Project Plan – Atmosphere

1. Name and details of the Principal Participants:

Principal Participants are the Parties to the Formal Collaboration Agreement, including the Collaboration Delegate. They provide the core Antarctic science capability to deliver on the objectives of this agreement. They are directly involved in the AAPP governance including funding and resource allocation decisions to implement the collaborative Antarctic research partnership. Principal Participants are expected to collectively contribute significant cash and/or in-kind support for AAPP activities. The Principal Participants for this Project are:

The Commonwealth of Australia represented by the Australian Antarctic Division, a Division of the Department of Climate Change, Energy, the Environment and Water (ABN 63 573 932 849), 203 Channel Highway, Kingston, TAS 7050 ("AAD")

The Commonwealth of Australia represented by the Bureau of Meteorology (ABN 92 637 533 532), Head Office Melbourne, GPO Box 1289, Melbourne, VIC 3001 ("BoM")

Commonwealth Scientific and Industrial Research Organisation (ABN 41 687 119 230), Castray Esplanade, Battery Point, TAS 7004 ("CSIRO")

University of Tasmania (ABN 30 764 374 782), Private Bag 3, Hobart, TAS 7001 ("UTAS")

2. Names of the Associate Participants:

Associate Participants provide additional niche and specialist capability to implement the AAPP activities. Through contribution of their additional capability, they provide cash and/or in-kind support to the AAPP. In some instances they may receive AAPP funds. Where this is the case, they will be required to sign an Associate Participant Agreement including Project Terms, the form of which will be endorsed by the Management Committee, prior to being entered into by the Associate Participant and Collaboration Delegate (at the direction of the Principal Participants). The Associate Participants for this Project are:

Geoscience Australia (ABN 80 091 799 039) ("GA")

Department of State Growth (ABN 36 388 980 563)

Integrated Marine Observing System (ABN 30 764 374 782) ("IMOS")

3. Project Commencement Date:

01/07/2019

4. Project Completion Date:

30/06/2029

5. Project Leader's name and contact details:

Project Leaders: Alain Protat (BoM) and Simon Alexander (AAD)
Alain Protat:
Australian Bureau of Meteorology
9th floor East, 700 Collins Street, Docklands, VIC 3008
Tel: +61 3 9669 8128 Fax: +61 3 9669 4660
alain.protat@bom.gov.au

Simon Alexander:
Antarctica and the Global System
Australian Antarctic Division
203 Channel Highway, Kingston, TAS 7050.
Tel: +61 3 6232 3358
simon.alexander@aad.gov.au

6. Project Funds required:

Total funds required for the Atmosphere project is $2,700,050 as per ANNEX 1.

A summary of eligible expenditure by projects for the life of the AAPP is provided in ANNEX 2 with the CSIRO payment schedule listed in ANNEX 3.

7. Other Contributions required:

In-kind staff contributions (FTE/y):

AAD: Simon Alexander (0.6), John French (0.6), Andrew Klekociuk (0.6), Damian Murphy (0.6)

BoM: Alain Protat (0.25), BoM technical support to run ACCESS (0.1)

CSIRO (yrs 1-4): Melita Keywood (0.2), Ruhi Humphries (0.2), Matt Woodhouse (0.2)

8. Justification for the Project Funds requested:

Salaries ($2,649,530):

- Postdoctoral Research Associate — Atmospheric Scientist [7 FTE-years] Will lead research effort on understanding aerosol – cloud – precipitation – radiation interaction processes using existing and new ships, aircraft, and ground-based observations over the Southern Ocean and Antarctica.
- Postdoctoral Research Associate — Atmospheric Scientist [7 FTE-years] Will lead research effort on understanding drivers of the surface radiation bias in ACCESS, analysis of cloud and cloud – radiation processes as a function of large-scale conditions, and ACCESS model evaluation using observational results.
- Research Scientists — Aerosol and Earth System Modelling [$395,961 worth of FTEs]. Co-investment in CSIRO staff for 4 years (Matthew Woodhouse 0.2 FTE/y, Melita Heywood 0.2 FTE/y and Ruhi Humphries 0.2 FTE/y) to lead aerosol work and development of parameterisations of clouds and aerosols for the ACCESS model.

Research Operating ($50,520):
$10,520 is needed over the lifetime of the project for shipping instruments to Hobart for voyages. $40,000 will be used towards duty at sea allowance payable under relevant EBAs.

9. How the proposed work aligns to the scientific plans of AAPP:
The objective of Theme 1 is to improve knowledge of future change in climate and sea level through better understanding of Antarctic and Southern Ocean processes influencing past, present and future climate. The proposed atmospheric project directly fits in this theme. More specifically, Antarctic atmospheric processes affect ice sheet stability and directly influence climate, yet are poorly understood with large errors in model simulations of clouds, aerosol – cloud interactions, and precipitation over Antarctica and the Southern Ocean which in turn bias simulations of surface radiation, snow accumulation, and sea surface temperature, and correspondingly have far reaching impacts on our capability to predict the evolution of sea ice properties and coverage, and high latitude ecosystems and food webs. Improved understanding of clouds is thus a prerequisite for reliable current and future climate simulations, and accurate knowledge of the Antarctic hydrological cycle is essential to determine the current surface mass balance of both the Antarctic Ice Sheet and surrounding sea ice.

10. Project Objectives and Outcomes:
The key science questions for this project are:
- What are the most important deficiencies in weather and climate models that hinder the accurate representation of cloud, radiation and precipitation over the Southern Ocean and Antarctic regions and how are these processes likely to change in a warming climate?
- What are the fundamental properties of aerosols over the Southern Ocean, how do emissions from ocean biota lead to aerosol formation and modification, and how do these properties subsequently affect the properties of clouds, precipitation and the surface energy balance?
- What is the role of ubiquitous super-cooled liquid water clouds in driving the surface radiation biases over the Southern Ocean, and how can we improve their representation in models?

Activities and deliverables
Years 1 and 2:
• Analysis of recently-collected atmospheric observations collected by ship, aircraft and satellite to quantify key aerosol, cloud and precipitation properties, the surface radiation budget, and errors in satellite precipitation products south of 40°S

Years 3 and 4:
- Full quality control and analysis of existing ship observations near the coast of Antarctica, allowing us to begin understanding the respective role of phytoplankton and seaspray emissions on aerosol and cloud properties.
- Evaluation of current version of the Australian Community Climate and Earth System Simulator (ACCESS) climate model (ACCESS-CM2) using satellite

observations and of the regional ACCESS weather forecast model using ship observations.
- Implementation of parameterization to represent the MSA cycle
- Start development of parameterization to resolve the link between aerosol and ice nucleating particles in the CASIM aerosol-cloud scheme.

Years 5 and 6:
- Collection and analysis of new ship deployments to address observational gaps identified in Years 1-4 (including the RV Investigator MISO and Cape Grim baseline voyages early 2024 and winter 2025; RSV Nuyina Denman Glacier voyage 2025, To provide new insights into Southern Ocean atmospheric processes and the large-scale conditions that drive surface radiation errors.
- New U.S Department of Energy Atmospheric Radiation Measurement (ARM) land-based field campaign CAPE-K (Tasmania) will provide 18 months of data from April 2024 for studying the seasonal cycle of clouds, aerosols and precipitation and to understand processes and their interactions and provide the data for evaluating high-resolution model simulations.
- Finalize development of new parameterizations to represent the sulfur cycle, sea spray aerosol and the link between aerosols and ice nucleating particles in the CASIM aerosol-cloud scheme.
- Sensitivity experiments on aerosol, cloud and precipitation parameterizations with revised version of ACCESS-AM2 (from work in Years 3-4) to further evaluate ACCESS and fine-tune the new parameterizations.
- Implement the regional version of the UM model that includes the new Cloud Aerosol module (CASIM) scheme and use this to run simulations over key areas, such as MISO voyage, Davis, Cape Grim. Evaluate these simulations against the new datasets as a path toward improving parameterisations within the UM.

Years 7 and beyond:
- Working towards a much-improved climate model able to accurately simulate the surface radiation budget over the Southern Ocean and the Antarctic weather and climate, and for the right reasons (i.e., no compensation of errors).

11. Brief review of the science and intellectual property background, including Background IP and any relevant third-party IP:

ACCESS is a community model derived from the UK Met Office suite of models. Background IP jointly belongs to BoM and CSIRO.

Datasets and codes developed to produce higher-level products from raw data used in this project belong to the individual institutions. Most relevant instruments for this Atmosphere project are the cloud radar data and lidar (BoM), the AAD lidar (AAD), the microwave radiometer (University of Utah), surface radiation measurements (AAD, Marine National Facility (MNF)), aerosol in-situ measurements (CSIRO, Queensland University of Technology (QUT), and Colorado State University (CSU)). All these datasets from past experiments are in the process of being made freely available for research through the CSIRO Data Access Portal. Data collected by the US Department of Energy's ARM (Atmospheric Radiation Measurement)

Programme are freely available and permanently archived on the web, as are aircraft data collected by NCAR.

Project participants acknowledge and agree that all project IP forms part of AAPP IP and will be owned and licensed in accordance with the Formal Collaborative Agreement as is outlined in the Project Terms (ANNEX 4).

12. Proposed methodology:

The project will use observations of aerosol, cloud, precipitation and radiation collected in recent years from ships, aircraft and satellites to improve understanding of the unique cloud and aerosol properties in the pristine atmosphere at high southern latitudes. These observational insights will then be used to improve the existing parameterizations of clouds and aerosols for use in climate models, including the Australian Community Climate and Earth System Model (ACCESS).

Unique aerosol, cloud, precipitation, and radiation datasets have been collected since 2016: RV Investigator CAPRICORN voyages in 2016 and 2018; six weeks of observations with a US research aircraft during the international SOCRATES experiment; two US Dept. of Energy deployments, one aboard Aurora Australis (MARCUS), one on Macquarie Island (AAS-ACRE/MICRE); and two years of data collected at Macquarie Island.

ACCESS model simulations have also been produced by BoM for these observational periods and will be considered as the current status of the model for evaluation purposes. The UK Met Office has also produced some simulations of case studies observed during CAPRICORN 2016.

The observational analysis will focus on better understanding of: 1) aerosol properties, identification of those acting as cloud condensation nuclei and ice nuclei and how these cloud condensation nuclei participate in cloud formation, 2) cloud and precipitation properties, 3) which type of cloud cover corresponds to largest errors in the surface radiation budget, 4) why do satellite precipitation products differ south of 40°S.

A set of sensitivity experiments will then be designed for the high-resolution and global versions of the ACCESS and UK Met Office model following the observational assessment of main issues with the cloud parameterization. An improved model configuration will finally be derived from extensive statistical comparisons against a set of validated satellite products and limited ground, ship, and aircraft observations. Special attention will be paid to jointly (not separately) evaluate different aspects of cloud and surface radiation properties (i.e., both cloud frequency of occurrence and liquid water content, both shortwave and longwave radiation at the surface). This will ensure that the model is not improved through compensation of errors, but through the improvement of the underlying physical processes inside the model.

13. Milestones, tasks, any proposed stop/go milestones in relation to deployment and (as applicable) recovery / maintenance of equipment:

Tasks:

- analyse existing ship and aircraft observations to better understand how aerosols acting as cloud condensation nuclei and ice nuclei participate in cloud formation and produce different cloud and precipitation microphysical properties over the Southern Ocean and Antarctica;
- derive cloud and precipitation macrophysical and microphysical properties from radar, lidar, and other ancillary observations;
- evaluate and contribute to the improvement of satellite aerosol, cloud, precipitation, and surface radiation products over the Southern Ocean and Antarctica
- identify the type of cloud cover associated with the largest model errors in the surface radiation budget (and quantify the magnitude of these errors) through model evaluation;
- provide input into the design of relevant sensitivity experiments on the aerosol and cloud parameterization parameters of the Australian ACCESS and UK Met Office Earth System models (collaboration already established with the UK Met Office scientists);
- produce a set of ACCESS and UM simulations of the observational periods by changing the identified sensitive parameters (i.e., run the sensitivity experiments)
- evaluate the model's ability to simulate cloud properties and surface radiation for each sensitivity experiment using extensive statistical comparisons against a set of validated satellite products and limited ground, ship, and aircraft observations

Milestones:

- Analysis of observations undertaken to provide a better understanding of atmospheric processes involved in aerosol – cloud – precipitation interactions.
- Identification of a set of satellite products which can be used for model evaluation at regional scale using ground and ship observations as references.
- Assessment of current model performance under different large-scale conditions.
- Identification of aerosol and cloud microphysical parameters that can be tuned to improve the model performance using observational results
- Production of sensitivity experiment runs with ACCESS and the UM models.

- Adjusted model configuration produced from model evaluation
- Identification of observational gaps to further our understanding of atmospheric processes and new experiments undertaken to address the gaps.

Although an extensive set of observations has been collected during recent field campaigns, some key data gaps have already been identified around the production of biogenic cloud condensation nuclei and ice nucleating particles from the upper ocean and its role in cloud life cycle. The need for a more statistically significant characterization of the latitudinal and seasonal variability of the atmospheric properties has also been identified. Our plan is to address these known observational gaps during the lifetime of this project as follows:

Years 3 and 4:

- R/V Investigator voyage in Austral Summer 2023 focussing on the interaction between biological productivity of the upper ocean and resulting aerosol and cloud properties (proposal will be submitted in June 2021) (moved to years 5 and 6 due to delay in RV Investigator MISO voyage).
- RSV Nuyina Marginal Ice Zone (MIZ) voyage in Sept – Oct 2023 to investigate why aerosol, cloud properties and surface shortwave radiation biases in ACCESS are different north and south of the Polar Front, and to determine the respective roles of phytoplankton, sea ice, and the Antarctic land mass emissions in aerosol production and resulting cloud and precipitation properties (cancelled due to delays in the commissioning of RSV Nuyina).

Years 5 and 6:

- RSV Nuyina Denman Glacier voyage (2025) to collect more observations, including adjacent to the Antarctic coastline, to investigate the respective roles of phytoplankton, sea ice, and the Antarctic land mass emissions in aerosol production and resulting cloud and precipitation properties.
- RV Investigator MISO voyage in Jan-Mar 2024 to investigate why aerosol, cloud properties and surface shortwave radiation biases in ACCESS are different north and south of the Polar Front, and to determine the respective roles of biological versus sea salt emissions in aerosol production and resulting cloud and precipitation properties.
- U.S Department of Energy Atmospheric Radiation Measurement (ARM) Mobile Facility (AMF) CAPE-K deployment at Cape Grim for 18 months starting in April 2024 to collect long-term observations of aerosol, cloud and precipitation properties to better understand the seasonal cycle of these properties and how models do capture this seasonal cycle.

Year 7 and beyond:

Conduct new long-term aerosol, cloud, precipitation, and surface radiation observations at Casey (minimum 2 years of observations) to quantify and understand the polar water cycle. This campaign will start in late 2026 (if

supported) and will complement the extensive suite of aerosol chemistry and trace gas measurements undertaken (or to be undertaken) at Casey by CSIRO and will provide the first annual cycle information in East Antarctica. It aligns directly with AAPP Atmosphere goals of reducing the Southern Ocean shortwave bias in climate models by understanding the properties and microphysics in air mass regimes experienced at the southern edge of this ocean. It will complement the large Cape Grim US ARM deployment (mid 2024 to late 2025) made at the northern edge of the ocean. Small instrument deployments aboard RSV Nuyina and Macquarie Island will likely complement the main effort at Casey.

Milestones will be established in project proposals and voyage/activity specific workplans, which will include stop/go progress assessments to inform adaptive project management.

All partners recognise that logistical arrangements are not the responsibility of a single agency and if any requests set out in this project plan indicate that logistical support will be provided by one or more partners, such logistical support requires administrative processes and approvals by the host agency. It is the responsibility of the Chief Investigators to ensure logistical arrangements are in place to deliver their research projects, including through applications to the AAS, MNF and international collaborators. The partners acknowledge that this plan is not directive and does not override the host agencies' decision regarding provision, or not, of logistical support.

14. Deliverables, in relation to availability of near-real-time and delayed mode data (as applicable); plus, quality controlled data delivery:

- Improved post-processed datasets for the CAPRICORN, MARCUS, SOCRATES, ACRE, MICRE experiments
- A set of ACCESS and UM model simulations with different settings for the aerosol and cloud parameterizations
- An improved ACCESS model configuration for the simulation of Southern Ocean and Antarctica weather and climate.

15. Risk analysis and how identified risks will be managed:

A risk register has been set up to track project risks. Risks have been analysed to identify the qualitative and quantitative impact of the risks on the project so that appropriate steps can be taken to mitigate them. The risk register is reviewed at least annually with the 'live' risk register located here.

16. Relevance and benefits, including alignment to the Australian Antarctic Strategy and 20 Year Action Plan explaining what will be provided to end-users and how they will benefit from the outcomes derived from the AAPP Project:

The AAPP research strategy directly addresses key science questions identified in the Australian Antarctic Strategic Plan:

Atmospheric processes and change (Stream 1.3). The AAPP will investigate cloud and aerosol processes in the Southern Ocean region. The pristine atmosphere at high southern latitudes results in fundamentally different behaviour of aerosols and

clouds, processes that are poorly represented in climate models and result in persistent biases in climate projections.

Through the modelling activities proposed, this project also closely aligns with goals listed as part of Theme 1 of the Australian Antarctic Strategic Plan, specifically to "enhance performance of coupled earth system models through improved representation of the dynamics of Southern Ocean and Antarctic processes providing more robust analysis of climate change to guide domestic and international responses".

The overarching benefits of our project are (i) a better knowledge of important atmospheric processes and interactions with the ocean and sea ice, specific to the Southern Ocean and Antarctica climate (ii) an improved climate model allowing for the multifaceted impacts of climate change on the high Southern latitude climate to be quantified and used to inform decision making.

The partners acknowledge a new Australian Antarctic Strategy and 20 Year Action Plan was released in 2022. Consistent with section 5.1 of the Formal Collaborative Agreement the AAPP seeks to enable science under the Australian Antarctic Strategy and 20 Year Action Plan. Upon release of the Strategy and Action Plan, the AAPP management committee will review alignment with the updated Strategy and Action Plan and advise researchers across all partner agencies of any inconsistencies, and the implications of any inconsistences, between this plan and the Strategy and Action Plan.

17. Special Conditions:

No variation to the project terms as per ANNEX 4.

ACKNOWLEDGEMENT

The Project Participants acknowledge and agree that, subject to the approval of the project as an AAPP Project, they will participate in and contribute to the AAPP Project under the leadership of the Principal Participants in accordance with this Project Plan and Project Terms.

Signed *University of Tasmania* by an authorised officer

Signature of officer

Name of officer

Office held

Signed *Commonwealth of Australia represented by the Bureau of Meteorology* by an authorised officer

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Signature of officer

Name of officer

Office held

Signed *Commonwealth of Australia represented by the Australian Antarctic Division* by an authorised officer

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Signature of officer

Name of officer

Office held

Signed *Commonwealth Scientific and Industrial Research Organisation* by an authorised officer

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Signed *Commonwealth of Australia represented by Geoscience Australia* by an authorised officer

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Name of officer

Office held

Signed *Integrated Marine Observing System* by an authorised officer

Signature of officer

Name of officer

Office held

Signed *Department of State Growth* by an authorised officer

Signature of officer

Name of officer

Office held

The Program Leader acknowledges and agrees that this project has been approved as an AAPP Project by the Management Committee.

Program Leader at the direction of the Management Committee

Signature of Program Leader

Name of Program Leader

Collaboration Delegate

Signature of Collaboration Delegate

Name of Collaboration Delegate

ANNEX 1: PROJECT BUDGET

5 May 2021 variation – revised as per Management Committee approval dated 5 May 2021.
Summary of variation(s):

1. Application budget versus revised budget.

4 May 2022 variation – revised as per Management Committee approval dated 4 May 2022.
Summary of variation(s):

1. 'Labour' salaries updated to reflect extensions and promotions (across all Projects).

5 May 2023 variation – revised as per Management Committee approval dated 5 May 2023.
Summary of budget variation(s):

1. 'Labour' salaries updated to reflect new UTAS staff agreement, extensions and promotions (across all projects).

1 May 2024 variation – revised as per Management Committee approval dated 1 May 2024.
Summary of budget variation(s):

1. 'Labour' salaries updated to reflect extensions and promotions (across all projects).

ELIGIBLE EXPENDITURE		Year 1 Application Budget	Year 1 Actuals	Year 2 Application Budget	Year 2 Actuals	Year 3 Application Budget	Year 3 Actuals	Year 4 Application Budget	Year 4 Actuals	Year 5 Application Budget	Year 5 Revised Budget	Year 6 Application Budget	Year 6 Revised Budget	Year 7 Application Budget	Year 7 Revised Budget	Year 8 Application Budget	Year 8 Revised Budget	Year 9 Application Budget	Year 9 Revised Budget	Year 10 Application Budget	Year 10 Revised Budget	TOTAL Application Budget	TOTAL Revised Budget
	FTE*Years	2019/20		2020/21		2021/22		2022/23		2023/24		2024/25		2025/26		2026/27		2027/28		2028/29			
Labour																							
Research Associate - Atmospheric Scientist (understanding aerosol – cloud – precipitation – radiation interaction processes)	7.00	148,714	- 95,079	151,688	- 126,813	154,722	- 135,009	157,816	- 145,953	160,972	- 158,988	-	- 166,222		- 42,968							773,911	- 871,032
Research Associate - Atmospheric Scientist (ACCESS model evaluation using observational results)	7.00			151,688	- 125,843	154,722	- 135,009	157,816	- 67,075	160,972	- 154,206	164,192	- 162,963	167,476	- 171,874	170,825	- 177,030	174,242		177,726		1,479,659	- 993,999
Research Scientists — Aerosol and Earth System Modelling/Ice Core Gas Analysis. Co-investment in CSIRO scientists.	2.40	94,896	- 94,896	97,573	- 97,573	100,329	- 100,329	103,163	- 103,163													395,962	- 395,961
Total	**16.40**	**243,609**	**- 189,975**	**400,948**	**- 350,228**	**409,772**	**- 370,347**	**418,795**	**- 316,191**	**321,945**	**- 313,195**	**164,192**	**- 329,185**	**167,476**	**- 214,842**	**170,825**	**- 177,030**	**174,242**	**-**	**177,726**	**-**	**2,649,532**	**-2,260,992**
Plant and Equipment																							
Total		-		-		-		-		-		-		-		-		-		-		-	
Research Operating																							
Shipping instruments to Hobart for voyages						5,000	-				- 5,000					5,520	-5520					10,520	- 10,520
Duty at Sea allowance payable under relevant EBAs						20,000	-				- 20,000					20,000	-20000					40,000	- 40,000
Total		-		-		**25,000**	-	-		-	**- 25,000**	-		-		**25,520**	**- 25,520**	-		-		**50,520**	**- 50,520**
TOTAL		**243,609**	**- 189,975**	**400,948**	**- 350,228**	**434,772**	**- 370,347**	**418,795**	**- 316,191**	**321,945**	**- 338,195**	**164,192**	**- 329,185**	**167,476**	**- 214,842**	**196,345**	**- 202,550**	**174,242**	**-**	**177,726**	**-**	**2,700,052**	**-2,311,512**

ANNEX 2: EXPENDITURE SUMMARY

A summary of eligible expenditure by projects.

14 October 2020 variation – revised as per Management Committee approval dated 14 October 2020.
Summary of variation(s):

1. Biogeochemistry 'Research Operating' budget item addition of $10,000 per year from year 2 to year 10, total $90,000 (note that this is matched by CSIRO)
2. Ice Shelves 'Research Operating' budget items reallocated with no change in total research operating funds (see Project Plan – Ice Shelves Annex 1)
3. Sea Ice 'Plant and Equipment' budget item of $25,000 moved to 'Research Operating' budget item
4. Ice Cores 'Labour – Research' co-investment in CSIRO scientists reduced as the Palaeo-Atmospheric Composition was approved in August 2019 as a UTAS position with 50% co-investment from CSIRO. New budget line item 'Research Associate – Palaeo-atmos composition' created reflecting this change including correcting FTE
5. Ice Cores 'Research Operating' wording changed to reflect clause 8
6. Krill and ecosystems 'Research Operating' wording changed to reflect clause 8 (note that the funds for activities on the 20/21 SOLACE ($25,000) and TEMPO ($161,000) voyages were funded from year 1 (19/20) carry forward from this project and other projects, and the science management project.
7. Administration budget item reduced by $10,000 per year from year 2 to year 10, total $90,000 to fund Biogeochemistry 'Research Operating' (see point 1 above)
8. Other Eligible Expenditure 'Leased High Perf Laptops Replaced ~ 3 yrs' revised to 'Software/Licensing' with no change in budget

5 May 2021 variation – revised as per Management Committee approval dated 5 May 2021.
Summary of variation(s):

1. Application budget versus revised budget.
2. Ice Cores 'Labour - Technician Ice Core Analysis' 0.5FTE years 3-6 changed to 1FTE in years 3-4 only.
3. Ice Cores 'Research Operating' budget item additional of $80,300 in year 3 for air sample preparation lines for CO2 and N2O concentrations and isotopes on mass spec.
4. Oceanography 'Labour – SWOT position' reduced to 3FTE years with addition of 2FTE ACC Analysis oceanographer position in years 6-7.
5. Revised budget for 'Other Eligible Expenditure' items related to data management, general administration expenses, communications, management committee, visiting fellowships, publications, software/licensing, data workshops/conferences, and science conference sponsorship have been reduced by 30% in years 3-8 and 90% in year 2.

4 May 2022 variation – revised as per Management Committee approval dated 4 May 2022.
Summary of variation(s):

1. 'Labour' salaries updated to reflect extensions and promotions (across all Projects).

2. Ice Cores ‘Research Operating’ budget items additional of $15,000 in year 4 for operation and measurements of new mass spectrometer and freight of ice core samples.
3. Move of Year 2 unspent funds to Year 3 (Projects impacted are: Ice Cores; Ice Shelves; and Sea Ice).

5 May 2023 variation – revised as per Management Committee approval dated 5 May 2023. Summary of budget variation(s):

1. ‘Labour’ salaries updated to reflect new UTAS staff agreement, extensions and promotions (across all projects).
2. Ice Cores Technician - Ice Core Analysis position remaining budget to be held until after year 6 and may revert to 0.5 FTE over longer period.
3. Ice Cores ‘Research Operating’ budget changes with lab operating costs budget to continue to roll over unspent funds to later years in readiness for when we need surge capacity for campaigns of ice core processing in anticipation of greater volumes of MYIC ice returning. Field Camp allowance budget to be rolled into lab operating costs as no way to spend this since there is no comparable field allowance for UTAS employed staff under the staff agreement.
4. Ice Cores Research Associates - ice gas measurements and ice core atmospheric sciences moved to commence year 7 due to delays in returning ice.
5. Ice Shelves ‘Research Operating’ budget line items rolled into one: ‘Ice shelves operating budget, includes satellite imagery, data downloads, telemetry, ApRES units and ancillary costs, GPS units and ancillary costs, tower sites with power & telemetry solutions, tools and consumables, and allowance where relevant’. NCI budget line item to remain separate.
6. ‘Other Eligible Expenditure’ $50k budget item to fund additional BGC-ARGO float with sensors that will provide a multidisciplinary suite of timeseries observations ranging from physical, chemical, optical, biological and ecological.

1 May 2024 variation – revised as per Management Committee approval dated 1 May 2024. Summary of budget variation(s):

1. ‘Labour’ salaries updated to reflect extensions and promotions (across all projects).
2. Ice Cores ‘Research Operating’ budget in years 5 to 8 partially reallocated to year 10 ($70k in total).
3. Ice Shelves – Research Associate Oceanographer final 3 months of the 4 FTE delayed to year 10 due to the commencement of a DECRA.
4. Ice Shelves ‘Research Operating’ budget in years 6 to 9 partially reallocated to year 10 ($5k per year).
5. Ice Shelves amended ‘National Computing Infrastructure (NCI)’ high performance computing and modelling expenditure to reflect agreement $51k per year in years 6 to 9. Reallocated savings to year 10.
6. Sea Ice amended ‘National Computing Infrastructure (NCI)’ high performance computing and modelling expenditure to reflect agreement $51k per year in years 6 to 9. Reallocated savings to year 10.
7. Oceanography ‘Hydrochemistry’ budget item to fund hydrochemistry onboard the RSV Nuyina for the Denman Marine Science voyage ($133k for year 6, 2024/25) and the CSEACOM voyage ($171k for year 7, 2025/26).

8. Sea Ice – Research Associate – Sea Ice Remote Sensing reduction in year 6 expenditure due to the commencement of a Future Fellowship in year 5.
9. Sea Ice – Research Associate – Sea Ice Quantitative Biogeochemist moved to commence in year 7.
10. Krill and Ecosystems – Sea Ice Invertebrate Ecologist 4.0 FTE position (not commenced) converted to Plankton Technician 3.0 FTE and Research Fellow – Plankton Ecology (AAPP contribution of 0.75 FTE over 3 years).
11. Krill and Ecosystems – Research Associate – Remote Sensing Zooplankton and Krill delayed position commencement (following resignation) to year 6 and further discussion within project on best use of this position.
12. Krill and Ecosystems 'Micro-optode' budget item to fund a dedicated micro-optode (dots) system for measuring responses by zooplankton under environmental stressors ($31.9k for year 6, 2024/25).
13. Krill and Ecosystems 'Research Operating' budget in years 7 to 9 partially reallocated to year 10 ($20k per year).
14. 'Administration' moved $20k per year in years 5 to 9 to year 10.
15. 'Other Eligible Exependiture' reduced Chair stipend budget in year 5 to reflect ~8.5 month MC Chair vacancy, partially reallocated budget for visiting fellowships, staff training, science conference sponsorship from years 5 to 9 to year 10, and increased budget for scholarship top-ups in years 6 to 10 to reflect current awards.

ELIGIBLE EXPENDITURE SUMMARY	Year 1 actuals	Year 2 actuals	Year 3 actuals	Year 4 actuals	Year 5 application budget	Year 5 revised budget	Year 6 application budget	Year 6 revised budget	Year 7 application budget	Year 7 revised budget	Year 8 application budget	Year 8 revised budget	Year 9 application budget	Year 9 revised budget	Year 10 application budget	Year 10 revised budget	TOTAL application budget	TOTAL revised budget
	2019/20	2020/21	2021/22	2022/23	2023/24		2024/25		2025/26		2026/27		2027/28		2028/29			
Atmosphere																		
Labour - Research	189,975	350,228	370,347	316,191	321,945	313,195	164,192	329,185	167,476	214,842	170,825	177,030	174,242		177,726		2,649,530	2,260,992
Plant and Equipment																		
Research Operating						25,000					25,520	25,520					50,520	50,520
Total	**189,975**	**350,228**	**370,347**	**316,191**	**321,945**	**338,195**	**164,192**	**329,185**	**167,476**	**214,842**	**196,345**	**202,550**	**174,242**		**177,726**		**2,700,050**	**2,311,512**
Ice cores																		
Labour - Research	310,932	279,962	176,603	153,389	148,093	166,166	479,439	175,247	334,951	526,411	341,650	420,422	348,483	364,681		375,622	3,121,351	2,949,436
Plant and Equipment																		
Research Operating	33,641	53,282	112,582	9,650	53,909	65,524	54,987	34,987	56,087	36,087	45,947	30,947	46,866	46,866	47,804	172,804	501,068	596,369
Total	**344,573**	**333,244**	**289,185**	**163,039**	**202,002**	**231,690**	**534,426**	**210,234**	**391,038**	**562,498**	**387,597**	**451,369**	**395,349**	**411,547**	**47,804**	**548,426**	**3,622,419**	**3,545,805**
Ice shelves																		
Labour - Research	102,184	428,906	543,691	582,214	382,287	525,412	554,125	363,600	565,207	472,607	576,511	527,176	500,921	273,511	66,623	-4,510	3,878,250	3,814,790
Plant and Equipment																		
Research Operating	25,189	51,934	175,767	112,705	64,946	174,292	71,245	66,827	82,670	67,244	84,323	67,669	86,010	62,582	87,730	123,319	1,005,428	927,529
Total	**127,373**	**480,840**	**719,459**	**694,918**	**447,233**	**699,705**	**625,369**	**430,427**	**647,877**	**539,851**	**660,834**	**594,845**	**586,930**	**336,093**	**154,353**	**118,809**	**4,883,677**	**4,742,320**
Oceanography																		
Labour - Research	414,283	551,958	604,258	689,516	879,645	859,208	701,196	915,156	751,342	1,090,691	730,067	730,067	528,335	702,577	177,726		6,771,163	6,557,714
Plant and Equipment	800,000	300,000	450,000	450,000	450,000	450,000	150,000	283,000	150,000	321,000	150,000	150,000	150,000	150,000	150,000	150,000	3,200,000	3,504,000
Research Operating	20,000	20,400	63,144	51,464	51,889	51,889	22,082	22,082	52,763	52,763	53,214	53,214	53,673	53,673	23,902	23,902	412,530	412,531
Total	**1,234,283**	**872,358**	**1,117,402**	**1,190,980**	**1,381,533**	**1,361,097**	**873,277**	**1,220,238**	**954,105**	**1,464,454**	**933,280**	**933,281**	**732,009**	**906,250**	**351,628**	**173,902**	**10,383,694**	**10,474,245**
Biogeochemistry																		
Labour - Research	596,533	593,902	783,818	909,501	922,812	916,059	820,245	955,255	838,796	1,103,297	686,953	830,336	352,344	235,256	119,430		6,935,138	6,923,957
Plant and Equipment	300,000	300,000															600,000	600,000
Research Operating	25,990	47,740	86,536	96,024	56,209	66,209	26,402	36,402	64,643	74,643	87,774	97,774	27,753	37,753	28,222	38,222	514,698	607,293
Total	**922,523**	**941,642**	**870,354**	**1,005,525**	**979,021**	**982,268**	**846,646**	**991,657**	**903,439**	**1,177,940**	**774,727**	**928,110**	**380,097**	**273,009**	**147,652**	**38,222**	**8,049,837**	**8,131,250**
Sea ice																		
Labour - Research	110,298	412,907	458,372	492,987	482,917	420,180	492,575	273,607	502,427	478,216	512,475	497,861	174,242	429,296		471,952	3,854,738	4,045,675
Plant and Equipment					5,000		5,000										25,000	
Research Operating		28,677	1,374	59,161	54,122	122,957	115,204	116,000	56,308	51,000	117,434	111,000	58,583	51,000	59,755	161,317	727,486	702,486
Total	**110,298**	**441,584**	**459,746**	**552,148**	**542,038**	**543,137**	**612,779**	**389,607**	**558,735**	**529,216**	**629,909**	**608,861**	**232,825**	**480,296**	**59,755**	**633,269**	**4,607,224**	**4,748,161**
Ecosystems/krill																		
Labour - Research	97,504	274,115	283,847	443,418	482,917	378,834	492,575	349,982	502,427	524,572	512,475	544,511	174,242	377,499	177,726	140,858	3,880,777	3,415,141
Plant and Equipment								31,900										31,900
Research Operating	6,453	250,039	55,846	13,640	64,946	61,555	66,245	66,245	67,570	47,570	68,921	48,921	70,300	50,300	71,706	191,706	656,983	792,277
Total	**103,958**	**524,154**	**339,693**	**457,059**	**547,863**	**440,389**	**558,820**	**448,127**	**569,996**	**572,142**	**581,396**	**593,432**	**244,541**	**427,799**	**249,432**	**332,564**	**4,537,760**	**4,239,318**
Scientific Program Management																		
Labour - Project Management	90,479	251,870	260,005	220,190	148,812	222,791	151,789	232,309	154,824	242,427	157,921	251,982	161,079	260,856	164,301	268,681	1,631,530	2,301,588
Operating - Data Management					46,818	12,773	47,754	13,428	48,709	14,096	49,684	14,779	50,677	30,677	51,691	151,691	386,234	237,444
Total	**90,479**	**251,870**	**260,005**	**220,190**	**195,630**	**235,564**	**199,543**	**245,736**	**203,534**	**256,523**	**207,605**	**266,760**	**211,757**	**291,533**	**215,992**	**420,372**	**2,017,764**	**2,539,032**
Travel and Accommodation																		
Travel and accommodation	16,263	-2,276	33,936	150,326	146,128	146,128	149,051	149,051	152,032	152,032	155,073	155,073	158,174	158,174	161,337	161,337	1,478,212	1,120,043
Total	**16,263**	**-2,276**	**33,936**	**150,326**	**146,128**	**146,128**	**149,051**	**149,051**	**152,032**	**152,032**	**155,073**	**155,073**	**158,174**	**158,174**	**161,337**	**161,337**	**1,478,212**	**1,120,043**
Administration																		
Administration (incl Admin Labour)	148,180	182,687	187,487	246,071	281,247	276,742	286,872	306,541	292,609	323,187	298,462	355,555	304,431	404,094	311,222	643,684	2,845,755	3,074,230
Total	**148,180**	**182,687**	**187,487**	**246,071**	**281,247**	**276,742**	**286,872**	**306,541**	**292,609**	**323,187**	**298,462**	**355,555**	**304,431**	**404,094**	**311,222**	**643,684**	**2,845,755**	**3,074,230**
Audit cost																		
Audit Cost			2,756			10,000	32,473			10,000	33,785			10,000	35,150	10,000	162,620	42,756
Total			**2,756**			**10,000**	**32,473**			**10,000**	**33,785**			**10,000**	**35,150**	**10,000**	**162,620**	**42,756**
Other Eligible Expenditure (Excl Research Operating)																		
Management Committee		10,000	10,000	10,000	32,473	15,000	33,122	30,000	33,785	30,000	34,461	30,000	35,150	30,000	35,853	45,000	328,492	210,000
Visiting Fellowships	4,819		4,984	10,598	51,957	28,000	52,996	28,000	54,056	28,000	55,137	28,000	56,240	28,000	57,364	63,000	525,587	223,401
Publications		16,742	33,560	33,148	54,122	31,500	55,204	35,000	56,308	35,000	57,434	35,000	58,583	35,000	59,755	75,000	547,486	329,950
Software/Licensing		5,274	5,666	3,390	21,067	14,747	21,067	14,747	21,067	14,747	21,067	14,747	21,067	14,067	21,067	28,067	210,666	115,452
Data Workshops/Conferences				50,000													101,000	50,000
Science Conference Sponsorship			18,534	24,780	54,101	37,871	55,183	23,628	56,286	24,400	57,412	25,188	58,560	23,560	59,732	139,732	446,314	317,694
Staff training	2,035	6,890	3,688	16,620	32,473	20,473	33,122	21,122	33,785	21,785	34,461	22,461	35,150	23,150	35,853	95,853	328,492	234,078
Scholarships & top-ups		7,973	39,896	85,380	66,000	119,606	57,000	160,521	36,000	135,411	12,000	79,915		39,099		-168,551	252,000	499,249
Facilities running costs	180,000	183,600	187,272	191,017	194,838	194,838	198,735	198,735	202,709	202,709	206,763	206,763	210,899	210,899	215,117	215,117	1,970,950	1,970,950
Total	**186,855**	**230,478**	**303,600**	**424,934**	**507,029**	**462,035**	**506,429**	**511,753**	**493,996**	**492,052**	**478,735**	**442,074**	**475,648**	**403,775**	**484,740**	**493,218**	**4,710,986**	**3,950,773**
TOTAL	**3,474,758**	**4,606,809**	**4,953,971**	**5,421,381**	**5,551,671**	**5,726,948**	**5,389,878**	**5,232,556**	**5,334,837**	**6,294,737**	**5,337,748**	**5,531,912**	**3,896,002**	**4,102,571**	**2,396,791**	**3,573,803**	**49,999,998**	**48,919,445**

ANNEX 3: CSIRO PAYMENT SCHEDULE

The CSIRO payment schedule is shown below by project and is to be paid as two equal 6-monthly instalments.

14 October 2020 variation – revised as per Management Committee approval dated 14 October 2020.
Summary of variation(s):

1. Project 2 – Ice Cores 'Labour – Research' reduced as the Palaeo-Atmospheric Composition was approved in August 2019 as a UTAS position with 50% co-investment from CSIRO
2. Project 5 - Biogeochemistry 'Operating' budget item addition of $10,000 per year from year 2 to year 10, total $90,000 (note that this is matched by CSIRO)

AAPP-CSIRO PAYMENT SCHEDULE BY PROJECT	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	TOTAL
	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	
	$ Ex GST	$ Ex GST	$ Ex GST	$ Ex GST	$ Ex GST	$ Ex GST	$ Ex GST	$ Ex GST	$ Ex GST	$ Ex GST	**$ Ex GST**
Project 1- Atmosphere											
Labour - Research	94,896	97,573	100,329	103,163							**395,961**
TOTAL Project 1	**94,896**	**97,573**	**100,329**	**103,163**							***395,961***
Project 2 - Ice Cores											
Labour - Research	122,078	125,520	129,069	132,712							**509,379**
TOTAL Project 2	**122,078**	**125,520**	**129,069**	**132,712**							***509,379***
Project 4 - Oceans											
Labour - Research	330,846	338,763	396,861	397,967	396,728	372,812	416,391	388,417	354,094		**3,392,879**
Plant and Equipment - Research	800,000	300,000	450,000	450,000	450,000	150,000	150,000	150,000	150,000	150,000	**3,200,000**
Other Eligible Expenditure (incl Research Operating)											
Operating	20,000	20,400	20,808	21,224	21,649	22,082	22,523	22,974	23,433	23,902	**218,994**
Duty at Sea Allowance			42,336	30,240	30,240	0	30,240	30,240	30,240	0	**193,536**
TOTAL Project 4	**1,150,846**	**659,163**	**910,005**	**899,432**	**898,616**	**544,894**	**619,154**	**591,630**	**557,767**	**173,902**	***7,005,409***
Project 5 - Biogeochemistry											
Labour - Research	224,828	231,174	237,701	244,419	251,326	258,427	265,742	273,263	104,622		**2,091,503**
Plant and Equipment - Research	300,000	300,000									**600,000**
Other Eligible Expenditure (incl Research Operating)											
Operating	20,000	30,400	30,808	31,224	31,649	32,082	32,523	32,974	33,433	33,902	**308,994**
Duty at Sea Allowance	4,320	16,416	55,728	64,800	34,560	4,320	42,120	64,800	4,320	4,320	**295,704**
TOTAL Project 5	**549,148**	**577,990**	**324,237**	**340,443**	**317,535**	**294,829**	**340,385**	**371,037**	**142,375**	**38,222**	***3,296,202***
Total	**1,916,968**	**1,460,246**	**1,463,640**	**1,475,750**	**1,216,151**	**839,723**	**959,540**	**962,668**	**700,142**	**212,124**	**11,206,951**

ANNEX 4: PROJECT TERMS

1 INTERPRETATION AND DEFINITIONS

1.1 Unless otherwise defined in this Agreement, the words and expressions in this Agreement have the same meaning as those in the Australian Antarctic Program Partnership (**AAPP**) Formal Collaborative Agreement.

1.2 The interpretation rules set out in Schedule 1 of the Formal Collaborative Agreement apply to this Agreement.

1.3 In this Agreement:

(a) **Agreement** means these Project Terms and the approved Project Plan and includes the schedules and annexures to this Agreement;

(b) **Budget** means the budget for the AAPP Project as set out in the Project Plan;

(c) **Financial Statement** means a statement of all receipts, income, outgoings and expenditure received, derived or incurred in carrying out the AAPP Project in an Approved Form;

(d) **Final Report** means the final report required under clause 9.4 and as specified in clause 9.5;

(e) **Formal Collaborative Agreement** means the Australian Antarctic Program Partnership Formal Collaborative Agreement for the establishment and operation of AAPP;

(f) **Milestones** means the milestones set out in the Project Plan;

(g) **Principal Participant** means the Party leading the AAPP Project and named as the Principal Participant as specified in the Project Plan

(h) **Project Background IP** means the Background IP which Project Participants make available for the conduct of the AAPP Project;

(i) **Project Funds** means that part of the AAPP Funds that the Management Committee has determined will be made available to the Principal Participant for the conduct of the AAPP Project;

(j) **Project Commencement Date** means the commencement date for the AAPP Project as set out in the Project Plan or such other date as the Project Participants agree to in writing;

(k) **Project Completion Date** means the completion date for the AAPP Project as set out in the Project Plan or such other date as the Project Participants agree to in writing;

(l) **Project Contributions** means the money, assets, personnel, facilities and services to be contributed to the AAPP Project by a Project Participant as detailed in the Project Plan;

(m) **Project IP** means Intellectual Property arising from the conduct of the AAPP Project;

(n) **Project Leader** means the person who will lead the AAPP Project and identified as such in the Project Plan;

(o) **Project Objectives** means the objectives of the AAPP Project as detailed in the Project Plan;

(p) **Project Participants** means the Parties involved in the AAPP Project and identified as the Project Participants in the Project Plan (and for the purposes of this Agreement, includes the Principal Participant as the context requires);

(q) **Project Plan** means the Project Plan approved by the Management Committee and any variation subsequently agreed to it;

(r) **Progress Report** means a progress report as required under the Commonwealth Agreements;

(s) **Project Term** means the period referred to in clause 15.

(t) **Special Conditions** means any special or additional terms or conditions agreed by the Project Participants and set out in the Project Plan;

2 APPLICATION OF FORMAL COLLABORATIVE AGREEMENT

2.1 The Project Participants acknowledge that the approved AAPP Project forms part of the Activities under the Formal Collaborative Agreement and that it must be carried out in a manner that conforms to the Formal Collaborative Agreement.

2.2 The provisions of the Formal Collaborative Agreement that expressly or by necessary implication apply to the conduct of the Activities will apply to the conduct of the approved AAPP Project and to the Associate Participants, national collaborators, international collaborators and other funding parties as if they were Principal Participants under the Formal Collaborative Agreement.

3 SPECIAL CONDITIONS

3.1 In the event of any inconsistency between the provisions of this Agreement and the Special Conditions, the Special Conditions will prevail to the extent of the inconsistency.

4 TERM

4.1 The AAPP Project will commence on the Project Commencement Date and, subject to the terms of this Agreement, will terminate on the Project Completion Date.

5 PROJECT FUNDS AND CONTRIBUTIONS

5.1 Subject to clauses 5 and 20, the Collaboration Delegate must pay the Project Funds to the Principal Participant from the AAPP Funds in the manner set out in the Project Plan.

5.2 Each Project Participant must make its Contribution to the AAPP Project for the purpose of pursuing the AAPP Project in the manner set out in the Project Plan or as otherwise reasonably required to ensure the Milestones and Project Objectives are met.

5.3 The Principal Participant will enter into any agreements it deems necessary to secure contributions from third parties.

5.4 The Collaboration Delegate may, on direction of the Management Committee, withhold a payment to the Principal Participant under clause 5.1 if the Principal Participant is primarily responsible for a Milestone that has not been met or a Deliverable that has not been delivered until such time as the Milestone is met or the Deliverable is delivered to the reasonable satisfaction of the Management Committee.

5.5 If AAPP Funds are identified in the Financial Statement provided at the Project Completion Date as unexpended, those funds must be repaid to the Collaboration Delegate.

6 BACKGROUND INTELLECTUAL PROPERTY

6.1 Project Background IP remains in the ownership of the Project Participant making it available.

6.2 Each Project Participant agrees to make its Project Background IP available to the AAPP Project in accordance with clause 16 of the Formal Collaborative Agreement.

7 CONDUCT OF THE AAPP PROJECT

7.1 Each Project Participant will carry out its part of the AAPP Project diligently and in accordance with generally accepted professional, scientific and ethical principles and standards in the conduct of the AAPP Project.

7.2 The Project Participants will:

(a) cooperate with each other and the Project Leader; and

(b) use all reasonable endeavours to ensure;

the AAPP Project meets the Project Objectives, Milestones and Deliverables as specified in the Project Plan.

7.3 The Project Participants acknowledge that the AAPP Project forms part of the Activities and that the AAPP Project will be managed by the Project Leader through the Principal Participant, the Program Leader and the Management Committee.

8 COMPLIANCE

8.1 Each Project Participant will ensure that all applicable codes of conduct and guidelines in carrying out the AAPP Project including any codes and guidelines with respect to research involving humans or animals adopted by the National Health and Medical Research Council (including without limitation the National Statement on Ethical Conduct in Research involving humans and the Australian Code of

Practice for the care and use of animals for scientific purposes) and by the Office of the Gene Technology Regulator, are observed at all times.

8.2 Each Project Participant will, where necessary or appropriate, undertake research using a relevant ethics committee or committees constituted in accordance with the codes and guidelines referred to in clause 8.1, to oversee all ethical clearances which may be required under those codes and guidelines. In addition to usual approvals/ethics approvals:

- For all projects on Macquarie Island, the approval of the Tasmanian Government is also required;
- All projects within Antarctica and the Southern Ocean below 60S must comply with the requirements of the Australian Antarctic program for environmental and ethics approvals; and
- All projects on Australian sub Antarctic islands must comply with the relevant Government requirements. E.g. Macquarie Island Tasmanian Government and Heard and Macdonald Islands (Australian Government laws administered by AAD).

8.3 Each Project Participant must comply with all applicable acts, ordinances, rules, regulations and by-laws applicable to the conduct of the AAPP Project in its state or territory including but not limited to State/Territory legislation about working with children and vulnerable people, and will also comply with the Antarctic Treaty and its 4 international agreements including all Commonwealth legislation relating to Antarctica.

8.4 When requested by the Program Leader or Collaboration Delegate, each Project Participant must provide evidence of the matters referred to in this clause 8 to the Program Leader or Collaboration Delegate as requested.

9 REPORTING

9.1 The Principal Participant will ensure that the Project Leader prepares and provides to the Program Leader the Progress Reports annually or otherwise upon the dates required to enable the Collaboration Delegate to comply with the reporting requirements under the Commonwealth Agreement(s)) on the conduct of the AAPP Project and the Milestones and Deliverables set out in the Project Plan.

9.2 Each Progress Report will be in writing and in an Approved Form with a level of detail reasonably acceptable to the Management Committee and will include:

(a) the name of the AAPP Project and the Project Leader;

(b) a description of each Milestone and the date on which it was reached or the reasons why it was not reached;

(c) a report on the activities conducted by the Project Participants to achieve the Milestones and Deliverables;

(d) details of expenditure incurred to date;

(e) any knowledge or discoveries and contributions to end users, including Project IP, made since the last Quarterly Progress Report;

(f) any variation which the Project Participants would like to make to the AAPP Project's methodology or Milestones; and

(g) any further information reasonably requested by the Program Leader.

9.3 The Program Leader may reasonably require the Project Leader to provide interim reports. Such interim reports will be in an Approved Form and address matters specified by the Program Leader from time to time. Interim reports must be provided to the Program Leader within 30 Business Days of the Project Leader receiving a request from the Program Leader to provide such a report.

9.4 The Project Leader must within 30 Business Days of the Project Completion Date prepare and provide to the Program Leader a Final Report.

9.5 The Final Report will be in writing in a format and content to be agreed unanimously by the Management Committee and subject to requirements of the Commonwealth Agreement.

9.6 The Final Report will be the final Milestone of the AAPP Project.

9.7 The Final Report must be in an Approved Form and in a level of detail reasonably acceptable to the Management Committee.

9.8 A Project Participant must promptly give any information it holds in relation to the AAPP Project in the form reasonably requested:

(a) to the Project Leader as reasonably necessary to enable the Project Leader to meet the reporting obligations under this Agreement; and

(b) to the Program Leader as reasonably necessary to enable the obligations under the Formal Collaborative Agreement and the Funding Agreements to be met.

10 RECORDS AND ACCOUNTS

10.1 Each Project Participant will keep full and accurate accounting records of its expenditure of Project Funds and its Contributions to the AAPP Project and will provide copies of those records to the Program Leader on request.

10.2 The Management Committee or the Collaboration Delegate may appoint a qualified person to audit the records referred to in clause 10.1 and each Project Participant will give the person undertaking the audit access at all reasonable times to the records and will provide such information and explanations as the person desires for the purposes of the audit.

10.3 The Principal Participant will provide to the Program Leader, at the times Progress Reports are required to be provided under clause 9.1, a Financial Statement covering the period since the last Progress Report.

10.4 A final Financial Statement must be provided to the Program Leader at the same time as the Final Report.

11 VARIATION OF PROJECT

11.1 An AAPP Project may, following a request to vary the AAPP Project from the

Management Committee or from the Principal Participant to the Program Leader, be varied by the Program Leader issuing a Document in Writing to the Project Participants confirming the requested variation or a variation substantially in compliance with the requested variation.

12 OWNERSHIP OF PROJECT IP

12.1 The Project Participants acknowledge and agree that all Project IP forms part of AAPP IP and will be owned and licensed in accordance with the Formal Collaborative Agreement.

12.2 Not Used

12.3 Each Project Participant must ensure that all Project IP is disclosed to the Project Leader as soon as practicable after its creation.

13 INDEMNITY AND INSURANCE

13.1 The Project Participants must maintain adequate product liability, third party liability and other reasonable insurance cover, including professional indemnity insurance, for the conduct of the AAPP Project for the Term and for a reasonable run-off period after expiry of the Term.

13.2 Each Project Participant (the Indemnifier) hereby releases and indemnifies and agrees to keep released and indemnified the other Project Participants and their respective officers and employees agents and representatives (the Indemnified) from and against any Loss howsoever arising that the Indemnified may directly suffer, incur or sustain as a result of any breach of this Agreement by the Indemnifier or any unlawful or negligent act or omission of the Indemnifier or any of its officers employees agents or representatives arising out of the conduct of the AAPP Project.

13.3 The liability of the Indemnifier under clause 13.2 will be reduced having regard to the extent to which the Indemnified contributed to the Loss in respect of which it seeks indemnity.

13.4 The obligations under this clause 13 will survive expiration or earlier termination of this Agreement.

13.5 Clause 13.1 does not apply to a Project Participant which is an agency or instrumentality of the Commonwealth or a State or Territory which self-insures.

14 CONFIDENTIALITY

14.1 A Project Participant's Confidential Information may only be:

(a) disclosed to another Project Participant's officers, employees and students who need access to the Confidential Information for the conduct of the AAPP Project and to another Project Participant's financial or legal advisers provided that they are subject to a legal obligation to maintain the confidentiality of the Confidential Information; and

(b) must only be used for the purposes of the AAPP Project.

14.2 The obligations under this clause 14 will survive expiration or earlier termination of this Agreement.

14.3 Despite clause 14.1, a Party or a Minister may disclose a Project Participant's Confidential Information to Parliament, Cabinet or a Parliamentary or Cabinet committee or subcommittee.

15 TERM AND TERMINATION

15.1 This Agreement will commence on the Project Commencement Date and, subject to this clause 15, terminate on the earlier of:

(a) the Project Completion Date; or

(b) the termination of the Principal Participants Agreement.

15.2 The Management Committee may terminate the AAPP Project on 20 Business Days written notice to the Principal Participant if:

(a) a Milestone has not been met by the due date and is not met within 20 Business Days after the Program Leader gives written notice to the Principal Participant;

(b) a Deliverable has not been supplied by the due date and is not supplied within 20 Business Days after the Program Leader gives written notice to the Principal Participant; or

(c) in the reasonable opinion of the Management Committee, the Project Objectives are unlikely to be met.

15.3 If the AAPP Project is terminated under clause 15.2 and there are sufficient Project Funds, the Collaboration Delegate will reimburse each Project Participant from the Project Funds for its reasonable expenses, as agreed by the Management Committee, necessarily incurred because of the early termination of the AAPP Project.

15.4 A Project Participant who is reimbursed under clause 15.3 must take reasonable steps to mitigate the expenses it incurs.

15.5 The total amount paid to each Project Participant must be no more than the balance of the Project Funds payable to the Project Participant if the AAPP Project had not terminated.

15.6 If there are insufficient Project Funds to reimburse all expenses, each Project Participant will be reimbursed on a pro rata basis.

15.7 Termination of the AAPP Project for any reason is without prejudice to the continuing enforceability of any rights and obligations of the Project Participants existing at the termination date.

15.8 The obligations in relation to confidentiality, indemnities, Project IP and any other obligations that expressly or by implication are intended to survive the operation of this Agreement will continue beyond termination of this Agreement.

16 EXPULSION OF A PROJECT PARTICIPANT

16.1 The Management Committee may expel a Project Participant from an AAPP Project if Due Cause exists and is not remedied within 20 Business Days after the Program Leader gives written notice to the Project Participant.

16.2 In clause 16.1, 'Due Cause' means:

(a) not making Project Contributions;

(b) unauthorised use of Project IP, Project Background IP or Confidential Information;

(c) any other material breach of the Principal Participants Agreement or this Agreement in conducting the AAPP Project, including not meeting Milestones;

(d) a change or proposed change of personnel that is likely to adversely affect the Project Participant's participation in the AAPP Project; or

(e) not resolving to the Management Committee's reasonable satisfaction, a conflict of interest in relation to the AAPP Project.

16.3 A Project Participant who is expelled from an AAPP Project ceases to be a Project Participant from the date on which the expulsion takes effect under clause 16.1.

16.4 The expulsion of a Project Participant from an AAPP Project does not affect:

(a) the enforceability of other obligations of the Project Participant under the Formal Collaborative Agreement or other AAPP Projects;

(b) rights against the Project Participant accrued at that time or arising from the withdrawal or expulsion;

(c) the obligation on the Project Participant to supply its Project Background IP for the AAPP Project; or

(d) the obligations on the Project Participant in relation to confidentiality, indemnities, Project IP and any other obligations that expressly or by implication are intended to survive the operation of this Agreement.

16.5 The withdrawal or expulsion of a Project Participant from the AAPP Project does not relieve the other Project Participants of their obligations under this Agreement.

17 NOTICES

17.1 The addresses for service of Notices to the Project Participants are those set out in the Project Plan.

18 FURTHER ASSURANCES

18.1 Each Project Participant must do all things and execute all documents necessary to give effect to the provisions and intent of this Agreement.

19 NO AGENCY OR PARTNERSHIP

19.1 The Project Participants enter into this Agreement as independent contractors and nothing in this Agreement will result in a Project Participant being constituted as an agent or partner of another Project Participant.

20 GST

20.1 Unless otherwise expressly stated, all amounts payable under this Agreement are expressed to be exclusive of GST.

20.2 If GST is payable on a Taxable Supply, the amount payable for that Taxable Supply will be the amount expressed in this Agreement plus GST.

20.3 If GST is payable on a Taxable Supply made by one party to another party, then that other party will not be required to pay any amount to the first party in respect of that Taxable Supply unless it has first received a Tax Invoice.

20.4 For the purposes of this clause 20, the terms GST, Taxable Supply and Tax Invoice have the meaning given to those terms in the A New Tax System (Goods and Services Tax) Act 1999 (Cth).