Australian Government

Department of Climate Change, Energy, the Environment and Water

Southern Ocean research aquarium

STATEMENT OF EVIDENCE TO THE PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS

SUBMISSION 1

Date of Submission: 6 November 2024

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1 EXECUTIVE SUMMARY

1.1 The Department of Climate Change, Energy, the Environment and Water (the 'Department'), through the Australian Antarctic Division (AAD), is responsible for leading, coordinating and delivering the Australian Antarctic Program (AAP).

1.2 Antarctic Krill are the keystone animal species of the Antarctic ecosystem.

1.3 Much of the research needed on Antarctic krill to support Southern Ocean conservation and management can only be performed on living krill in a specialised research aquarium. Australia - through the AAD - is recognised as the world leader in aquarium research on Antarctic krill and has maintained various research facilities for many decades.

1.4 After 23 years of operations, the current krill aquarium is reaching its end of life. The need to replace this facility has been recognised by Government and an action to construct a new aquarium was included in the *Australian Antarctic Strategy and Action Plan* and 2022 update.

1.5 A collaborative arrangement has been developed in conjunction with the University of Tasmania (UTas) whereby:

a. UTas will construct a 'cold shell' and related infrastructure to house the new aquarium, and

b. The Department will fit-out the cold shell to create the new aquarium.

1.6 The Department entered into a contractual arrangement in May 2024 with UTas for the construction of the cold shell.

1.7 This submission presents a proposal to fit-out the cold shell and installation of supporting services and infrastructure to establish the new aquarium to support ongoing research into Antarctic krill.

1.8 The new aquarium will allow expanded research across additional Southern Ocean species and evolving krill research areas.

1.9 It will further strengthen Hobart as an international gateway to East Antarctic by developing Southern Ocean research infrastructure.

1.10 Other benefits accruing from this project would include significantly improved health and safety; additional employment opportunities through the construction and operational phases; and increased education opportunities.

2 INTRODUCTION

2.1 This submission to the Parliamentary Standing Committee on Public Works (PWC) presents the second phase of a proposal for the development of a replacement cold-water marine research aquarium (the Southern Ocean research aquarium or SOra) to be co-located at the University of Tasmania's (UTas) Taroona site, in conjunction with similar research facilities operated by them. This aquarium will facilitate research into the biology and ecological resilience of krill (a keystone species), and other related species in the Southern Ocean. The need to build a new aquarium was identified in the *Australian Antarctic Strategy and 20 Year Action Plan* and 2022 update.

2.2 Construction of the new aquarium will be completed in two phases:

a) construction of a 'cold shell' and related infrastructure to house the new aquarium, and

b) fit-out of the cold shell, including construction of an ozone plant, to create SOra.

2.3 In consultation with the PWC Secretariat and the Department of Finance, a medium works submission was lodged in November 2022 to seek approval for the construction of the 'cold shell' to support the development of SOra. UTas are managing the construction of the cold shell and related infrastructure and an Agreement for Lease (AFL) has been executed between the parties to manage the construction of the 'cold shell' building and related infrastructure.

2.4 The cold shell and related infrastructure will be leased to the Department under a long lease term arrangement (up to 30 years).

2.5 This approach was necessary as the Department had to provide a contractual commitment to UTas to ensure the construction of the cold shell but, as the detailed design work was still in the preliminary stages, a P80 costing could not be undertaken and therefore a full PWC submission could not be developed for consideration by PWC.

2.6 This submission addresses the interior fit-out and installation of supporting services within the cold shell to establish the new research aquarium (SOra).

The Australian Antarctic Program

2.7 The Department, through the AAD, is responsible for leading, coordinating and delivering the Australian Antarctic Program (AAP) and administering the Australian Antarctic Territory, and the Territory of Heard Island and McDonald Islands, in the subantarctic.

2.8 The Program is highly collaborative, with partnerships across government and more than 150 national and international research institutions. Australia also works with other national Antarctic programs to run joint international scientific and logistical operations.

2.9 Australia's national interests and vision for future engagement in Antarctica are set out in the *Australian Antarctic Strategy and 20 Year Action Plan*[1] (the 'Strategy and Action Plan'*)* and 2022 update. The Plan recognises Australia's strong strategic and scientific interests in Antarctica and the Southern Ocean, and strives to strengthen Australia's role as a leader in the region.

2.10 The Strategy and Action Plan - first released in 2016 and updated in 2022 - publicly articulates Australia's long-standing national interests and vision for Australia's future engagement in Antarctica. The Strategy and Action Plan details the tangible steps to be undertaken to fulfil the strategy and realise its desired outcomes.

2.11 A key element of the Strategy and Action Plan is "leadership and excellence in Antarctic science". A range of specific actions have been identified to support this element over the next five years including "Build new krill aquaria to study ecological resilience of krill and related species in the Southern Ocean by establishing a new marine research facility co-located with the University of Tasmania".

2.12 Antarctic Krill are the keystone animal species of the Antarctic ecosystem. They are the world's most abundant crustacean and they have the greatest single species biomass of any wild animal. Krill form the staple diet of many animals including whales, seals, penguins, other seabirds, fish and squid.

2.13 How much krill is in the Southern Ocean, and how the population fluctuates, are major questions to address in considering the protection and sustainable management of the Antarctic environment.

2.14 Scientists at the AAD have refined sophisticated echo sounder technology, software and sampling methodology to provide the best estimates so far of krill abundance and distribution in the Indian Ocean sector of the Southern Ocean. This information has been used by the international body that regulates the fisheries of the region — the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) — to set conservative, or 'precautionary', fishing limits that allow for the needs of all the other animals that depend on krill as a food source in the ecosystem.

2.15 Effective management of the krill fishery requires more than estimating the abundance and distribution of krill populations. In ship-based studies and at the AAD's unique cold-water krill research aquarium at Kingston, Tasmania, scientists are examining aspects of the biology of krill that will contribute to the sustainable management of the krill resource. Such studies focus on krill growth, reproduction, ageing and response to climate change and ocean acidification. Understanding these key variables are important for informing the statistical models utilised by CCAMLR to help manage the krill fishery.

2.16 Much of the research needed on Antarctic krill to support Southern Ocean conservation and management can only be performed on living krill in a specialised

[1] *The Australian Antarctic Strategy and 20 Year Action Plan* https://www.antarctica.gov.au/about-us/antarctic-strategy-and-action-plan/

research aquarium. Australia (through the AAD) is recognised as the world leader in aquarium research on Antarctic krill.

2.17 Maintaining this position as world leaders of live krill science is dependent on being able to access a top tier facility to undertake our research.

2.18 Australia's new state of the art research ice breaker, *RSV Nuyina*, has delivered revolutionary capabilities for collecting and transporting live marine specimens from the Southern Ocean. The vessel's "wet well" specimen collection system and integrated containerised aquarium system constitute the world's leading marine specimen capture and transport system for marine research specimens.

2.19 The quality and number of Antarctic marine specimens that can be collected and transported in excellent physiological condition for research now vastly exceeds the capacity of the AAD's existing Antarctic marine research aquarium at Kingston, Tasmania.

2.20 AAD has partnered with UTas to construct a new Antarctic marine research aquarium infrastructure specifically designed to interface with *RSV Nuyina*'s containerised aquaria.

2.21 The aquarium infrastructure will enable sophisticated research to be undertaken on Antarctic krill and related species and will enable the calibration and testing of research instruments that are to be deployed in the Antarctic in support of ecosystem conservation and management work.

2.22 The new aquarium will allow expanded research across additional Southern Ocean species and into evolving krill research areas, including conducting experiments to clarify climate change responses and growth and fecundity rates.

2.23 The aquarium will further strengthen Hobart as an international gateway to East Antarctica by developing Southern Ocean research infrastructure. Research from this aquarium will assist the AAD to provide the basis for Australia to support sustainable management of Southern Ocean fisheries, environmental protection and to enhance leadership in the Antarctic Treaty System.

3 PURPOSE OF WORKS

3.1 The Department provides evidence to the PWC, on the proposed development of the Southern Ocean research aquarium.

Project Aims

3.2 Maintain Australia's status as a leader and innovator in Southern Ocean conservation and management through provision of a state-of-the-art research facility.

3.3 To better understand the biology of Antarctic krill and related species and answer critical research questions on the effects of climate change and ocean acidification on the Southern Ocean ecosystem.

Project Objectives

3.4 The development of the facility will provide a world-leading research aquarium that will support the study of the ecological resilience of krill and related species in the Southern Ocean and will:

a. Ensure continuity of existing research - The new facility will ensure the continuity of Australia's world-leading krill research already being undertaken in the current krill aquarium at Kingston

b. Increase research capacity - The existing aquarium is operating at full research capacity with no room to accept the increased live sample availability delivered through *RSV Nuyina*. The larger facility will significantly enhance the AAD's capacity to undertake more sophisticated and flexible research, leveraging the AAD's new capacity to capture and deliver live Antarctic research specimens in better condition than has previously been achievable

c. Increase research collaboration - The new aquarium will provide a world leading facility to undertake temperate and cold-water research that will attract collaborations with national and international research partners. Located in the greater Hobart region and co-located on site with the UTas' Institute of Marine and Antarctic Science (IMAS), the new facility will confirm Hobart as the preferred Antarctic Gateway for collaborating national Antarctic programs studying temperate and cold-water marine species.

d. Improve flexibility - The aquarium will provide a research facility with an extended lifespan within a flexible framework whereby the configuration can be adapted and modified to cater for evolving research requirements and introduction of additional species to ensure the delivery of world class research over decades

e. Integrate live specimen research technologies - The aquarium will interface with *RSV Nuyina*'s containerised aquaria and will extend live specimen research well beyond the duration of voyages, improving research capability through enhanced sophistication and integration, and

f. Improve workplace, health and safety together with enhance biosecurity regulatory compliance – The new aquarium will introduce significant WHS improvements by adopting a safety-by-design approach so that issues are identified and the risks mitigated in the design phase. A similar approach will also be applied to ensure full compliance with biosecurity regulations.

3.5 On completion of this project, the new research aquarium will continue to support long-term scientific research as well as innovative new research by the Australian Antarctic Division and researchers in the broader Australian Antarctic Program (AAP).

4 NEED FOR WORKS

4.1 AAD krill aquarium research began in the 1980's with *MV Nella Dan*, fundamental research on the krill life cycle was achieved at this time in the most basic facilities. In the 1990's the *RSV Aurora Australis* delivered improved aquarium capabilities which enabled more krill research at sea and in shore based cold rooms at AAD Kingston.

4.2 In 2001, AAD constructed a prototype warm air, cold water aquarium at AAD Kingston to increase research capability and improve work health safety. The facility has been progressively updated and improved since its construction.

4.3 The aquarium is internationally recognised as the leading facility for krill aquarium research internationally, attracting collaborating scientists from around the world to work on all aspects of krill biology. The research conducted on krill feeding, growth, reproduction, schooling, hydroacoustics, and responses to climate change has enhanced Australia's capacity to impact international negotiations on fisheries management and environmental protection in the Southern Ocean.

4.4 The arrival of *RSV Nuyina* in 2021 delivered a transformative platform for Antarctic krill aquarium research. A unique laboratory deep within the vessel, the 'wet well', enables scientists to capture a large number of specimens in superb condition and without the use of dedicated ship time.

4.5 Research conducted at sea can be extended beyond the duration of the voyage through integrated containerised aquaria which transport live specimens back to Australia for ongoing aquarium research. Specimen survival rates have improved from 10% on the *RSV Aurora Australis* to 95% on *RSV Nuyina* utilising wet well caught specimens that are transported in the containerised aquaria.

4.6 The new aquarium infrastructure has been designed to interface seamlessly with the containerised aquaria, making specimen transfer more efficient and safer for both specimens and researchers.

4.7 The aquarium will be located at the University of Tasmania's Taroona research laboratories on the Derwent estuary in Hobart as part of a redevelopment of the site. The new aquarium will take advantage of existing infrastructure and filtered sea water supply and discharge.

4.8 The aquarium will have approximately five times the research space of the AAD's existing Antarctic Marine Research Facility including a 50,000 litre, temperature controlled, 4-metre-deep test tank, dedicated live feed culture facilities and a cutting-edge sea ice research freezer. Research will focus on all areas of krill biology and enable research on related species across the Southern Ocean ecosystem.

4.9 Research that complements Australia's strategic priorities in the Southern Ocean will be undertaken collaboratively within the AAP, national and international collaborators.

4.10 Critically, research on live Antarctic marine species can be undertaken in Australia 24/7, providing Australia an advantage in undertaking influential validated science.

4.11 The aquarium will maintain Australia's leadership in Antarctic krill research and will significantly value add to the investment in *RSV Nuyina* with research extending long beyond the completion of voyages.

4.12 The scientific output from the research aquarium will demonstrate Australia's commitment and leadership in Southern Ocean conservation and management and bolster Australia's influence in Antarctic Treaty negotiations.

Current facility

4.13 After 23 years of operations, the current aquarium is reaching its end of life:

a. It is reaching the end of its economic life where the cost of repairs and maintenance is significant and many of its components are at an age where they need to be replaced

b. There are WHS hazards that are not able to be eliminated and need to be managed through engineering and administrative controls. In recent years there have been more than a dozen reported WHS incidents. Space constraints associated with the current facility have resulted in several areas being designated as 'confined spaces', limiting access and decreasing serviceability and replacement of equipment. This has required significant corrective measures to ensure compliance of the electrical systems and controls with the relevant Australian Standards. Refer to Figures 1 and 2 for examples of the WHS issues

c. The new facility will incorporate safety-by-design principles, prioritising the identification and elimination of hazards through engineered design to mitigate risks

d. The aquarium is operating at capacity and there is no scope to expand current research activities or undertake research in key priority areas

e. Much of the technology used in the aquarium is 20 years old and it is increasingly challenging and inefficient to incorporate current technologies into the facility. For instance, integrating experimentally accurate LED lighting with advanced control features into the existing aquarium control system is challenging, if not unfeasible. Control of this key variable in Southern Ocean research would permit new key areas of research to be undertaken

f. The current facility does not meet all new biosecurity requirements and a formal variation to continue to operate, nominally until the end of 2028-29 financial year, is currently being put in place including known areas of non-compliance. The agreed pathway to compliance is to build a new compliant aquarium and decommission the current facility

g. There are significant operational limitations resulting from the ad hoc improvements to the facility over the years leading to significant inefficiencies

h. The aquarium, being inland with no continuous access to fresh sea water, uses a water recirculation and filtration model requiring labour intensive, and by today's standards, inefficient technologies to ensure the water remains in a clean and habitable state for krill. The aquarium also relies on the regular replacement of sea water to maintain suitable water quality and to achieve this, 10,000 litres of clean sea water is trucked in each fortnight

i. The aquarium, being inland and under biosecurity control discharges its waste sea water to sewer. A 10,000-litre limit per week is imposed by the local water authority on the volume of waste sea water that can be discharged. This also has flow-on limitations on research capacity, and

j. The current aquarium location does not provide sufficient access for integration to the containerised aquarium facilities utilised aboard the *RSV Nuyina* and therefore the improved specimen quality and WHS advantages of this containerised system cannot be realised at the current aquarium site.

4.14 In summary, the aquarium is at its end of useful life, presents significant avoidable WHS issues, is currently operating at capacity without any possibility to expand research, uses ageing inefficient technologies, and no longer complies with biosecurity requirements. As a result, the current krill aquarium needs be replaced if Australia is to remain at the forefront of Southern Ocean research. It is accepted that optimum research results are obtained from flow through research systems such that experimental treatments remain independent of each other. The new aquarium will achieve this and will therefore remain competitive against other research aquaria which are currently being planned by other nations at this time, with Chile significantly progressed in the design of its facility.

Figure 1: WHS issues - Working in a confined space

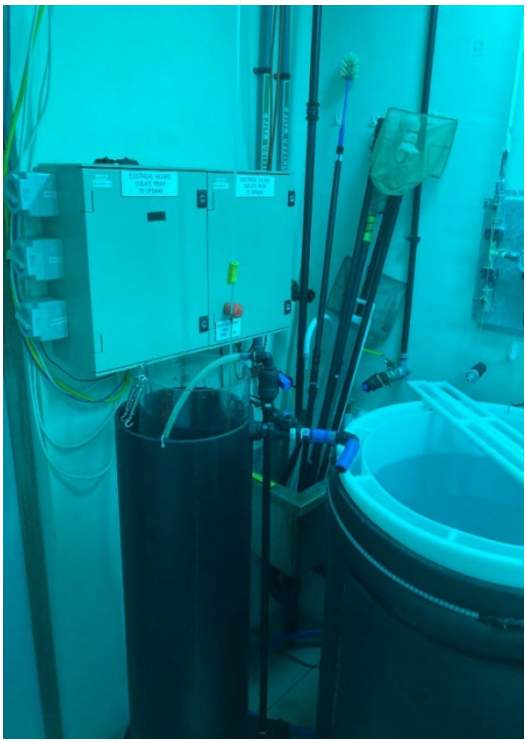


Figure 2: WHS issues – Electrical power outlets and controls located in the same wet space as livestock

5 OPTIONS CONSIDERED

5.1 The following options for a new Southern Ocean research aquarium were identified:

a. Option 1 – Upgrade the existing aquarium facility

b. Option 2 – Construction of a new aquarium at the AAD Kingston site

c. Option 3 - Construction of a new aquarium at a greenfield site

d. Option 4 – Construction of a new aquarium at the University of Tasmania, Taroona site

Option 1 – Upgrade the existing aquarium facility (do nothing is not considered a viable option)

5.2 The current facility is at the end of its economic life and would need to be shut-down in the near future unless a substantial refit was initiated. This option would provide an upgrade and replacement program that would increase the longevity and safety in order to ensure continuation of this important field of research.

5.3 However, this option was not considered feasible as it could not guarantee the biosecurity issues would be addressed. Further, it would be comparatively costly to upgrade the current facility but would effectively result in less available research space and a decreased research capability in order to address the WHS and biosecurity issues.

5.4 This option would not allow for any increase in research activities and research activities would have to cease during the reconstruction works resulting from an upgrade. Additionally, the current facility (and any refurbished facility) would not be able to be directly connected to the containerised aquaria used on-board the *RSV Nuyina* due to the confined site and location, thereby failing to realise the benefits of an integrated process and the associated specimen quality and work health safety improvements of this system.

Option 2 – Construction of a new aquarium at the Kingston site

5.5 Option 2 would deliver a purpose-built aquarium required to deliver on the key research outcomes in this field and provide additional capacity to expand priority research areas in the future.

5.6 However, this option is not considered feasible for such a complex and sophisticated research facility due the inherent water supply issues at the Kingston site.

5.7 As the site is not close to a reliable and continuous source of suitable sea water, the current model involving continuously recirculating sea water with filtration - including the discharge of ‘old’ sea water and trucking in fresh sea water each fortnight - would need to be retained. This would be at a much-expanded volume and frequency to match the increased capacity which would incur significant

increased operational costs due more frequent truck movements for the transport of water. Further, a new aquarium would be constrained by the limit the local water authority has placed on discharging sea water to sewer (10,000-litre per week limit). Any waste sea water in excess of this limit would need to be trucked off site for biosecurity treatment and discharge. This would come at an increased operational cost.

5.8 One purpose of a new aquarium is to expand the AAD's research capabilities. The continuation of a recirculating water model would not be ideal for an expanded facility. Although it would be manageable to maintain suitable water quality, it could potentially compromise the overall quality of science outcomes because reusing water that has already passed through an experimental apparatus can jeopardise the independence of experimental treatments. Operating a flow through, rather than a recirculating, sea water system is therefore a more robust scientific approach but it is also dependent on having a near unlimited supply of sea water and therefore requires the facility to be adjacent to a suitable body of water. Furthermore, animal health is directly related to water quality and as such the most robust research will be conducted with systems that are not limited by water supply.

5.9 The Department recently renewed a 10-year lease for the Kingston site. The limited commitment would introduce a substantial property related risk as SOra has an expected life of around 30 years, a mis-match with the current Kingston lease arrangement.

Option 3 – Construction of a new aquarium at a Greenfield site

5.10 Option 3 would deliver a purpose-built aquarium at a suitable – as yet unidentified - site required to deliver on the key research outcomes in this field and provide capacity to expand priority research areas in the future.

5.11 Notwithstanding the significant increased cost, extended timeline and limited collaborative opportunities in comparison to the preferred option, this option is the second preferred choice.

5.12 A detailed costing of this option is not feasible as a suitable site has not been identified. However, a high-level cost estimate indicates it would be significantly higher than the preferred option.

5.13 The AAD does not have sufficient funding within its Departmental Capital Budget to support this option and additional funding would need to be sought.

5.14 This option would not capitalise on the significant benefits that would be realised through a collaborative initiative with UTas (refer option 4) which is already a significant partner organisation in the broader AAP. These benefits cannot be under-stated in developing a broader and more encompassing AAP.

Option 4 – Construction of a new aquarium at the University of Tasmania, Taroona site

5.15 This is the preferred option.

5.16 Option 4 would deliver a purpose-built aquarium constructed at the UTas, Taroona site and would deliver on the key research outcomes required in this field and provide capacity to expand priority research areas in the future.

5.17 This is the preferred option due to the lower cost compared to Option 3 and enhanced collaborative opportunities.

5.18 The key elements of option 4 include:

a. The construction of a bio-secure building to meet AAD's requirements to contain the aquarium facility (the 'cold shell' and related infrastructure)

b. AAD would enter into a long-term (30 years) contractual arrangement to secure access to the site and specialist infrastructure required to support the operation of the aquarium

c. The construction of shared reception areas, amenities, and office and meeting spaces

d. the extension of supporting infrastructure on the site (access roads, carparks, hard stand, sewerage, electrical power supply, potable water, communications and fencing)

e. additional investment in shared specialist infrastructure to support the operation of a research aquarium (sea water intake/pump station, incoming sea water treatment to support an aquarium, waste sea water treatment and discharge, chillers, back-up power supply), and

f. Construction of an aquarium (the 'fit-out' of the cold shell to create SOra) to meet AAD's requirements while the existing Kingston research aquarium remains in operation until the new facility is fully commissioned, thereby allowing continuation of research.

5.19 There are significant benefits under this option:

a. it would deliver a cost-effective solution as it is leveraging off the existing infrastructure at the Taroona site (water intake, pump station, water treatment, site infrastructure) and the cost of infrastructure upgrades and common areas within the development would be shared with UTas

b. it is a waterfront site in close proximity to the AAD Kingston facility that already has many of the required approvals in place

c. it has access to a proven high-quality water supply that can support the aquarium

d. the operation of a co-located facility would provide significant operational efficiencies as operating costs would be lower through shared operational and maintenance costs

e. the co-location of the new AAD aquarium with the UTas facility would provide significant advantages through increased opportunities for collaboration between researchers from the two organisations, provide a pathway for students into Antarctic research and in doing so train the next generation of Antarctic marine researchers, increase the number of researchers with marine aquarium research experience to address high priority research questions, enable the open sharing of knowledge and techniques to the benefit of both parties to elevate the quality of research outputs

f. UTas is a significant partner in the broader AAP and the benefits of a co-located facilities cannot be over-stated in developing a broader and more encompassing AAP, and

g. Permit the current krill aquarium to remain operational during construction of the new facility, providing continuity of research and also allow a comprehensive commissioning period.

6 SCOPE OF WORKS

Description of Proposal (Option 4)

6.1 The preferred solution is the construction of a new aquarium at the UTas, Taroona site which is approximately 11 kilometres south of the Hobart CBD, through a 2-phase process.

6.2 Option 4 represents value for money in meeting the Government's commitment outlined in the Strategy and Action Plan to build a new marine research aquarium by leveraging off an existing site with established specialised infrastructure required to support the operation of a new research aquarium.

6.3 The solution as it relates to SOra involves:

a. Cold shell and related works (as part of the UTas broader development – Phase 1):

i. The construction of the cold shell and related infrastructure by UTas to support the operation of the new aquarium. The costs of this development are allocated between the two parties based on the gross floor area of the respective buildings

ii. The redevelopment of specialised infrastructure to support the operation of an expanded research aquarium capability - sea water intake/pump station, incoming sea water treatment system to maintain suitable water quality, and HVAC process water system for aquarium sea water cooling and heating to maintain desired water temperatures and discharge system. Again, this cost is to be shared between the two parties based on a range of measures designed to reflect use by the two parties

iii. The works relating to the cold shell and related infrastructure have been agreed between parties and previously approved through a Medium Works process. This phase has commenced and a comprehensive AFL has been executed between parties, including the draft Lease agreement, to manage the construction, and

b. Fit-out of the cold shell including construction of an aquarium to meet AAD's requirements, connections to any services and other internal works (Phase 2). This activity will be undertaken by the AAD. This is the subject of this proposal to PWC.

Refer to Attachment 1 for the Site plan and Attachment 2 for the renders of the main building.

Refer to Attachment 3 for the internal lay-out of the aquarium (the fit-out) and Attachment 4 for a render of a skid arrangement.

Technical information

6.4 The following information provides high level information on the proposal including specific information on the AAD components (both the cold shell and fit-out). A significant amount of design work has already been completed on the fit-out, including the aquarium systems detailed below.

Shared areas and services

6.5 Shared areas and services are part of the broader UTas development (addressed through Phase 1 and documented in the AFL) and include the following:

a. Common areas – The development will include a reception area together with meeting rooms, other flexible work spaces and a tea room. These areas will be shared with UTas to minimise the building area and construction costs and further promote collaborations with UTas research staff and students.

b. Civil works – The Taroona site already has in place internal roads and car parking to support its current operation. The existing roads and car parking will be extended to support the expanded activities including the AAD aquarium.

Specialist infrastructure

6.6 The site already has a range of infrastructure in place required to support the operation of a marine aquarium. As part of the broader development (addressed through Phase 1), there will be upgrades to the existing specialist infrastructure to support the expanded operation.

6.7 Additional specialist infrastructure that will be undertaken as part of the fit-out works include:

a. Replacement of the ozone plant used to sterilise incoming water, and

b. Inclusion of a bio-secure, continuous-flow, high capacity seawater treatment plant. Waste seawater will be mechanically filtered to 1 micron, then treated with ozone and ultraviolet radiation to ensure that the water is completely sterile and free of residual ozone prior to discharge back to the Derwent estuary in accordance with biosecurity regulations.

Biosecurity

6.8 Antarctic krill and other Southern Ocean research specimens come from outside of the Australian Biosecurity Boundary (12 nautical miles offshore), and they are brought into Australia under a biosecurity import permit and must remain under biosecurity control in Biosecurity Containment Level 2 (BC2) Class 5.2 aquatic biosecurity containment.

6.9 SOra has been designed specifically to meet the relevant biosecurity class requirements to keep live Antarctic krill and other Southern Ocean aquatic organisms.

6.10 There is one notable advancement in the design and this is regarding how the large volume of biosecurity-controlled waste seawater (up to 100,000 litres per day) will be treated before disposal. The current approved biosecurity treatments are not practical or cost effective to implement and maintain for SOra and an appropriate framework is being progressed.

6.11 The Department has worked closely with the Department of Agriculture, Fisheries and Forestry to develop a waste water treatment process that adequately addresses biosecurity risks, is practical to implement and cost effective to establish and maintain. This process involves mechanical filtration to remove particles down to 1 micron in size, chemical sterilization by treating the water with ozone and further sterilisation by ultra-violet light (UV) irradiation which also removes residual ozone before the water is discharged back in to the Derwent River.

6.12 Refer to 6.7 b) above for the works included in the fit-out to support the elevated biosecurity requirements.

Aquarium fit-out

6.13 The aquarium spaces will be arranged such that they can support a flexible array of diverse experimental types.

6.14 The majority of the aquarium spaces will be rooms in which a variety of research apparatus and tanks can be flexibly installed. Adjacent to these spaces will be a large plant and equipment corridor in which skid mounted filtration, temperature and gas control systems will be located. These aquaria will be maintained at Antarctic temperatures while the air is held at a warmer temperature in order to optimise work health and safety.

6.15 The facility will be built to comply with biosecurity requirements for BC2 Class 5.2 Aquatic (5.2.3).

6.16 The research spaces will include:

a. Nine (9) small research rooms designed to accommodate research systems up to 3,000 litres in volume

b. Five (5) large research rooms designed to accommodate research systems up to 8,000 litres in volume

c. One (1) of the large research rooms is designed to Biosecurity Containment Level 2, Microbial (BC2 Class 5.2.1) standard with its own dedicated HVAC system and Plant Room to ensure complete separation of system components

d. Deep tank or 50,000-litre temperature-controlled tank (4-metre-wide by 4-metre-tall) to enable research on krill swarming, and the testing and calibration of acoustic moorings and other equipment

e. Sea ice research freezer to enable the study of sea ice, through simulating sea ice conditions, and its interactions with krill and other species

f. Culture room to support the culturing of phytoplankton and other live feed species as a food source

g. Feed rooms to maintain static stock and parental phytoplankton cultures within a temperature-controlled environment

h. General purpose marine laboratory to undertake water quality analysis, microscopy and prepare scientific samples, and

i. Cold room designed to house short-term experiments where a specified ambient low temperate is required (range -1 to +10 degrees).

6.17 Each research space will be supported by a Recirculating Aquaculture Skid System (RASS) which will be engineered to provide a continuous supply of temperature-controlled, highly filtered seawater for experimental applications.

6.18 Each research space and RASS will have an automated data collection, monitoring and system alarming for components and experimental parameters are managed by an advanced control system that integrates with the facility's Supervisory Control and Data Acquisition (SCADA) system.

6.19 An upgrade to the incoming seawater filtration and treatment plant is incorporated into the works which is required to meet the increased flow rates (water volume) of the new facility.

6.20 The facility will include a bulk seawater store to ensure the system is capable of operating at full capacity for 24 hours should an issue arise in the water supply.

6.21 The facility will include office spaces for aquarium technical personnel, a workshop and store room.

Engineering services

Electrical services

6.22 As part of the fit-out works, lighting and power reticulation systems will be new throughout the building including:

a. distribution board and wiring

b. automated back-up power generators, and

c. energy monitoring system.

6.23 Electrical infrastructure and switchboards will have 20 per cent spare capacity to allow for future growth or increased demand.

Mechanical services

6.24 The mechanical services – plumbing, heating, ventilation and air conditioning (HVAC), elevator - have been designed to meet the functional requirements of the

building and new aquarium. Wherever practical, the fit-out of the cold shell will utilise the mechanical services integrated into the larger development. This will maximise the overall efficiency in providing the services and give rise to cost savings over the medium to longer term.

Hydraulic services

6.25 The new facility will be connected to the site's potable water supply and sewerage systems through a new connection to the existing site services infrastructure.

6.26 Storm-water drainage will be provided to collect storm-water runoff and direct it into the existing infrastructure system.

6.27 Domestic water heating will be included in the fit-out works.

Fire protection

6.28 Fire protection requirements have been developed in consultation with Tasmania Fire Service and are in accordance with the National Construction Code (NCC) and Building Code of Australia (BCA) requirements where applicable. Fire detection and protection will be provided through a combination of standard alarm, extinguishers, hose reels and external hydrant coverage.

6.29 The fit-out includes a separate fire sub-panel connected to the main fire panel. All new fire protection systems will meet Australian Standards.

ICT

6.30 Information and communication technology infrastructure will be developed and installed to support the facility. This will consist of a server room to support the AAD aquarium, dedicated optical fibre connection into the server room and data connections within the building.

7 PLANNING AND DESIGN

7.1 The following information relates to the broader planning construct at the Taroona site. It is provided to the PWC for context about the site and how the new research aquarium fits into the broader UTas development.

7.2 UTas consolidated the IMAS in Southern Tasmania, with the Fisheries and Aquaculture program - comprising teaching and research components - being relocated from the Newnham campus (Launceston) to Taroona (Hobart).

7.3 The Taroona site is located adjacent to the Derwent River and is within a largely residential area. The design of the broader development has been undertaken to minimise noise and not adversely impact on the residential amenity of the area.

7.4 The new buildings included in the broader development will incorporate a building (the cold shell) that will contain the new SOra that will be managed by the AAD.

7.5 Structure - The building consists of a lightweight timber framed structure to the general administration spaces, and a concrete structure for the larger format research facilities. Modular planning and a clear separation between different building parts enables a simple structural grid to be employed throughout.

7.6 Materials and finishes - Heavy concrete structures with hard wearing finishes are incorporated into the design – including the cold shell - where required to accommodate heavy research use, whilst more lightweight tactile materials are incorporated in the general labs and administration (common/shared) spaces. An emphasis on sustainability through the selection of materials and construction methodology promoting a circular economy has been employed throughout.

7.7 Landscaping - The project will involve the creation of a building, roads and car-parking to support the intended use of the site. Landscaping will be undertaken to restore any areas disturbed during construction. The landscape design will be functional with low maintenance a high priority. A water sensitive design approach has been adopted with plants selected indigenous to the area.

8 ENVIRONMENTAL SUSTAINABILITY

8.1 As a government entity, the Department is required to evaluate predicted energy consumption of the development under the APS Net Zero Emission by 2030 target and strategy.

8.2 The building is all-electric and located in Tasmania where the electricity grid is predominately powered by renewable sources, the construction of the cold shell together with the related infrastructure and fitout (the subject of this submission) are already considered compliant with Government energy expectations. However, the Department is still required to undertake an evaluation of energy use for reporting purposes. This is currently being undertaken by consultants to the project.

Heritage and environmental considerations

8.3 The heritage and environmental matters were addressed by UTas in developing the broader Taroona site proposal. This included a number of detailed assessments including:

a. Natural Values Assessments

b. Ecological Assessment

c. Aboriginal Heritage Assessment

d. Acoustic – Noise Assessment

e. Traffic Impact Assessment

f. Bushfire Hazard Report

g. Historic Heritage Management Strategy

h. Preliminary Site Investigation Report

i. Coastal Erosion Report

j. Geotechnical Investigation Report

k. Natural Values Statement – Collision Risk

l. Natural Values Statement – Sea Eagle.

8.4 All reports and assessments were fully developed by independent experts and considered in the Development Application process. The broader development, including the cold shell, takes into consideration the findings and recommendations from these reports. As an example, use of low reflectivity glass to minimise the possibility of bird strike.

Sustainable buildings

8.5 UTas has developed a Sustainability Policy that includes a requirement that 'the University will develop, maintain, and operate sustainable campuses, both built and natural environments, through applying outcomes-driven sustainable design principles, assurance frameworks and operational tools. This framework was applied to the design and constructability of the cold shell.

8.6 In support of the policy, the buildings are being constructed with a 'circular economy' focus. Low energy embodied materials will be used where possible and any new buildings will be constructed in a manner which limits waste and enables for disassembly and reuse in the future.

Measures to reduce energy and water use

8.7 The development, including the infrastructure required to support the operation of the new aquarium, will incorporate various design and operational initiatives to ensure the targets are achieved.

8.8 A key feature of the project is the use of sea water reticulation for building heating and cooling needs. The heating and cooling of the mechanical systems will be achieved through a sea water heat rejection system, coupled to water-to-water reverse cycle chillers which will increase the overall efficiency of the system.

8.9 The AAD has optimised the warm bio-filtration flowrate to improve the energy efficiency of the new facility in comparison to the current aquarium.

8.10 The use of higher energy efficient 3-phase electrical equipment has been specified where possible.

8.11 Electrical energy consumption in both the broader development and the fit-out will be reduced through the use of LED and high efficiency lighting systems, coupled with occupancy sensor controls where possible. An occupancy detection system will be utilised to control HVAC and lighting systems, enabling the automatic stand-down of areas not in use.

8.12 Low water use Water Efficiency Labelling and Standards (WELS) rated tapware and sanitary fittings will be utilised within the project to minimise the use of potable water.

Reuse of existing structures and infrastructure

8.13 The new building is situated within the existing IMAS site, with the existing buildings remaining. The existing sea water pumping station will be used as the basis for the redeveloped water intake/pump station, including the heating and cooling heat rejection circuits. Additionally, the existing site filtration plant (incoming) will be upgraded to provide the required sea water treatment to the aquarium. Several of these buildings and related infrastructure are critical to the operation of the new aquarium.

9 OTHER CONSIDERATIONS

Legislation, codes and standards

9.1 The project will comply will all relevant Commonwealth and Tasmanian legislation, codes and standards relevant to the project.

9.2 Key legislation includes:

a. Building and Construction Industry (Improving Productivity) Act 2016

b. Biosecurity Act 2015

c. Work Health and Safety Act 2011 (Commonwealth)

d. Public Governance, Performance and Accountability Act 2013 (PGPA Act)

e. Nature Conservation Act 2002 (Tasmania)

f. Work Health and Safety Act 2012 (Tasmania), and

g. Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act).

9.3 Key codes and standards include:

a. Code for the Tendering and Performance of Building Work 2016 (the Building Code) which, amongst other considerations, mandates compliance with certain designated building laws, WHS laws, Competition and Consumer Act and Migration Act, and

b. National Construction Code 2016 which sets the minimum requirements for the design, construction and performance of buildings throughout Australia.

Work health and safety

9.4 The design and future operation of the facility will comply with the requirements of the Work, Health and Safety Act 2012, other relevant legislation, regulations and codes of practice, and the relevant policies of the Department and UTas.

9.5 UTas are responsible for the all WHS aspects of the project through the construction phase of the broader development including the cold shell, while the Department will be responsible for the WHS aspects of the fit-out.

9.6 Once the development is fully operational, it has been agreed in principle that UTas will manage all WHS aspects of their buildings and all common/shared areas while the Department will be responsible for managing its aquarium and related operations.

9.7 All project personnel, including contractors and sub-contractors will be subject to the Work Health and Safety Act 2012 (Tasmania) and other relevant WHS regulations.

9.8 Safety aspects relating to the fit-out of the cold shell will continue to be addressed throughout the design process and a safety-in-design approach has been adopted to identify and eliminate wherever possible potential risks.

9.9 As part of its obligations, UTas maintains a register of all known hazardous materials at the site which includes chrysotile (asbestos) on some pipe lagging, switchboard enclosures and asbestos cement sheeting. All hazardous materials are identified with warning labels and subject to regular inspection. The majority of the development – construction of the new building – will not be impacted by hazardous materials although the redevelopment of specialist infrastructure may encounter hazardous materials. Any construction works involving or adjacent to hazardous materials will be closely managed in conjunction with the contractor and be in accordance with the relevant standards.

Provision for people with disabilities and childcare facilities

Accessibility

9.10 The facility has equal access to both floors (through the main foyer and via internal lift). Research rooms and marine laboratories have been designed in-line with AS1428.1 'Design for access and mobility, Part 1: General requirements for access - New building work'. Equal access consultants have provided guidance through the design phase to ensure compliance and usability.

Childcare facilities

9.11 SOra will be classified and operate as a BC2 Research facility, thus restricting access to only trained and inducted personnel. The wider building houses research and teaching laboratories, and marine systems, therefore making it unsuitable to house childcare facilities. The SOra facility will accommodate 6 technical staff only and there are a number of childcare operators in the area should this be required.

Consultation and stakeholder engagement

9.12 The Department, through the AAD, recognises the importance of stakeholder engagement and input into the design process and incorporating comments and feedback into the proposed works.

9.13 Consultation and stakeholder engagement can be divided into two components:

a. consultation through the broader UTas development at the Taroona site, and

b. stakeholder engagement through the design of the fit-out of the cold shell to establish the new research facility, SOra.

Taroona site

9.14 Extensive consultation was undertaken by UTas in submitting and obtaining relevant approvals for the broader development of the Taroona site to support an expansion of activities undertaken by IMAS, including the construction of the cold shell.

9.15 Material issues identified through the process include:

a. safety and traffic management (increased frequency of vehicles and heavy vehicle movements) over the construction period

b. concerns by residents over increased traffic flows associated with an expanded IMAS facility, and

c. loss of 'significant' trees as part of the development.

9.16 Kingborough Council has confirmed that the road was suitable for the intended number of vehicle movements post construction and UTas is managing the vegetation/trees in accordance with planning recommendations.

Fit-out

9.17 The fit-out will cause very little impact to the local community or other parties beyond the 'science community'.

9.18 The Department has actively engaged with the preeminent scientific organisations with an interest in a specialist aquarium research facility including CSIRO, UTas, and Australian Institute of Marine Science (AIMS).

9.19 The Department also convened a reference group to provide specialist input into the design process including subject matter experts from AIMS and the science and technical staff within the AAD.

9.20 Safety in design workshops have been convened with stakeholder engagement to identify, mitigate, and assign risk management responsibilities as appropriate through the design and operation phases.

9.21 Attachment 5 provides an endorsement of the initiative from the Chair – Dr Nick Gales - of the Australian Antarctic Science Council.

10 COST EFFECTIVENESS AND PUBLIC VALUE

Project costs

10.1 The out-turned capital cost of the Southern Ocean research aquarium is estimated to be $36.7 million. This cost estimate includes the construction cost for the cold-shell and related infrastructure, contribution to the construction of shared facilities and the fit-out of the cold shell (construction costs of the aquarium plus services and related costs). It includes professional fees, construction costs, IT infrastructure and equipment, contingencies and an allowance for cost escalation plus contingencies to provide a cost estimate at a P80 confidence level.

10.2 Funding will be provided from existing funding in the Departmental Capital Budget.

10.3 There will be a modest increase in the aquarium's operating costs, primarily due to the need for additional personnel to support a larger facility, along with maintenance and operating costs. Funding will be provided from existing sources within the Department.

Local impact

10.4 The fit-out works will employ a range of construction workers that will support the local construction industry.

10.5 It is difficult to estimate the number of jobs that will be generated prior to engaging a contractor. It is worth noting that several of the specialised systems may need to be sourced from overseas as they are not manufactured in Australia.

10.6 On completion of the aquarium, it is anticipated additional support personnel will be employed by the AAD on an ongoing basis. With the expanded capacity, it is anticipated there will be a significant increase in the amount of research that can be undertaken within the facility. This will present significant opportunities for external research bodies and will lead to a significant increase in the number of researchers. At this stage, quantifying the wider impact is not feasible other than recognising that the facility will be a significant enabler.

Project delivery strategy

10.7 The Department has engaged a team of service professionals that will assist in taking the project through to 100 per cent completion of the design phase, encompassing the design of the fit-out and related services. This phase is substantially progressed and the design is assessed at 90 per cent completion. Subject to Parliamentary approval of the project, the delivery partners will continue to be engaged to manage the procurement, construction and commissioning phases of the project including the defects liability period.

10.8 UTas has commenced construction of the broader development including their buildings and internal spaces, the cold shell, common areas (reception and amenities), all specialist site infrastructure and other related site infrastructure. Through the construction phase, the delivery partner will implement a quality review

process to ensure all elements are delivered in accordance with the requirements documentation and AFL.

Project schedule

10.9 Subject to Parliamentary approval, construction is expected to commence in March 2026 and be completed by September 2027.

Table 1: Anticipated key milestone dates

Milestone	Target Completion Date
Cold shell construction commenced	Commenced in April 2024
Hand-over of the cold shell	February 2026
Commence fit-out works	March 2026
Hand-over of the fit-out works	September 2027
Commissioning commences	September 2027
Commissioning complete	September 2028

Revenue

10.10 No revenue will be generated through the operation of the facility.

Public value

10.11 The public value associated with the project includes:

a. **Scientific research capability**: The facility will ensure that a marine research aquarium is available to facilitate continuation of Australia's current Antarctic marine research and that it has the capacity to meet emerging research priorities

b. **Health and safety**: The new facility will reduce the WHS risks associated with the current facility

c. **Employment opportunities**: The construction activities will create additional jobs through the construction and fit-out phases. The on-going operation of the new facility will support an increased number of researchers, and

d. **Education opportunities**: The facility will enable greater opportunities for postgraduate training and in so doing will be a key element in developing the next generation of Southern Ocean marine scientists.

10.12 The primary purpose of the facility is to provide a platform to undertake research of high scientific and geo-strategic merit, and to support long term management of the krill fishery off the Australian Antarctic Territory. Southern Ocean research is a key area demonstrating Australia's commitment to national and international science programs of high significance.

10.13 This proposal will renew and extend Australia's capability to undertake world leading marine research through a modern and flexible marine aquarium. The facility will work in conjunction with Australia's new state of the art research ice breaker,

RSV Nuyina, which has delivered revolutionary capabilities for collecting and transporting live marine specimens from the Southern Ocean.

10.14 The aquarium will strengthen Hobart as an international gateway to East Antarctica by further developing Southern Ocean research infrastructure. Research from this aquarium will help the AAD to provide the basis for Australia to support sustainable management of Southern Ocean fisheries, environmental protection and to enhance Australia's leadership in the Antarctic Treaty system.

10.15 The project is an action included in the 2022 update to the *Australian Antarctic Strategy and 20 Year Action Plan*.

10.16 Much of the research undertaken through the AAP can be considered a public good in that it is either not undertaken for commercial benefit, relates to the protection and/or greater understanding of Antarctica and the Southern Ocean or supports monitoring of and enhances the understanding of global systems. It is difficult to measure the benefit flowing from this research but, as with all research conducted under the AAP, it is made available to researchers around the world and contributes to a greater understanding of critical elements of earth systems. There continues to be a strong demand to undertake research of high scientific merit in the Southern Ocean and it is expected that this demand will continue.

Attachment 1 – Site plan

(separate file attached to submission)

Attachment 2 – Render of main buildings (including the ‘cold shell’)

A - 2.1 South East view

A - 2.2 Front View

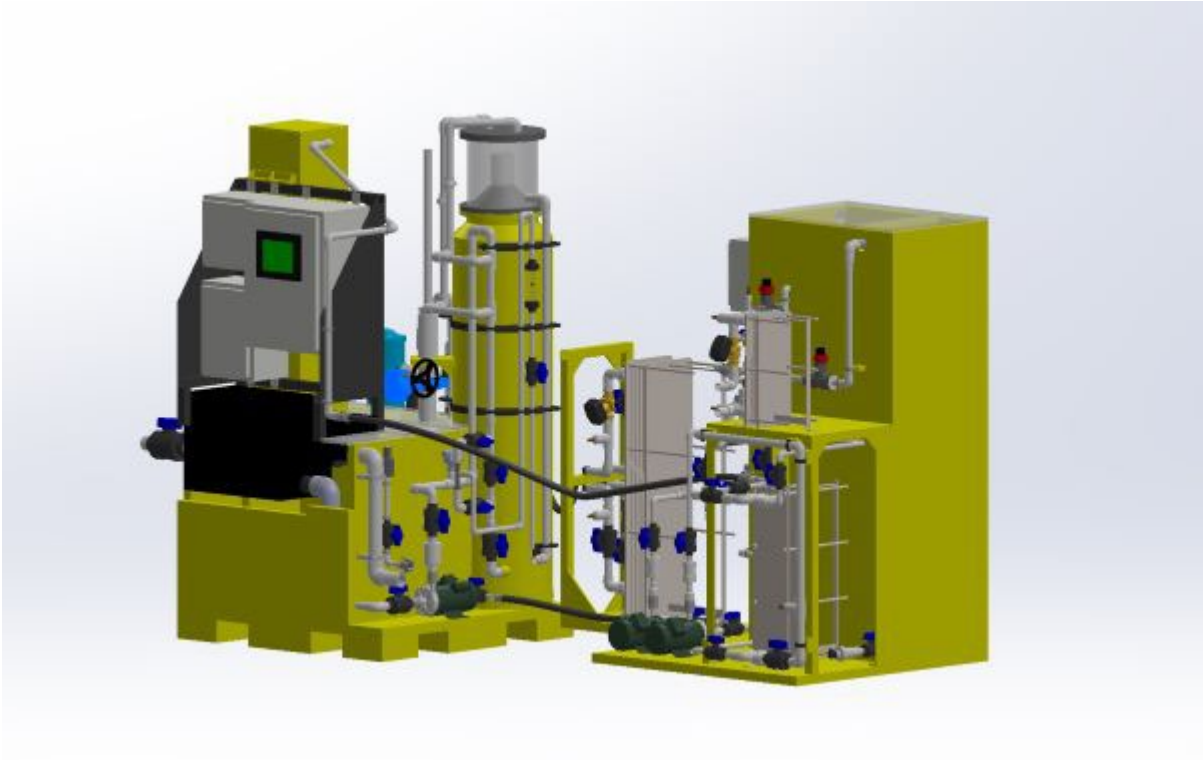
Attachment 3 – Internal lay-out (the ‘fit-out’)

A - 3.1 Ground floor

A - 3.2 Lower floor

(separate files attached to submission)

Attachment 4 – Render Skid arrangement



Attachment 5 – Endorsement of SOra from the Australian Antarctic Science Council

AUSTRALIAN ANTARCTIC SCIENCE COUNCIL

Council Secretariat contact:
Australian Antarctic Division
AASC@aad.gov.au
03 6232 3273

ref: D24/57280

30 October 2024

Public Works Committee
RE: Southern Ocean Research Aquarium

Dear Committee,

I am writing to express support of the Australian Antarctic Division's (AAD) proposed Southern Ocean research aquarium (SOra) to be constructed in collaboration with the University of Tasmania in the Hobart suburb of Taroona.

The role of the Australian Antarctic Science Council is to advise Government on the Australian Antarctic Science Program and to inform the strategic delivery of Australia's National Interests in Antarctica through globally significant and influential science.

Australia is internationally recognised as the world leader in Antarctic krill aquarium research through the use of an existing but aging facility at AAD's Kingston headquarters. In light of the rapid environmental changes occurring in the Southern Ocean, there is an urgent need for both scientific research and policy development focused on Antarctic krill, as well as other crucial species within the ecosystem. Understanding the physiology, behaviour and life history plasticity of these species is essential for modelling potential changes in the Southern Ocean ecosystem under various environmental pressures, and for guiding the sustainable management of Southern Ocean fisheries.

The SOra infrastructure demonstrates Australia's continued leadership in Antarctic krill research and our continued commitment to scientific research in the Antarctic and Southern Ocean in general.

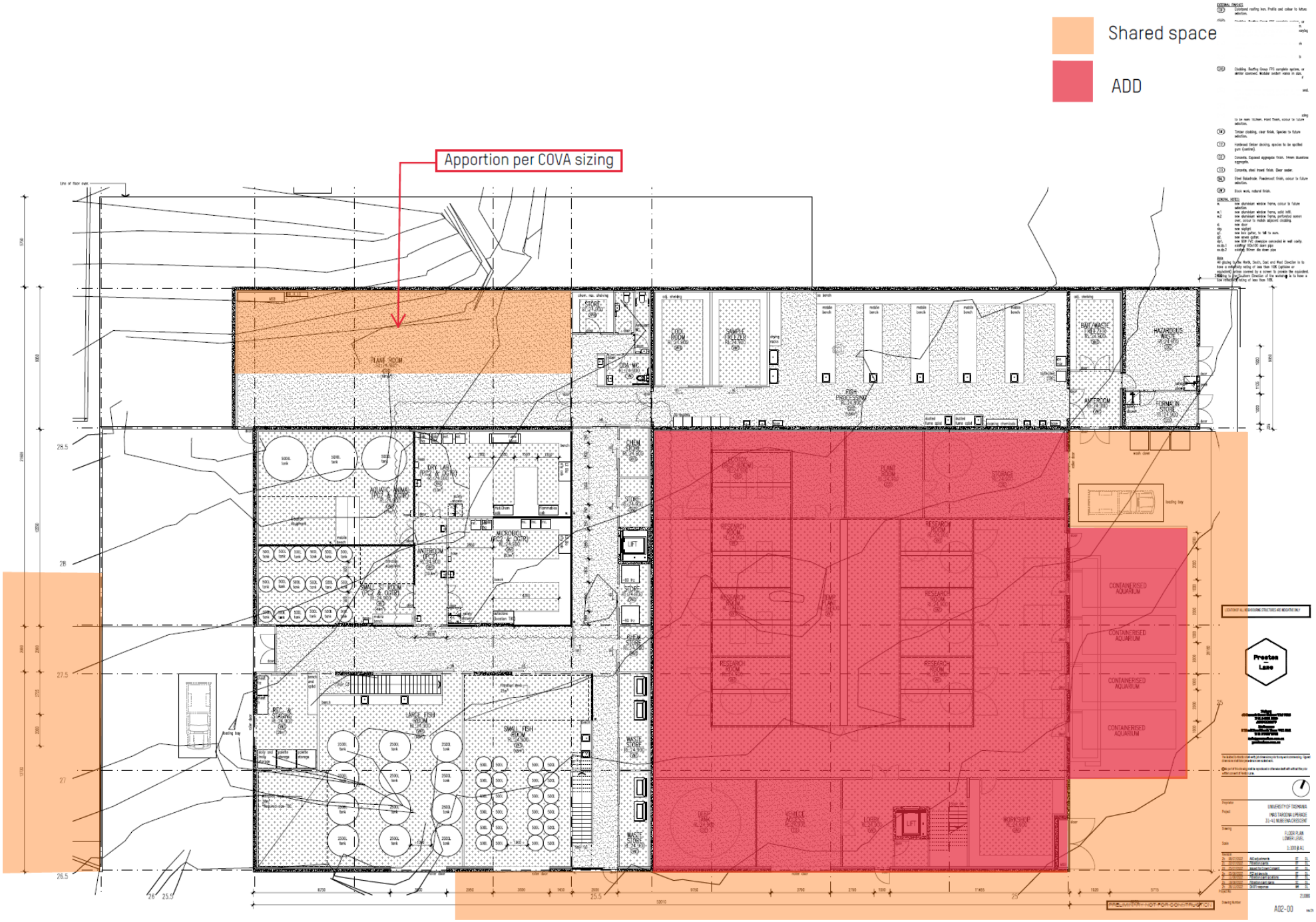
The SOra infrastructure signifies a step change advancement in Australia's experimental marine biological capability in the Southern Ocean. Collaboration with the University of Tasmania in this endeavour will further extend that capability by promoting the training and development of Australia's next generation of Southern Ocean marine biologists. The SOra facility is essential for supporting Australia's objectives in the Antarctic, and I wholeheartedly advocate for its construction and operation as a world class scientific facility.

[redacted]

Dr Nick Gales
Chair, Australian Antarctic Science Council

Page 1 of 1

Attachment 1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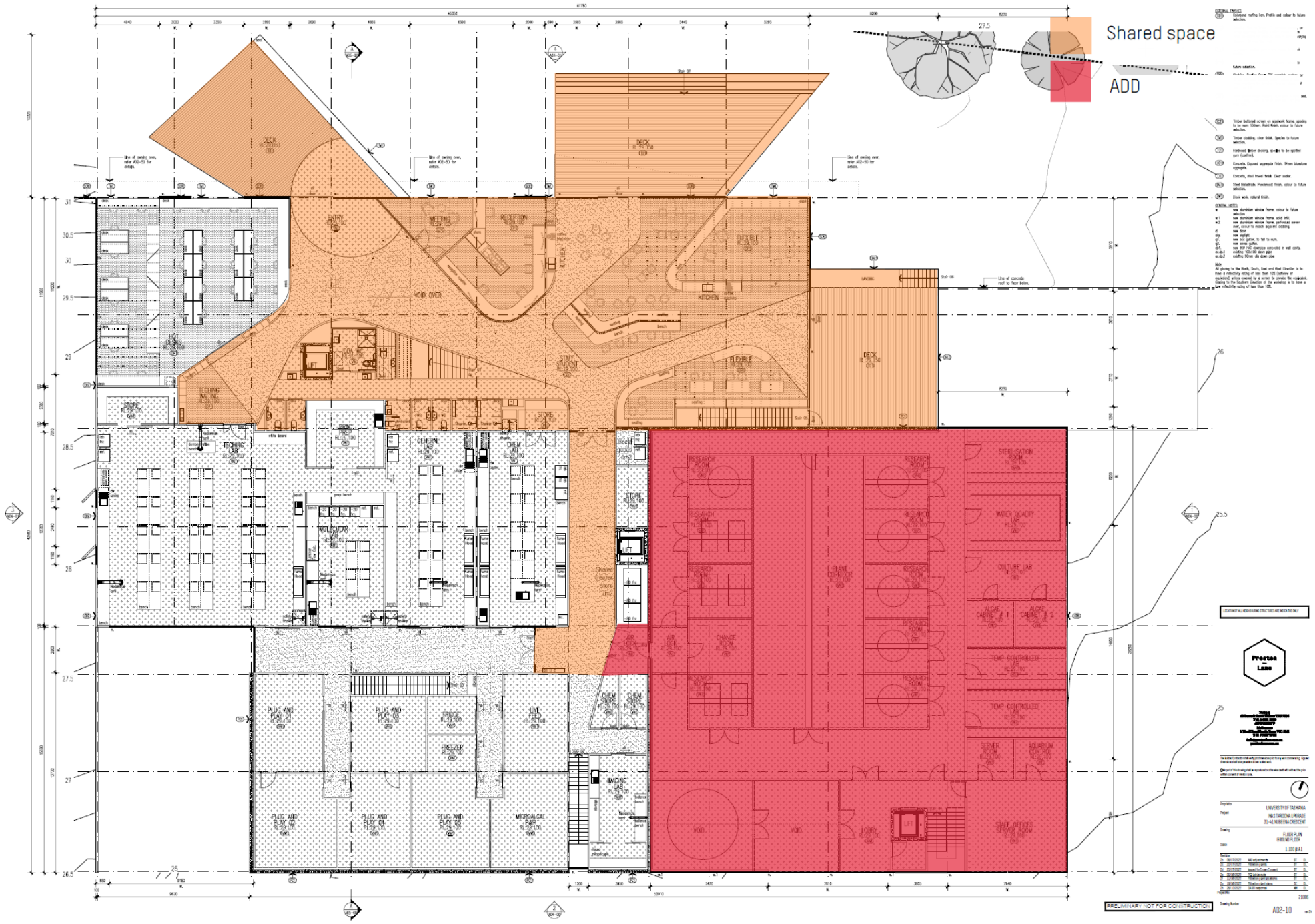
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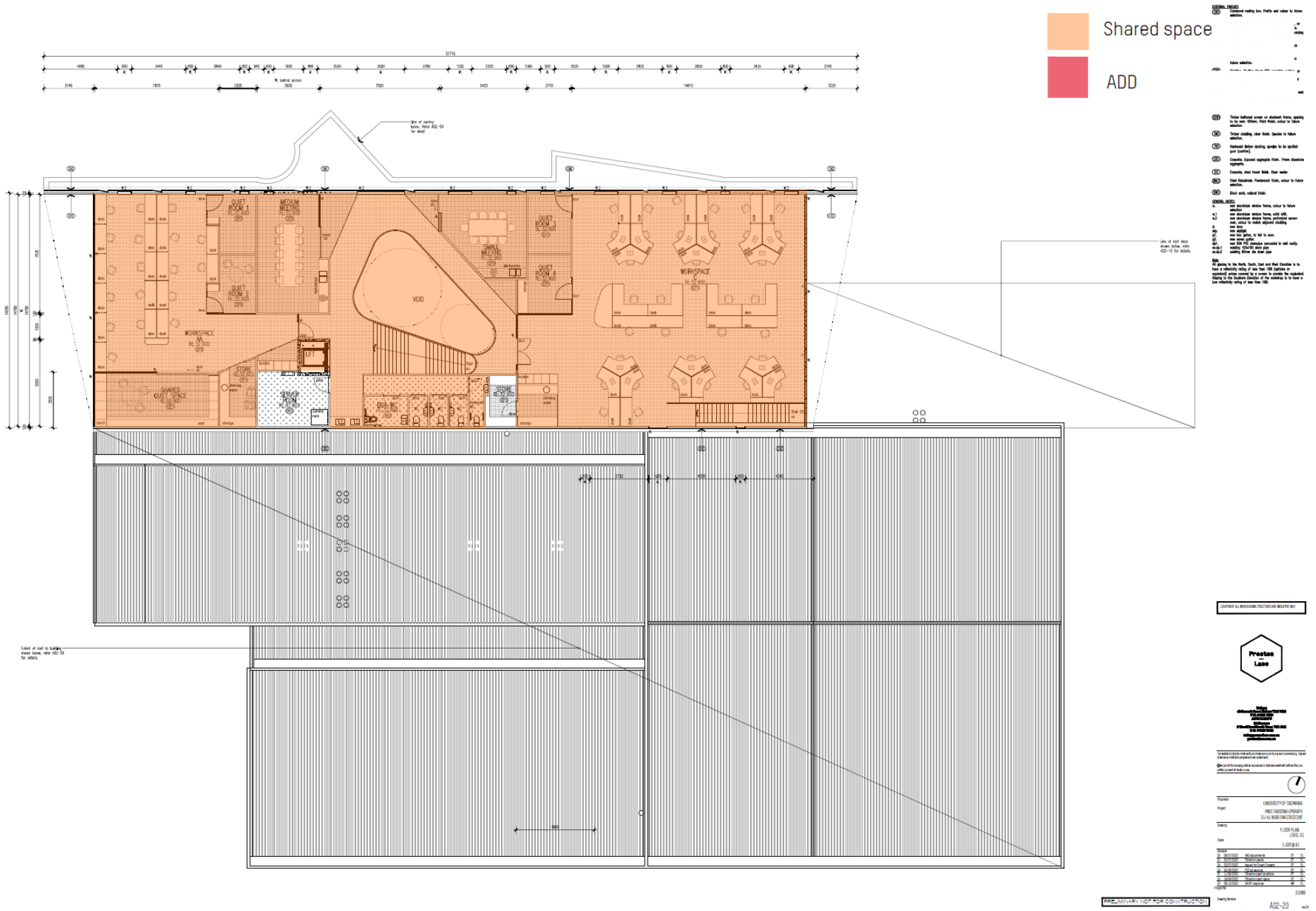
A02-10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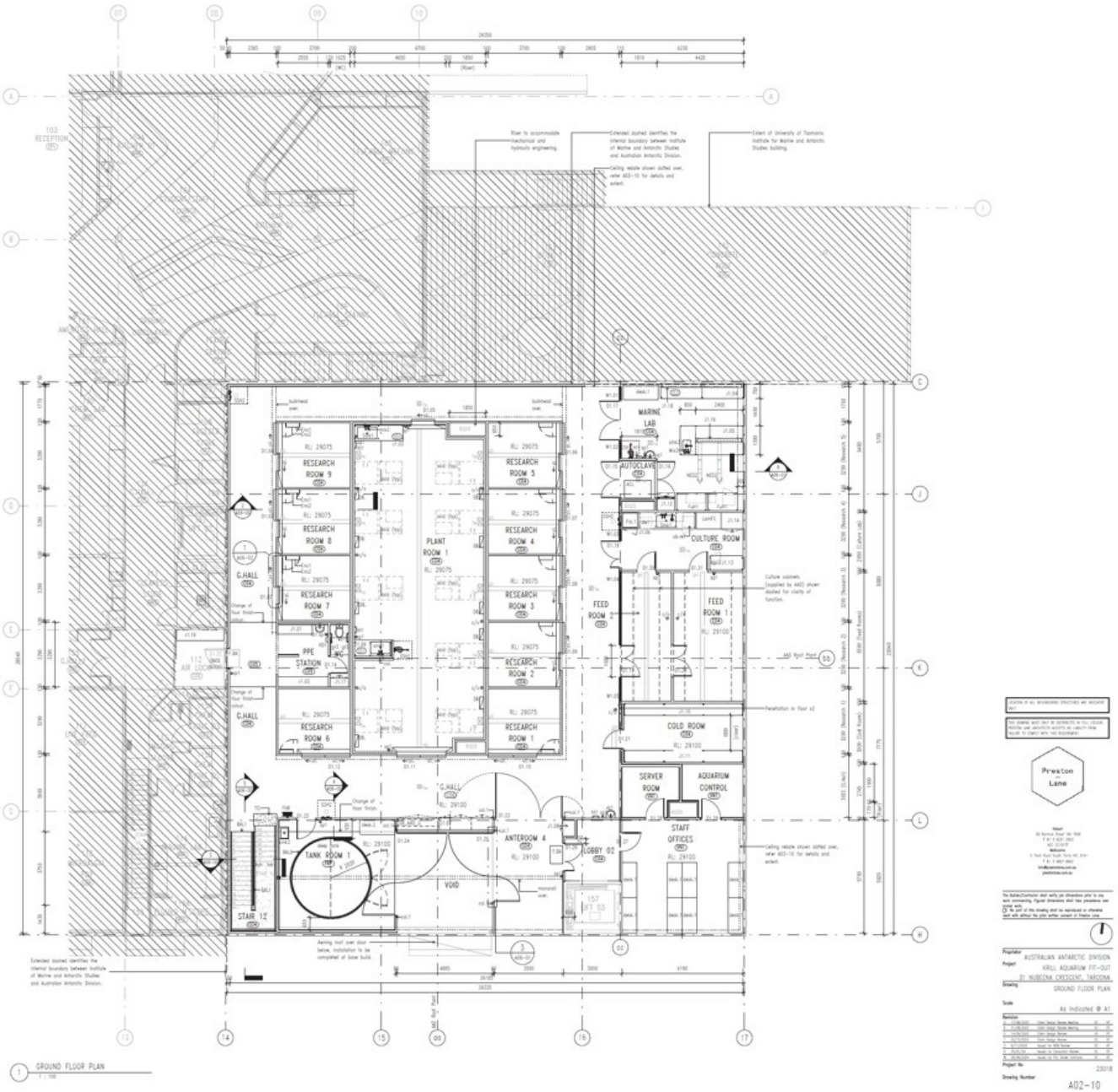
MEDIUM MEETING
QUIET ROOM 2
SMALL MEETING
QUIET ROOM 3
QUIET ROOM 4
WORKSPACE
VOID
WORKSPACE
LIFT
SHARED QUIET SPACE
SERVER ROOM
STORE
Line of roof deck shown below, refer A02-10 for details.
Extent of roof to buildings shown below, refer A02-50 for details.
PRELIMINARY NOT FOR CONSTRUCTION
A02-20

Attachment 3.1



Preston Lane

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Project: KRILL AQUARIUM FIT-OUT
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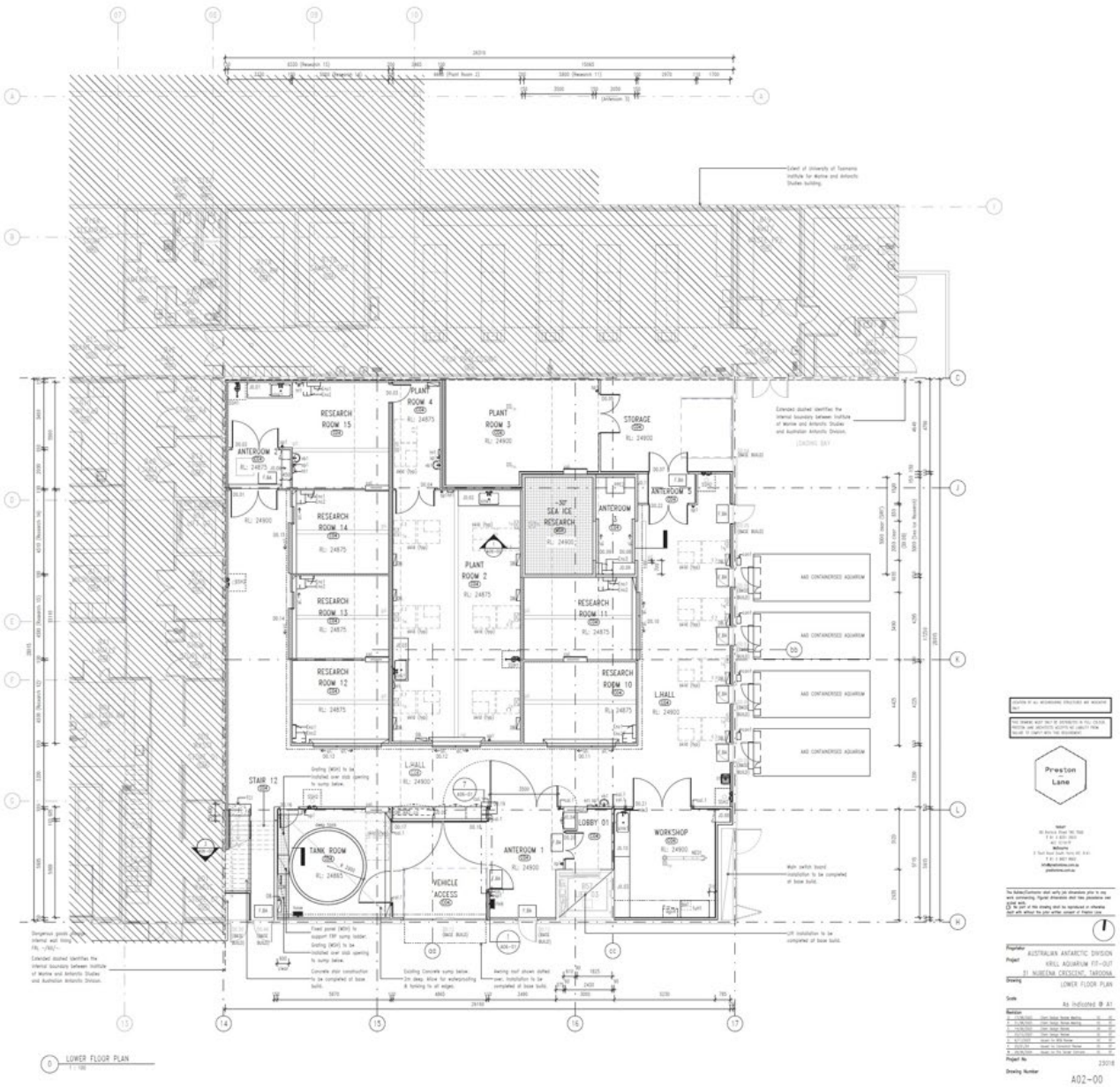
Scale: As Indicated @ A1
Project No: 23018
Drawing Number: A02-10

Attachment 3.2