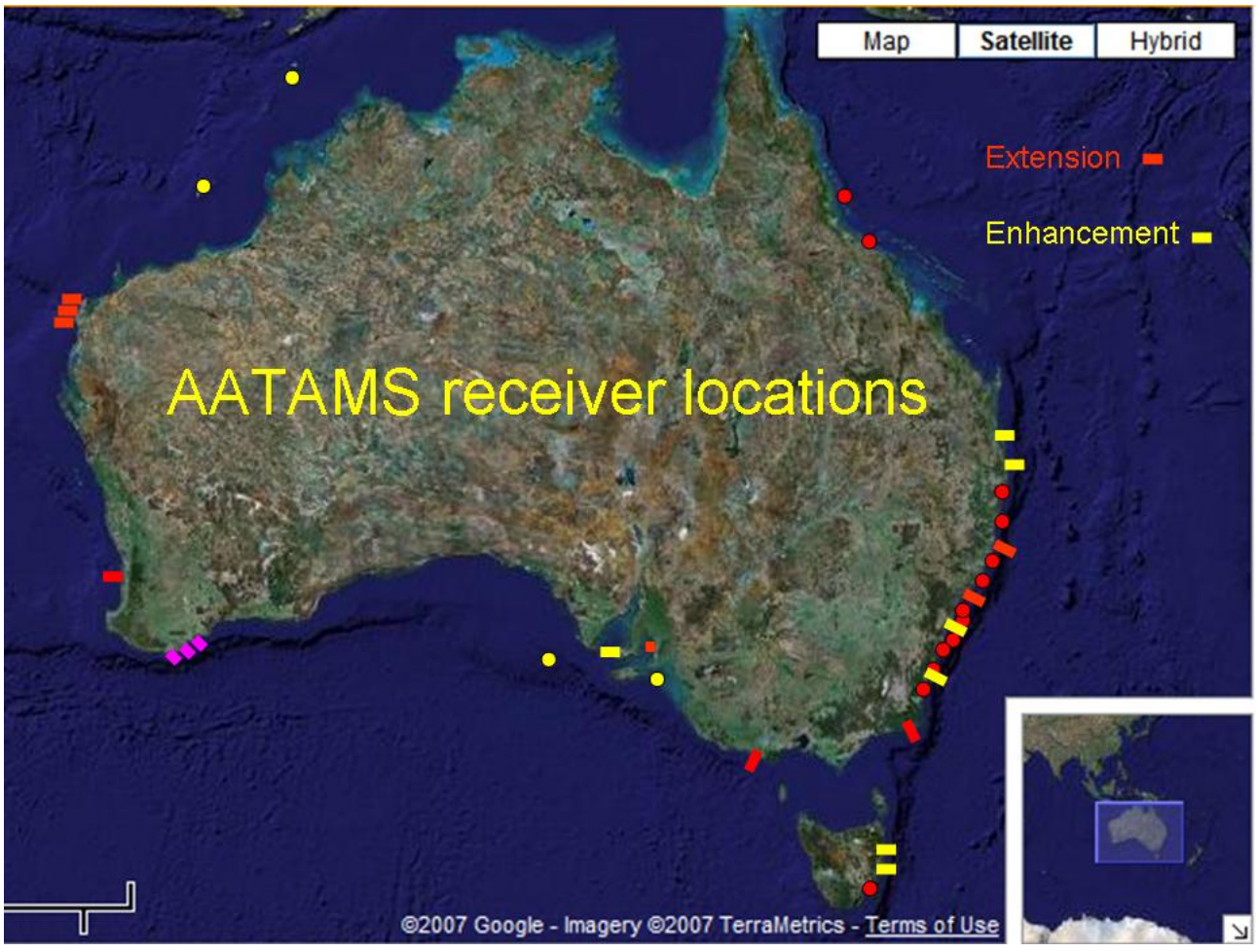
McMahon et al. (2009) Shifting trends: detecting environmentally mediated regulation in long-lived marine vertebrates using time-series data. Oecologia 159:69-82

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

Extension	Node	Major Party	Duration	Start	Finish
GBROOS	QMOS	JCU/AIMS	4	2009	2013
National AATAMS	National Backbone	SIMS/MQ	6	2007	2013
East Coast	NSWIMOS	DECC/UNSW/NSWII/PIRVic/OTN	5	2008	2013
NRETA	WAIMOS	AIMS/CSIRO	5	2008	2013
Perth	WAIMOS	Fisheries WA/OTN	5	2008	2013
SOSS	BWN/SAIMOS	SIMS/MQ /UTAS/CSIRO/AAD	4	2009	2013
South Aust	SAIMOS	SARDI – Aquatic Sciences	6	2008	2013

Enhancement					
SEQ	QMOS	CSIRO	3	2010	2013
East Coast	NSWIMOS	UNSW/SIMS/NSWII	3	2010	2013
Tasmania	TASMOS	TAFI/CSIRO	3	2010	2013
SA	SAIMOS	SARDI	3	2010	2013
TOSS	WAIMOS	AIMS/CHEVRON/APACHE	3	2010	2013
Multispecies SA	SAIMOS	SARDI/Flinders	3 (20+-preexisting)	2010	2013
MAPSO	BWN	UTAS/AAD/ SIMS/MQ	3 (20+ preexisting)	2010	2013

AATAMS Lines – depicting extensions of existing infrastructure (red) and proposed enhancements (yellow)



Seal as Oceanographic Samplers (Bluewater and SAIMOS)

.Node	Tags/species	2009/10 EIF	2010/11	2011/12	2012/13
Bluewater	CTD Elephant seals	30	30	30	30
SAIMOS	CTD for Aust. sea lions[1]	20	10	10	10
SAIMOS	GPS-temp tags - NZ fur seal		10	10	10
SAIMOS	SPLASH tags -mako sharks		10	10	10

Monitoring Apex Predators of the Southern Ocean (Bluewater Node)

	2010/2011			*2011/2012*				*2012/2013*	
Species	*Davis*	*Casey*	*Mawson*	*Species*	*Davis*	*Casey*	*Mawson*	*Species*	*Davis*
Southern Elephant seal	*15*	*15*		*Southern Elephant seal*	*15*	*15*		*Southern Elephant seal*	*15*
Weddell Seal	*15*			*Weddell Seal*	*15*			*Weddell Seal*	*15*
Adelie Penguin	*20*	*20*	*20*	*Adelie Penguin*	*20*	*20*	*20*	*Adelie Penguin*	*20*
Emperor Penguin	*15*	*15*		*Emperor Penguin*	*15*	*15*		*Emperor Penguin*	*15*
Snow Petrel				*Snow Petrel*				*Snow Petrel*	
Cape Petrel				*Cape Petrel*				*Cape Petrel*	
Antarctic Petrel				*Antarctic Petrel*				*Antarctic Petrel*	
Antarctic Fulmar				*Antarctic Fulmar*				*Antarctic Fulmar*	
Short-tailed shearwater	*20*			*Short-tailed shearwater*	*20*			*Short-tailed shearwater*	*20*
Total	*100*	*60*	*20*	*Total*	*100*	*60*	*20*	*Total*	*100*

Devices include Conductivity-Temperature-Depth recorders (CTD), Argos PTTs (Argos) and light temperature loggers

SAIMOS Predator Responses

	2010/2011			*2011/2012*			*2012/2013*	
Species	*Pup /Chick Production*	*Pup Growth*	*Cohort Survival*	*Pup /Chick Production*	*Pup Growth*	*Cohort Survival*	*Pup /Chick Production*	*Pup Growth*
Australian Sea lion	*x*	*x*		*x*	*x*		*x*	
New Zealand Fur seal	*x*	*x*		*x*	*x*		*x*	
Cape tern	*x*		*x*	*x*		*x*	*x*	*x*

Access, pricing regimes:

- **How will data access be provided?**

AATAMS Arrays and Curtains

Data is scheduled to be recovered periodically and uploaded into the AATAMS/eMII data base. From there all receiver and tag data will be freely available via eMII.

Southern Seals as Oceanographic Samplers (SSOS), Turtles as Oceanographic Samplers (TOSS), Predator Responses to Ecosystem Variability (PREV) and Monitoring Apex Predators of the Southern Ocean (MAPSO)

The CTD-SRDL tags include high-resolution temperature and conductivity sensors, which are manufactured by Valeport (UK). Temperature is measured to an accuracy of 0.01º C, and conductivity to 0.01 mS/cm. The devices retain the measurement circuitry but use the CTD-SRDLs to carry out the data compression using the standard algorithm for ARGO drifting CTD floats modified to give a combination of fixed depth and inflection points. The tag performs up-casts depending on time and depth criteria that suit the deployment, sampling every 0.5 sec. With the good satellite coverage four full temperature and salinity profiles will be transmitted each day.

The satellite then relays the data to ground stations that process the information, compute the location from which the message was received and place the location and raw data into a database. The ARGOS database is interrogated automatically every two hours by the SMRU computers and the data are automatically loaded into a local database and decoded. The data will be downloaded by AATAMS personnel and submitted to eMII. Raw and filtered predator foraging locations will be available through the eMII and Australian Antarctic Division Data Centre webportals. Measures of relative foraging and reproductive success will also be available. These metrics will differ between species but are likely to include trip durations, trip distances and foraging trip mass changes, and offspring mass changes and survival where applicable. Combined foraging locations will also be provided as estimates of overall foraging activity to identify Areas of Ecological Significance (AES). These AES will provide other node stakeholders and interested parties to plan and refine ecological surveys based on prior ecological information. This has proven to be a successful strategy for determining whole-ecosystem-surveys based on predator foraging locations (e.g., Loots et al 2007). This information will also provide important information for ecosystem modelling on predator foraging ecology and top-down controls on lover trophic levels for ecologists and natural resource modellers. Furthermore these foraging location data will be used to assess foraging success in relation to temporal and spatial oceanographic variation of the region. Once stored in eMII it will be directly available to the biologging and ecosystem communities for incorporation into their models and comparison with other systems, species and locations.

- **How will data and products be managed?**

AATAMS data

Receiver data will follow the guidelines of the AATAMS data committee and IMOS principals of free and timely access to all data as per current practice. This data will be periodically downloaded into the AATAMS data base. Data will follow the current AATAMS

data format and quality control. Data will be incorporated into the management currently provided by IMOS/eMII.

Southern Seals as Oceanographic Samplers (SSOS) and Turtles as Oceanographic Samplers (TOSS) Predator Responses to Ecosystem Variability (PREV) and Monitoring Apex Predators of the Southern Ocean (MAPSO)

The data will be collected by ARGOS and archived to the central depository on the SMRU server (St Andrews, UK), where it is stored on an ORACLE database and secured. The data will be then be accessed by AATAMS and sent to eMII as an ACCESS database. Once stored in eMII it will be directly available to the oceanographic community for incorporation into their models. Equivalent data from the French program is currently incorporated directly into the French Coriolis database and for the English equivalent to the British Oceanographic Data Centre. Raw and filtered predator foraging locations and measures of relative foraging and reproductive success will be available through the EMII and Australian Antarctic Division Data Centre web-portals.

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

The ***Extend*** option in this proposal is jointly driven by AATAMS, UTas, MQ, SARDI, CSIRO, AIMS and AAD along with other interested parties. AATAMS is dependent upon continued goodwill of members throughout the animal tagging community and performance of eMII in providing a working data product from AATAMS data. SOSS is dependent upon continuance of the Sea Mammal Research Unit (SMRU), St Andrews, Scotland. SMRU are a statutory body of the British Government and embedded within the University of St Andrews which has been a leading British University since 1413.

The ***Enhanced*** option is driven by our co-investment partners including state governments in 4 states, plus AAD, AIMS, Utas, MQ and SARDI. MAPSO is particularly dependent upon the AAD and PREV upon SARDI. Both are statutory bodies of Federal and State Governments respectively.

- **Collaborative structures for allocation of priorities**

AATAMS will be responsible for the ***Extend*** and ***Enhance*** options on the Australian mainland with cooperation of SARDI, CSIRO and AIMS and AATAMS will be responsible for the ***Extend*** and ***Enhance*** options with cooperation of UTas, MQ and the Australian Antarctic Division for the Southern Ocean component.

Governance

- **Performance indicators**

Key performance indicators for AATAMS will be:

- Placement and delivery of orders for loggers and telemetry devices
- Successful negotiation logistic support with co-investment parties
- Successful deployment of receivers and animal tags
- Continued engagement of the community including workshops
- Retrieval of data
- Provision of data to eMII

1) List of the data streams that are available for use in research, grouped by facility
AATAMS currently produces one data stream- time and location (and depth and temperature if those sensors are deployed) and location by individual animal across nearly 60 species. SOSS provides high resolution vertical profiles with conductivity, temperature, depth and location in real time. Spatial coverage will be enhanced considerably with TOSS, PREV and MAPSO and ARGO/GPS loggers provide higher resolution spatial measurements albeit without conductivity. Demographic data (Predator Response to Ecosystem Change) from the ENHANCEMENT will include 1) NZ fur seal annual pup production 2) population change of Australian sea lions from colonies; 3) breeding numbers of crested terns 4) NZ fur seal pup growth rates 5) Australian sea lion age-specific survival and fecundity rates 6) crested tern age-specific, cohort specific survival and growth rates. These demographic data will build on existing (20+ year) data sets.

2) Meeting Researcher Needs
AATAMS has from the outset worked with the research community to develop a national facility that serves the needs of the community. A national acoustic telemetry network was created by AATAMS that includes 103 researchers across 34 Institutions. These researchers are conducting over 50 projects on approximately 60 different animal species for which approximately 1000 acoustic receivers have been deployed. These acoustic telemetry users have expressed great interest in the AATAMS project. Data from the non-AATAMS receivers which are owned by these users are being negotiated for access to data. AATAMS hosted two national workshops (2007 and 2009) at the Sydney Institute for Marine Science and will continue to do so biannually. AATAMS is the lead component of the Ocean Tracking Network and now with SOSS has become a major contributor to the Marine Mammal Exploration of the Oceans Pole to Pole (MEOP) Program.

3) Quality of Research Infrastructure
We are using exactly the same instruments that are deployed routinely and successfully in OTN, TOPP and MEOP. Demographic data (Predator Response to Ecosystem Change) has been collected for 20+ years and used in collaborative programs worldwide. This allows qualitative comparisons against data from other predator programs throughout the world.

4) Fostering Collaborative Development of Infrastructure
A major aim of this proposal is to contribute to an integrated view of marine pelagic ecosystems, including the physical, chemical and biological environment. The addition of high resolution temp/pressure sensors to the AATAMS lines will provide a unique dataset of cross-shelf measurements. Each CTD-SLDRs measure temperature, salinity, and depth.

5) Fostering Interdisciplinary and World-class Research
Work is in progress for the first papers from AATAMS data. Considerable numbers of high impact papers have been produced in great proliferation by both TOPP and MEOP data. We expect future AATAMS papers will help address our objectives.

- **Describe key risks and risk management strategies**

Risk	**Risk mitigation**
AATAMS Receiver loss	AATAMS receivers have undergone loss post deployment due to a Tropical Cyclone. We have budgeted for a 10% annual loss around Australia although rates of loss overall are significantly lower than this. Moorings have been refined over the first four years of AATAMS improving recovery rates.
CTD-SRDL loss or malfunction	Sensors deployed upon animals do on occasion malfunction or are lost. Data from CTD-SRDLS is transmitted in real time and so data streams will be generated until the batteries in the transmitter are exhausted or the tag is moulted by the animals. Biologgers have very high success rate although failing to recapture of animals can reduce data returns. Sample

	sizes are based on many years experience using loggers of these types.
Animal Ethics/Welfare	All procedures used with vertebrate animals are conducted under the auspices of Animal Ethics Committees using well developed Standard Operating Procedures and world best practice.
Field safety	All participants in AATAMS are required to be trained to Australian standards and undertake research under the OH & S requirements of their host institution whether within Australia or Antarctica
Loss of key staff	AATAMS is dependent on key staff (Rob Harcourt, Mark Hindell, Simon Goldsworthy, Andrew Boomer). Rob Harcourt and Mark Hindell are both tenured Professors at their respective Universities. Simon Goldsworthy has a permanent senior position at SARDI. Andrew Boomer the AATAMS technician has been with AATAMS for one year but is extremely enthusiastic and unlikely to leave provided career development is provided. The extensive opportunities for training, both nationally and internationally, have kept the team extremely interested. All Team members have expressed their interest in helping to build AATAMS and previous staff (Charlie Huveneers) maintain their commitment and involvement even after moving on suggesting strong continuity.

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

- Budgets are presented separately for the ***Enhance*** and ***Extend*** options below.
-

Extend

- **EIF Funds**
- Capital Funds are required to replace equipment that breaks or is lost over the course of 2010-2013. AATAMS acoustic receiver arrays have a predicted loss of 10% annually. CTD-SRDLS employed on southern elephant seals are presumed to be lost over the course of each deployment; the data stream is the provided through the satellite uplink. CTD-SRDLs will be recovered from sea lions and fur seals though some attrition is expected and has been budgeted for. In Southern Australia SOSS the inclusion of New Zealand fur seals in later years has been included to broaden vertical profiles coverage in particular down to the subtropical front.
- Operating expenses include acoustic receiver retrievals rebatterying, mooring repair.

- **Co-investments – source and nature**
- There are two major sources of co-investment in this project. The largest is in logistic support including use of the AIMS boat *Solander* in Ningaloo, Defence Maritime Services in NSW, and AAD support for SOSS. The second major form of co-investment is by SIMS, MQ and UTas in terms of project management, project support, provision of laboratory space, provision of equipment as detailed in the budget. In particular, the 1.2 FTE provided by MQ.

- **Staffing details**
- A total of 1.5 FTE is required currently to run AATAMS, based at SIMS. To keep the Team highly motivated and to increase the capability of the AATAMS team, AATAMS scientific committee members perform many functions including logistic support during deployments.
-

Enhance

- **EIF Funds**
- Capital Expenditure. Exciting opportunities exist to expand AATAMS acoustic curtains at critical junctures around the Australian coastline. These include SEQ off Fraser Island, SE NSW at Jervis Bay Marine Park and Batemans Bay Marine Park; off east coast Tasmania;

Southern South Australia and out to the Rowley Shoals and Scott Reef in WA. Funds have also been allocated for a range of tags for attachment to the different species of predators under MAPSO.

- Operating funds will be used to measure apex predator responses to oceanographic change facilitating IMOS access to and further collection of long term demographic data from the southern ocean and southern Australia.

- **Co-investments – source and nature**
- The major sources of co-investment are similar to those under the extension. Significant co-investment is being provided in cash by the oil and gas industry in WA and by DEH in SA. In kind co-investment of a very significant nature comes from Chevron and AIMS (WA); SARDI (SA); UTAS and CSIRO (Tasmania and MAPSO); AAD; MAPSO and MQ (Overall).

- **Staffing details**
- A total of 1.0 FTE is required to support the AATAMS TO in the enhanced AATAMS.

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		Seals as Oceanographic Samplers (SOSS)	SOSS	AATAMS Bottom-Temp Loggers Apex Predators (MAPSO)
WAIMOS	NRETA		NRETA	Scott Reef and Rowley Shoals AATAMS Array TOSS
QMOS/GBROOS		GBROOS AATAMS (Orpheus, Heron, One Tree)	GBROOS AATAMS (Orpheus, Heron, One Tree)	SEQ AATAMS Lines
NSW-IMOS	East Coast Lines		East Coast Lines	South East Coast Lines
SAIMOS	Glenelg Line Bass Strait Gates* (OTN funded)	Seals as Oceanographic Samplers (SOSS)	Glenelg Line SOSS	Apex Predators Ecosystem Response SA AATAMS lines
TASIMOS				Tasman AATAMS lines