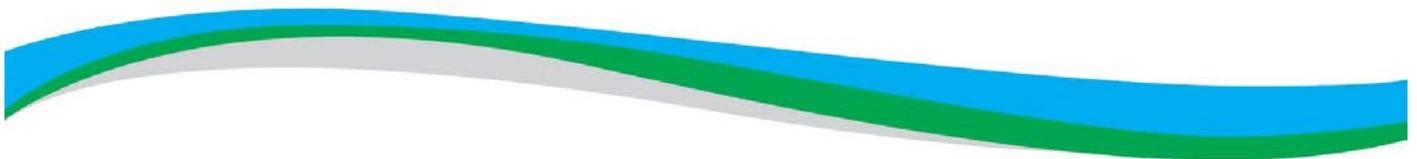


Annual Research & Development Plan and Budget 2017-18



www.goyderinstitute.org



The Goyder Institute for Water Research is a partnership between the South Australian Government through the Department of Environment, Water and Natural Resources, CSIRO, Flinders University, the University of Adelaide, the University of South Australia and the International Centre of Excellence in Water Resources Management. The Institute will enhance the South Australian Government's capacity to develop and deliver science-based policy solutions in water management. It brings together the best scientists and researchers across Australia to provide expert and independent scientific advice to inform good government water policy and identify future threats and opportunities to water security.



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Goyder Institute Associates

Goyder Institute Associates typically contribute expertise and capabilities in areas outside of those contributed by the Goyder Institute Partners. Associates may participate in capacity building, knowledge exchange and/or specific research projects, and invest in the Goyder Institute Research program with in-kind commitments in the same manner as Goyder Institute Partners. The following Associate organisations have contributed to outcomes of Goyder Institute research projects.



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1 Introduction

The Goyder Institute for Water Research Agreement requires that the Director prepare an Annual Research and Development Plan and Budget for each financial year. This plan is to be submitted to the Research Advisory Committee for endorsement and then to the Management Board for approval.

1.1 Strategic Research Plan

The Strategic Research Plan 2015–2019 provides a high-level overview of the long-term strategic outcomes for the Goyder Institute research programme, which will help ensure the water resources of the state of South Australia are sustainably managed for economic, social and environmental benefits.

1.2 Annual Research and Development Plan

The Strategic Research Plan 2015–2019 identifies three broad research impact areas: Economic Development, Healthy Ecosystems and Climate Action. Research to support each impact area is to be implemented through an integrated set of Research Projects with associated Research Project Plans. The Annual Research and Development Plan describes this annual rolling portfolio of projects that are the mechanism for achieving the outputs required to contribute to the achievement of the objectives of the Institute.

Each financial year, the Director will produce an update of the Annual Research and Development Plan and Budget. This updated Annual Research and Development Plan describes the progress of ongoing projects and the development of new projects. Individual projects identified within the Annual Research and Development Plan may be varied and updated annually as policy priorities and budgets dictate.

The Annual Research and Development Plan and Budget for a given financial year describes:

- The proposed Research Projects to be undertaken by the Institute in that year; and
- The proposed budget for each Research Project.

In addition, potential investment in research activity over the remaining term of the Goyder Institute will be identified. These figures are indicative only and are designed to support strategic investment in research projects that will deliver outcomes by 30 June 2019, which is the current expiry date of the initial term of the Goyder Institute Agreement.

1.3 Approved Research Projects

An Approved Research Project consists of a Project Plan and Budget Pack that has been signed by all participating Partners in the project and that has been endorsed by the Research Advisory Committee (RAC) and approved by the Management Board. This is documented in the form of a Project Agreement that has been signed by the Chair of the Management Board.

During the execution of an Approved Research Project, changes and modifications to the Project Plan and Budget Pack may be submitted to the Director for consideration. The Director may approve minor modifications to Project Plans that do not significantly alter the proposed outcomes, and do not have significant financial consequences for the project. The Director may consult the RAC about these modifications. Major modifications to Project Plans that involve financial changes will be prepared in consultation with the Director the RAC. After endorsement of these modified Project Plans by the RAC, the Director will formulate recommendations for approval by the Management Board.

2 Project Overview 2016-17

The Goyder Institute established a number of significant new research projects during 2016-17. These projects are:

Economic Development				
<i>Mining and Energy</i>				
Project No.	Project Title	Project Partners	Funding	Key Outcomes/Summary
ED-17-02	Finding Long-term Outback Water Solutions: Stage 3 (G-FLOWS Stage 3)	CSIRO, Flinders University, DEWNR	Cash: \$1,904,400 In-kind: \$1,904,415 External: \$2,540,000	Extend the AEM geophysical interpretation process by establishing hydrogeological control test sites, reducing uncertainty in using AEM data to identify potential groundwater resources in deep sedimentary deposits. Characterise groundwater resources in the SA APY Lands, including the potential water in storage in the systems and their capacity to provide viable water supplies.
<i>Northern Corridor</i>				
Project No.	Project Title	Project Partners	Funding	Key Outcomes/Summary
ED-17-01	Sustainable Expansion of Irrigated Agriculture and Horticulture in Northern Adelaide Corridor	CSIRO, SARDI, Flinders University, Uni SA, DEWNR	Cash: \$1,550,253 In-kind: \$1,550,253 External: \$0	Assess how the water resources available to the Northern Corridor region can be best used to optimise the development of industries that generate new employment opportunities in the region in a sustainable way and not result in long term environmental problems that lead to reduced productivity and legacy costs for industry, landowners, local and state government.
ED-16-03	Assessment of Small Scale Desalination by Capacitance Deionization for Treatment of NAP Waters	Uni SA	Cash: \$30,000 In-kind: \$32,529 External: \$30,000	Assess technical options and economic viability of capacitive de-ionisation (CDI) technology for desalination of primary water sources in the Northern Adelaide Plains, including marginal-salinity groundwater and Bolivar DAFF recycled water, for use in horticultural production.

Climate Action				
<i>Carbon Neutral</i>				
Project No.	Project Title	Project Partners	Funding	Key Outcomes/Summary
CA-16-04	Coastal Carbon Opportunities: demonstrating additionality and potential for future offsets in South Australia	University of Adelaide, CSIRO, SA Water, DEWNR	Cash: \$400,021 In-kind: \$1,458,583 External: \$165,000	Estimate baseline carbon stocks and carbon storage dynamics at case study sites within South Australian coastal ecosystems. Demonstrate additionality and potential for future offsets from coastal ecosystems (in seagrass, mangrove and saltmarsh environments).
CA-16-08	From Salt to C; carbon sequestration through ecological restoration at the Dry Creek Salt Field	Flinders University, Uni of Adelaide, Uni of SA, DEWNR	Cash: \$336,000 In-kind: \$1,360,645 External: \$783,500	Ascertain a proof of concept that reconnecting Dry Creek salt ponds to tidal flow will lead to a re-establishment of saltmarsh and mangrove vegetation and with it, carbon abatement and other ecosystem service provision.
CA-17-01	Knowledge gap analysis and testing model fitness for offsetting greenhouse gas emissions through increasing soil organic carbon and improving nitrogen efficiency in South Australian clay modified soils	SARDI DEWNR	Cash: \$50,000 In-kind: \$50,000 External: 0	This project will undertake a desktop analysis to: (1) collate, reanalyse and conceptualise existing carbon and nitrogen data for clay modified soils; and (2) identify gaps in current knowledge, identify available models, and assess their 'fitness' for clay modified soils. A road-map to support the opportunity for carbon sequestration and N ₂ O reduction will be developed to improve the knowledge base required to inform agricultural carbon offset policy and landholder adoption.
<i>Extreme Events</i>				
Project No.	Project Title	Project Partners	Funding	Key Outcomes/Summary
CA-16-01	Climate Resilience Analysis Framework and Tools	University of Adelaide, CSIRO	Cash: \$199,872 In-kind: \$199,872 External: \$0	Develop and demonstrate a framework and methodology to assess the vulnerability of industries and natural resources to the impacts of climate change and hydroclimate variability.

Projects in the Healthy Ecosystem Impact Area were endorsed by the Research Advisory Committee as of 30th June 2017 but were not yet approved by the Management Board.

All Goyder Institute research projects established during the initial term (2010-15) are included at Appendix A and further details through the Goyder Institute website (www.goyderinstitute.org).

2.1 Project Expenditure to end of 2016-17 financial year

All project and administration payments for the first term of the Goyder Institute (2010-15) were finalised by the 30th June 2017. The final research investment for the first term of the Goyder Institute (2010-15) included the South Australian Government investment of \$21.1M cash to research projects, with in-kind contributions totalling \$23.2M provided by research partners CSIRO, Flinders University, University of Adelaide and University of South Australia as well as State research providers SARDI and AWQC. There was also an additional \$12.6M of external cash and in-kind contributions to the research programme. Collective whole of life investment across the 46 approved research projects was \$43.9M. The final financials for the first term are presented below. Note that additional administration charges were incurred post June 2015 and prior to the relocation of administration and accommodation in November 2015.

FINANCIAL REPORT: INSTITUTE FINANCES WHOLE-OF-LIFE (2010-15)								
Theme	Roadmap		APPROVED Total Budget	APPROVED CASH	PARTNER IN-KIND	EXTERNAL CASH AND IN-KIND	CASH ACTUALS to 30 Jun 2017	
1	Climate Change	C.1	Climate Change Downscaling	7,589,485	3,411,921	4,177,564	144,212	3,411,921
2	Environmental Water	E.1	River Murray	7,259,256	3,489,617	3,662,431	1,133,290	3,489,617
		E.2	Surface water, groundwater and wetlands	5,648,492	2,544,410	2,818,664	568,954	2,544,410
3	Water for Industry	I.1	WAP and Water Quality	8,652,519	4,294,791	4,526,790	4,011,765	4,294,791
		I.2	Outback Water	6,582,415	3,282,962	3,459,867	1,588,542	3,282,962
4	Urban Water	U.1	WSUD	2,035,904	1,017,833	1,062,752	57,000	1,017,833
		U.2	Water Resource Mix	6,172,329	2,974,423	3,456,760	5,128,979	2,974,423
				43,940,400	21,015,957	23,164,828	12,632,742	21,015,957
5	Research Adoption	Research Adoption	PhD Supplements	750,000	750,000	2,060,998	0	750,000
			PhD Comms Activity	30,000	30,000	0	0	23,441
			ANZSOG	627,116	277,145	354,468		254,065
			DEWNR Model Warehouse	115,481	72,884	42,597	0	72,884
			Knowledge Management	400,000	400,000	10,000	12,000	392,467
			Research Adoption Totals	1,922,597	1,530,029	2,468,063	12,000	1,492,857
6	Institute Office		Director's Office	4,273,982	2,519,014	1,714,744	0	2,635,466
INSTITUTE TOTAL (2010-15)				50,136,979	25,065,000	27,347,635	12,644,742	25,144,280

The second term of the Institute (2015-19) commenced research investment in 2016 following establishment of new administration arrangements and office location (December 2015) and release of the Strategic Research Plan (July 2016) that guided investment into research. As of 30 June 2017, the investment in the new research programme includes \$4.5M cash from the South Australian Government, \$6.6M in-kind from research partners CSIRO, Flinders University, University of Adelaide and University of South Australia as well as State research providers SARDI, DEWNR and AWQC, and \$3.5M external cash and in-kind contributions. The accrued interest balance is an additional cash contribution to the research and administrative functions of the Institute. Combined with the State Government cash contribution of \$8M over the four-year term, the total available cash is \$9.1M.

FINANCIAL REPORT: INSTITUTE FINANCES WHOLE-OF-LIFE (2015-19)								
Theme	Impact Area		APPROVED Total Budget	APPROVED CASH	PARTNER IN-KIND	EXTERNAL CASH AND IN-KIND	CASH ACTUALS to 30 Jun 2017	
7	Interest Earnings 2010 to present						1,137,280	
8	Institute Office	Administration	2,000,000	2,000,000	0	19,381	745,727	
8	Research Projects	Climate Action	5,003,493	985,893	3,069,100	948,500	102,017	
		Economic Development	9,541,306	3,484,653	3,486,653	2,570,000	675,579	
		Healthy Ecosystems	0	0	0	0	0	
		Research Program Total	14,544,799	4,470,546	6,555,753	3,518,500	777,596	
9	Knowledge Management	Knowledge Management	400,000	400,000	0	2,757	134,724	
INSTITUTE TOTAL			16,944,799	6,870,546	6,555,753	3,540,638	1,658,047	

3 Research Investment 2015-19

3.1 Research Impact Areas

The Goyder Institute will be consolidating its research around three key impact areas with water central to these impact areas. Research projects will build upon research undertaken over the past five years, harnessing the research outcomes and partnerships to build and inform the new research investments. Research effort will be focussed across three impact areas:

1. Economic Development

Sustainable opportunities for economic development and job creation in South Australia that is underpinned by evidenced based water resource information

2. Healthy Ecosystems

Knowledge to enhance environmental management of urban, regional and natural assets and identification of alternative approaches to achieving multiple outcomes

3. Climate Action

Proven opportunities for managing climate risk that support the creation of new, innovative industries that are climate resilient and grow the economy to achieve the State's climate and environmental targets

Within each of these impact areas there are themes that target research investment designed to deliver specific outcomes and/or policy directions that have been identified by both Government Agencies and other water industry partners.

Any ongoing research projects and proposed future research projects will be expected to demonstrate how they contribute to a specific impact area and a specific long-term strategic outcome for the Goyder Institute. Efforts are being concentrated on enabling research, fundamental research, applied research, implementation, tools, outcomes and knowledge adoption. This enables the Goyder Institute to arrive at a balanced R&D profile.

3.2 Investment across Research Themes

The Strategic Research Plan 2015–2019 identified that the selection of new research projects should consider the desired priority of Goyder Institute funding across the mix of research themes. The following table provide an indication of the proposed distribution of research funding across the three impact areas. This distribution will be continually monitored by the RAC and Management Board and amended as appropriate.

Proposed Investment for each of the three impact areas and Goyder Institute Leadership and Administration:

Research Impact Area	Cash Contributions	Matching Partner Contributions	Other*	Total
Economic Productivity	\$3,515,000	\$3,515,000	\$2,100,000	\$9,130,000
Healthy Ecosystems	\$1,800,000	\$1,800,000	\$1,080,000	\$4,680,000
Climate Action	\$1,300,000	\$1,300,000	\$600,000	\$3,200,000
Knowledge Management	\$400,000	0	0	\$400,000
Institute Leadership and Administration	\$2,000,000	0	0	\$2,000,000

*Target for external funding

Leadership and Administration activities account for the remaining \$2,000,000 over the four years, with knowledge adoption activities to be integrated into the research portfolio and embedded in research projects.

3.3 Portfolio Mix of Projects

The Strategic Research Plan 2015-2019 identified impact areas designed to ensure that the Goyder Institute continues to deliver relevant outcomes for government in the short, medium and long term whilst retaining the flexibility to respond to changing pressures and priorities over time. In this the first year of operations under the second term of the Institute and its new research directions, it is intended that no more than 30% of the total budget will be committed, with a balance across the three horizons:

- Short-term targeted R&D *advice* activities with clear and immediate uptake in policy & management (e.g. 6–12 month path to uptake);
- Medium-term *applied* research activities. Demand-driven with clearly defined outcomes, but with less clear and protracted uptake (e.g. 1–2 year path to uptake);
- Longer-term and *enabling* research activities. PhD-style research of fundamental principles aimed at supporting applied research outcomes, but not directly related to uptake (e.g. 2–4 year path to uptake).

The indicative split of funding, consistent with the directions of the Management Board are summarised in the table below.

Proposed Investment by Project Scale as a percentage of research funding:

Research Project Duration	Proposed Investment	Actual Investment
Short Term Projects <1 year	10-15%	\$80,000 (.01%) (with projects identified in R&D Plan: \$280,030 - .004%)
Medium Term Projects 1-2 years	25-30%	\$935,894 (15%) (with projects for approval: \$2,785,864 – 44%)
Long Term Projects 2-3years	55-60%	\$3,454,653 (55%)

3.4 Proposed Budget 2017-18

The focus of investment for 2017-18 is to finalise the research programme and seek approval for the two key projects in the Healthy Ecosystem impact area and a remaining Climate Action project. It is anticipated that these will be approved in July 2017 with a September 2017 commencement date.

3.5 Investment Principles

The Investment by the Goyder Institute will consider the following Principles in the development of and evaluation of research projects:

- Research will directly contribute to meeting a priority set by state government;
- Research will demonstrably support the capacity of state government to implement adaptive management processes in water management;
- Research will build capacity inside state government to develop better policies, and inside research organisations to undertake better science;
- Investment will be towards the best initiatives amongst the research partners that have a demonstrated capacity to achieve the highest standards in science;
- The highest return in terms of outcomes achieved per dollar invested will be supported;
- All partners have had the opportunity to engage in project development;
- Each project proposal to include team members from at least two research partners;
- Investment will result in high-quality research outcomes;
- There must be a clear and funded pathway for technology transfer to ensure that research outcomes are adopted;
- Project leaders will have a demonstrated excellence in project management;
- Administrative overheads will be kept to a minimum; and,
- Preference will be given to projects with a significant proportion of external funding (co-investment) that contributes to the strategic objectives of the Institute.

A target of 30% external co-investment in research projects is being sought for the second term of the Goyder Institute. In seeking these opportunities, the proposed co-investment must align with the Policy, Capability and Science objectives of the Goyder Institute and aim to build effective local, national and international partnerships.

3.6 Operational Principles

All projects will follow the operational principles of the Institute in that:

- Peer review of scientific outcomes is required to ensure science excellence;
- Scientific research and interpretation will be undertaken and reported free from political interference or bias; and,
- Researchers will respect the need for confidentiality in whatever form it is requested by the Director or the Management Board.

All projects will be planned and executed with attention to uptake and adoption of the products and outcomes of the research.

The development of large, integrated research project areas will require experienced leadership and facilitation. Research Leaders will be chosen based on the following criteria:

- Credibility (seniority and track record);
- Understanding of the principles of Goyder Institute;
- Previous experience in managing cross agency, multi-disciplinary programmes and projects;
- Understanding of the context within which the results will be used; and,
- Demonstrated experience in transferring outputs into outcomes;

Research Leaders will be recommended by the RAC.

4 Knowledge Management, Adoption and Dissemination

A focus of the Institute is to ensure that the research outcomes are appropriately communicated to relevant stakeholders, with more focussed adoption activities undertaken to ensure that the Goyder Institute science is available in an accessible and meaningful format. Availability of this expert science, in a format relevant for decision-makers, will help ensure that the expert science created by the Institute is embedded in partner organisations and other stakeholders that could benefit from the outcomes of this research investment.

An important part of the knowledge management strategy of the Goyder Institute is the development of a common framework for data management and appropriate documentation of models.

4.1 Knowledge Pathways

The Goyder Institute recognises the need to actively communicate the outcomes of research to potential users. An important measure of the value of research outcomes is their uptake and impact in areas of policy, resource management and industry.

To date the Goyder Institute has made significant progress in linking science to policy development for improved water management. Some notable examples include the development of South Australia's Water Sensitive Urban Design policy and the research that informed South Australia's negotiations on the Murray-Darling Basin Plan. Much has been learned about knowledge transfer and communication.

All parties agree that the next logical step towards improving the transfer of scientific knowledge into policy and delivering outcomes is to embed policy staff into research projects more often, as this was a highly effective mechanism for building two-way understanding and improving the overall value from an investment into science.

A further enhancement will be to invest in transferring research outcomes directly into training provider programmes, such as those administered by the NCGRT and ICE WaRM.

Indicative areas of activity under the knowledge pathways programme are:

- Communication
 - Targeted products and events
 - Increased use of social media
 - Accessibility of information
- Support in teaching and training
 - Translation of research findings to underpin South Australian training provider programmes (for example ICEWaRM, NCGRT, Tafe SA)

Other Key activities and strategies have been documented following the joint Board and RAC workshop in June 2016. These activities will be prioritised and implementation will commence during 2017-18. The current activities such as the e-Newsletter and maintaining new content on the website are key and ongoing activities.

4.2 Archiving of Research Data and Numerical Models

A set of consistent processes to ensure research data arising from Goyder Institute funded projects is well described and discoverable through Research Data Australia (RDA) has been developed with the Australian National Data Service (ANDS) and is being implemented for all projects before project completion is signed-off by the Director. The ANDS support will help ensure that the data collected from the Institute's research programme continues to be available beyond the life of the Institute.

5 Goyder Institute Activities 2017-18

5.1 Workshops

It is proposed that the following key workshops are held in 2017-18:

- i. Water Forum
- ii. Research Teams Science Forum (Board, RAC, Research Teams (Project and Task leaders))
- iii. Establishment of all project steering committees

5.2 Planning of Research Investment 2017-18

5.2.1 Research Impact Area: Healthy Ecosystems

Research within the Healthy Ecosystems impact area will be delivered via three streams:

- i. Catchments
- ii. Coasts and marine
- iii. Communities

The priority focus in 2017-18 is the River Murray within the Catchments stream and the Spencer Gulf Socio-Ecological Framework within the Coasts and Marine stream.

Consultation with State Government and other stakeholders during 2015 identified a number of research priorities relating to the River Murray. Principal among these was the need to understand and demonstrate the positive ecological effects of the Murray-Darling Basin Plan and the environmental watering that it permits.

i. Catchments - River Murray

Context

The primary purpose of the Murray-Darling Basin Plan for South Australia is to achieve environmental outcomes, whilst minimising negative impacts on society. Four environmental outcomes are of particular relevance for the Basin Plan: fish, waterbirds, vegetation and ecosystem functions.

Environmental outcomes will be achieved through a combination of 'natural' river flows, environmental water provisions, relaxed constraints and the operation of infrastructure. South Australia's desired outcomes are outlined in the long-term watering plan for the River Murray.

Project Driver(s)

The operation of multiple floodplain infrastructure assets may increase water quality risks. During infrastructure operations under relatively low flow conditions, resources are mobilised by floodplain inundation and may pass into an ecosystem with hydraulic conditions that favours the transfer of energy into the growth of cyanobacteria ('blooms') and bacteria ('blackwater'), rather than through the foodweb.

Providing inundation and hydraulic conditions that favour the transport and transformation of energy through the foodweb may result in improved environmental outcomes and reduced likelihood of water quality risks eventuating.

There is a lack of knowledge on what inundation and hydraulic conditions are required to allow for the transport of resources, propagules (e.g. eggs, seeds) and biota; and the transformation of energy at large spatial scales. This has been identified for the Lower Murray (see Goyder Project E.1.7 "River Murray Research Requirements", Bice et al., 2014) and internationally (see "Challenges and Opportunities in the Hydrologic Sciences", National Academy of Sciences, 2012).

The key management question to be addressed is: *What is best way to operate multiple infrastructure assets to facilitate the transfer of resources, propagules and biota and manage water quality risks to an acceptable level for environmental and domestic purposes for any given river flow and antecedent conditions?*

The key research question to be addressed is: *How do inundation and hydraulic conditions across the Lower Murray alter the transfer and transformation of energy, propagules and biota within and between the floodplain and river channel?*

A research project to address these questions would be aimed at providing knowledge to support the development of an evidenced-based integrated infrastructure operations plan/schedule for the Lower River Murray that is being pursued by the Environmental Pathways programme (DEWNR Major Projects).

This specific research area has been identified as a priority through a number of stakeholder engagement processes, including meetings with government stakeholders, potential research partners and a definition workshop held in January 2017. A project plan was endorsed by the RAC in June 2017 and will be prepared for Management Board approval in July 2017.

Project Planning Timeline

PROCESS	JUN (17)	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
GOYDER INSTITUTE RAC APPROVAL	◆												
GOYDER INSTITUTE BOARD APPROVAL		◆											
PROJECT COMMENCEMENT			◆										

ii. Coasts and Marine – Spencer Gulf Socio-ecological Evaluation Framework

Context

The proposed study builds on a suite of highly successful projects to progress ecosystem-based management of Spencer Gulf and the Great Australian Bight that have been undertaken previously. The most relevant examples are several large projects funded by the Fisheries Research and Development Corporation (Ward et al. 2005; Tanner and Volkman 2009; Goldsworthy et al. 2011; Gillanders et al. 2015; McLeay et al. 2015) and undertaken as part of the Spencer Gulf Ecosystem and Development Initiative (SGEDI, Gillanders et al. 2013, 2016; Begg et al. 2015). These projects have resulted in the publication of a large number of scientific papers in important international journals (bibliography available on request).

The focus of this project was developed through a series of meetings with key stakeholders (e.g. SGEDI Board, Spencer Gulf NRM Planning Workshop) and key government departments (DEWNR, EPA, PIRSA, DSD, DPTI) who all recognized the need to 1) undertake a triple-bottom line assessment of Spencer Gulf; 2) establish a suite of indicators against which future assessments can be undertaken; 3) collate, and where possible inter-calibrate, the diverse array of existing datasets; 4) provide stakeholders with access to information needed to support approval processes; and 5) identify opportunities to enhance future integrated assessment and management of South Australia’s marine ecosystems.

The benefits of ecosystem-based management of marine socio-ecological systems are widely recognised, but progress towards operationalisation has been slow both in Australia and elsewhere (Begg et al. 2015). In this project, an innovative and pragmatic approach to addressing this challenge will be used by developing a suite of customised and cohesive indicators of the social, economic and ecological status of South Australia’s most valuable marine asset, Spencer Gulf. The proposed approach builds on similar but less comprehensive approaches currently being developed overseas and in Australia. Relevant examples include the California Current Integrated Ecosystem Assessment, which focuses on features related to fisheries and aquaculture, and the Port Phillip Bay Environmental Study, which dealt mainly with environmental impacts.

The new set of social, economic and ecological indicators that this project will develop from data currently held by a wide range of government agencies, research bodies and other stakeholders will provide a baseline and framework for assessing and managing the impacts, interactions and cumulative effects of current and future developments in Spencer Gulf. It will also allow existing monitoring efforts undertaken by a range of stakeholders to be better integrated, allowing duplication to be eliminated, and future monitoring efforts to be directed to areas where they can be of most benefit. Perhaps most importantly, it will provide a basis for understanding and

evaluating the likely impacts of new developments (e.g. a desalination plant) on other stakeholders and the ecosystem. The approach developed in this study will also provide a blueprint for undertaking future assessments of other marine ecosystems off South Australia, such as Gulf St Vincent, the Great Australian Bight and the Bonney Coast.

Policy Drivers

Spencer Gulf is the centre of South Australia's Blue Economy; its marine environments contribute >\$1B per annum to the State's economy. Almost half of South Australia's seafood comes from the gulf. It is a major gateway to the State's energy, mining and agricultural resources, and supports a wide range of fisheries, aquaculture, recreational activities and an expanding ecotourism sector. The gulf's marine ecosystems and species have global conservation significance.

The economic status and social fabric of Spencer Gulf's largest coastal communities (e.g. Whyalla, Port Augusta, Port Pirie) have been impacted by contraction and closure of important industries. There is an urgent need to develop existing and new businesses to provide alternative employment opportunities and ensure the ongoing prosperity of the region, whilst still maintaining existing industries and the environmental values that underpin them.

In June 2016, an expression of interest to establish an \$8M Research Consortium Program to protect and unlock the wealth from Spencer Gulf was submitted to the Premier's Research and Industry Fund that aimed to deliver the suite of complementary decision-support tools needed to:

- Support existing marine businesses and government to increase efficiency, safety, profitability and sustainability;
- Accelerate potential new developments by identifying suitable sites, providing information for approvals and eliminating the need to conduct environmental assessments from the beginning for each new venture; and,
- Independently and efficiently assess impacts of existing and new activities on other users and the environment, including cumulative impacts.

Partial and minimum benefits of this type of programme were estimated at \$136M in a preliminary cost-benefit analysis (EconSearch 2015).

The proposed consortium aimed to build on demonstration projects undertaken by SGEDI and addressed four of the State's Ten Economic Priorities:

- 1) Unlocking the full potential of SA's resources, energy and renewable assets;
- 2) Premium food and wine produced in our clean environment and exported;
- 4) The Knowledge State;
- 6) Growth through innovation.

The Consortium Partners included SARDI, University of Adelaide, Flinders University, SGEDI Partners (BHP Billiton, Santos, Nyrstar, Flinders Ports, Arrium, Iron Road, fishing and aquaculture industry), Goyder Institute, DEWNR, PIRSA Fisheries and Aquaculture, Spatial, FRDC, BOM and IMOS. The expression of interest was highly regarded but was not progressed as a full proposal.

Proposal

The project addresses the State economic priorities listed above and will support the approval and development of existing and new industries that are needed to support the prosperity of Spencer Gulf. It will also make a substantial contribution to the State's ability to undertake meaningful and comprehensive State of the Environment reporting for the marine environment and build on DEWNR's Natural Resource Management reporting framework to inform condition assessment of the State's key marine natural assets.

This specific research area has been identified as a priority through a number of stakeholder engagement processes, including meetings with government stakeholders, potential research partners and external government and

industry funders. A project plan was endorsed by the RAC in June 2017 and will be prepared for Management Board approval in July 2017.

Project Planning Timeline

PROCESS	JUN (17)	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
GOYDER INSTITUTE RAC APPROVAL	◆												
GOYDER INSTITUTE BOARD APPROVAL		◆											
PROJECT COMMENCEMENT			◆										

iii. Communities - Translating Ngarrindjeri Yannarumi into water resource risk assessment

Context

Ngarrindjeri are the Traditional Owners of the Lower Murray, Lower Lakes, Coorong and surrounding region. Over the past 15 years Ngarrindjeri have emerged as a leading nation in relation to Indigenous engagement in water resource management in the River Murray. Through the Murray Futures program, the Ngarrindjeri Regional Authority with its partner Flinders University Office of Indigenous Strategy and Engagement have established a range of innovative Indigenous engagement approaches that support Ngarrindjeri engagement and were recognised through winning the 2015 Australian Riverprize. Murray Futures investment has supported the emergence of the Ngarrindjeri Yannarumi Assessment process that enables assessments of the environmental and water health based on Ngarrindjeri principles and philosophies. From a Ngarrindjeri standpoint, this work is central to supporting Indigenous people to look after their rights to water. This innovative approach to translating and connecting Ngarrindjeri values into water planning has the potential to improve South Australia's risk assessments being developed to underpin the State's Water Resource Plans (WRP; for accreditation under the Murray-Darling Basin Plan).

This work has been informed by previous Goyder research projects E.1.3, E.1.7, and E.1.17 partnerships between NRA and Flinders University.

Policy Drivers

Under Chapter 10, Part 14 of the Murray-Darling Basin Plan, South Australia must meaningfully engage Aboriginal Nations in the development of WRPs. This includes identifying a Nation's objectives and outcomes related to the management of water resource and having regard for their cultural values and uses. Basin States are utilising risk assessments to underpin the development of the WRPs. Currently DEWNR has no process to assess risks to Aboriginal cultural values. This impacts on the State's ability to develop strategies to minimise these risks.

Proposal

The Ngarrindjeri Regional Authority, Flinders University and DEWNR are currently working collaboratively to support Ngarrindjeri engagement in WRP development. The parties have entered into a Water Resource Planning Statement of Commitment with an associated Cultural Knowledge Agreement and have formed a working group to support the engagement process.

This project will develop and trial a tool and methodology that supports the translation of Ngarrindjeri Yannarumi Assessments into WRP Risk Assessment. Using Ngarrindjeri and non-Indigenous research methods and risk assessment methodologies, the project will identify linkages between the two processes and develop a replicable and transparent conversion tool and methodology that protects the integrity of Ngarrindjeri knowledge and further develops Ngarrindjeri translation and engagement mechanisms. The trial stage will apply the conversion tool and methodology to assess risks to Ngarrindjeri values across South Australia's three WRP areas that overlap the Ngarrindjeri Nation. Given State Government timelines associated with the delivery of the three Water Resource Plans (WRP), the application of this methodology will be utilised in the risk assessment planning process associated with the River Murray.

Key Outcomes

The key project outcomes are designed to be:

- Supporting the protection of Ngarrindjeri cultural values associated with water through the development of an innovative translation/connection tool and methodology for WRP risk assessment that considers Ngarrindjeri Yannarumi principles for wellbeing.
- Supporting State Government commitments to the Ngarrindjeri Nation through existing agreements and Statements of Commitments relating to WRP.
- Strengthening South Australia's WRP risk assessment to incorporate risks to Aboriginal cultural values.
- Identification of management strategies to minimise identified risks to Aboriginal cultural values.
- Enabling the WRP, and broader water planning, to consider the quadruple bottom line (cultural, social, economic and environment aspects) and aligning South Australia's planning approaches with International conventions (United Nations Declaration on the Rights of Indigenous Peoples, Convention on Biological Diversity).
- Connecting approaches developed in this project to contemporary State Government NRM planning (e.g. State NRM Plan development).

Process

State Government have identified this targeted project as a key priority to assist in the current WRP process. This small project had been designed to deliver against this requirement in both timeframes and outcomes. The proposed project planning process is outlined below:

Project Planning Timeline

PROCESS	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
GOVERNMENT CONSULTATION	■											
CIRCULATE PROJECT PLAN TO RAC			◆									
GOYDER INSTITUTE RAC APPROVAL				◆								
GOYDER INSTITUTE BOARD APPROVAL					◆							
PROJECT COMMENCEMENT						◆						

5.2.2 Research Impact Area: Climate Action

As identified in the Goyder Institute Strategic Research Plan, the Climate Action impact area will be delivered through three streams: Carbon Neutral, Extreme Events and Water Security. For each of these programs a series of knowledge gaps have been identified that need to be addressed to deliver against the policy questions.

i. Carbon Neutral - Carbon Offsets Research to Support the State Carbon Sequestration Strategy

Context

The South Australian Government, led by the Department of Environment, Water and Natural Resources (DEWNR) and the Low Carbon Economy Unit (LCEU) of the Department of Premier and Cabinet (DPC) is developing a State Carbon Sequestration Strategy. This will identify the carbon sequestration opportunities that could be pursued to achieve South Australia's (SA's) goals of net zero greenhouse gas emissions by 2050 and realising the economic and enhanced adaptive capacity benefits from strong and timely action on climate change. This work will also identify potential carbon sequestration and emissions abatement offsets to realise the commitment for the City of Adelaide to be the world's first carbon neutral city.

Project Drivers

There is limited information available with which to advise the planning of a mix of carbon offset activities within South Australia that will provide the optimum value, in terms of carbon offsets per dollar, to support the implementation of the State Carbon Sequestration Strategy. A preliminary options paper 'Preliminary options for carbon offsets: potential land-sector carbon sequestration and emissions abatement opportunities in South Australia', prepared jointly by CSIRO, DEWNR and PIRSA identified indicators for assessing the feasibility of land sector carbon offset option and outlines seven land sector carbon offset options. Some options offer real and immediate abatement opportunities with known technology and good data available (e.g. reforestation/forestation

C). Other options are less certain, but may offer longer-term cost-effective abatement opportunities with significant co-benefits (e.g. blue carbon). Research to be proposed will aim to support the further development of a diversified portfolio of offset options to mitigate risk (e.g. a “staggered” approach would reduce temporal risks) and capture the most cost-effective opportunities available for each option.

The Goyder Institute Strategic Research Plan 2015-2019 identified the following knowledge gaps that are of relevance to Carbon Sequestration in South Australia:

- Evaluation of the opportunities for carbon sequestration through soil and vegetation within South Australia.
- Development of tools and information to support assessment of the optimum mix of carbon offsets achievable.
- The potential for carbon offsets from coastal environments:
 - Understanding the value of coastal environments as carbon sinks, including the opportunities from, and needs of, on-shore and near-shore coastal vegetation management and restoration of seagrass meadows.
 - What is the spatial extent and condition of coastal environments and their potential levels of carbon emission and sequestration (for carbon accounting)?

Key Outcomes

The research project(s) will provide outcomes that support the assessment of land-sector or coastal-zone carbon sequestration and emissions abatement opportunities in South Australia.

Research Questions and Approach

A call for expressions of interest from Goyder Institute research partners was administered by the Institute between September 2016 and February 2017. This process identified four projects for Goyder Institute funding, with the Carbon Offset Evaluation Framework requiring additional guidance in the development of a project plan to align with government priorities and knowledge gaps. A further targeted workshop was held in March 2017 to better define the research need. Following this workshop, and endorsement from the key Climate Change program leaders in DEWNR and DPC, a project plan was developed and subsequently endorsed by the RAC in June 2017 and will be prepared for Board approval in July 2017.

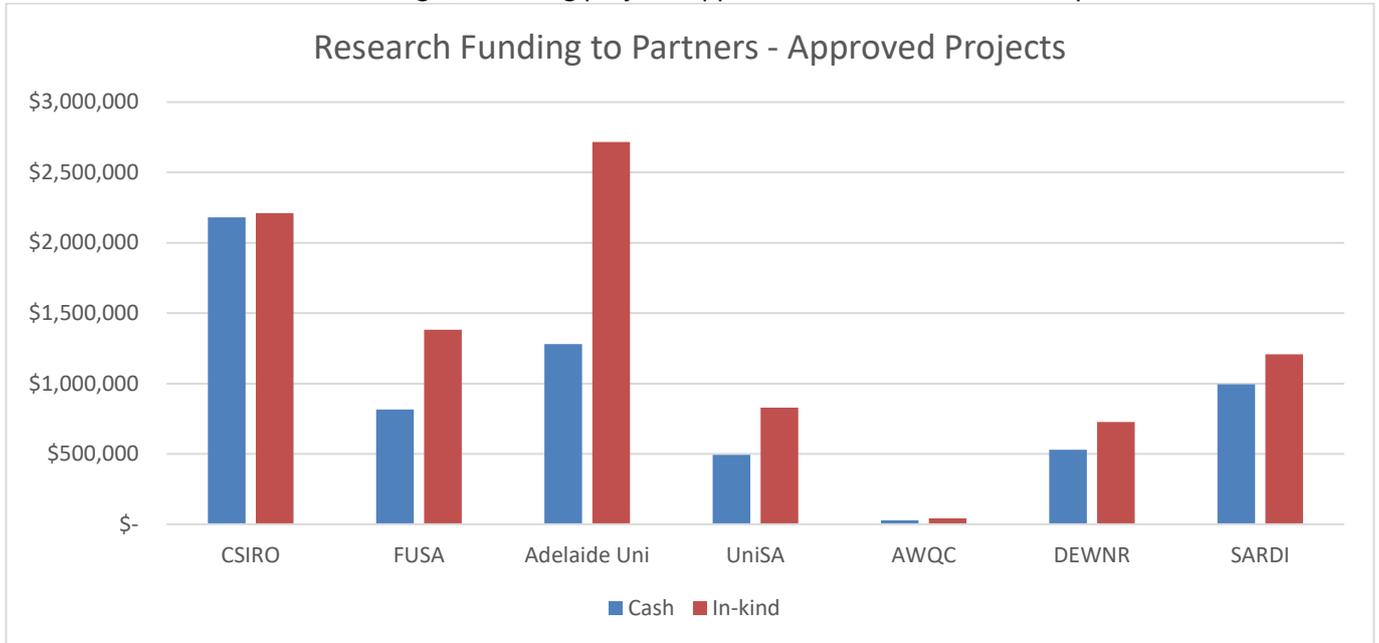
Project Planning Timeline

PROCESS	JUN (17)	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
GOYDER INSTITUTE RAC APPROVAL	◆												
GOYDER INSTITUTE BOARD APPROVAL		◆											
PROJECT COMMENCEMENT			◆										

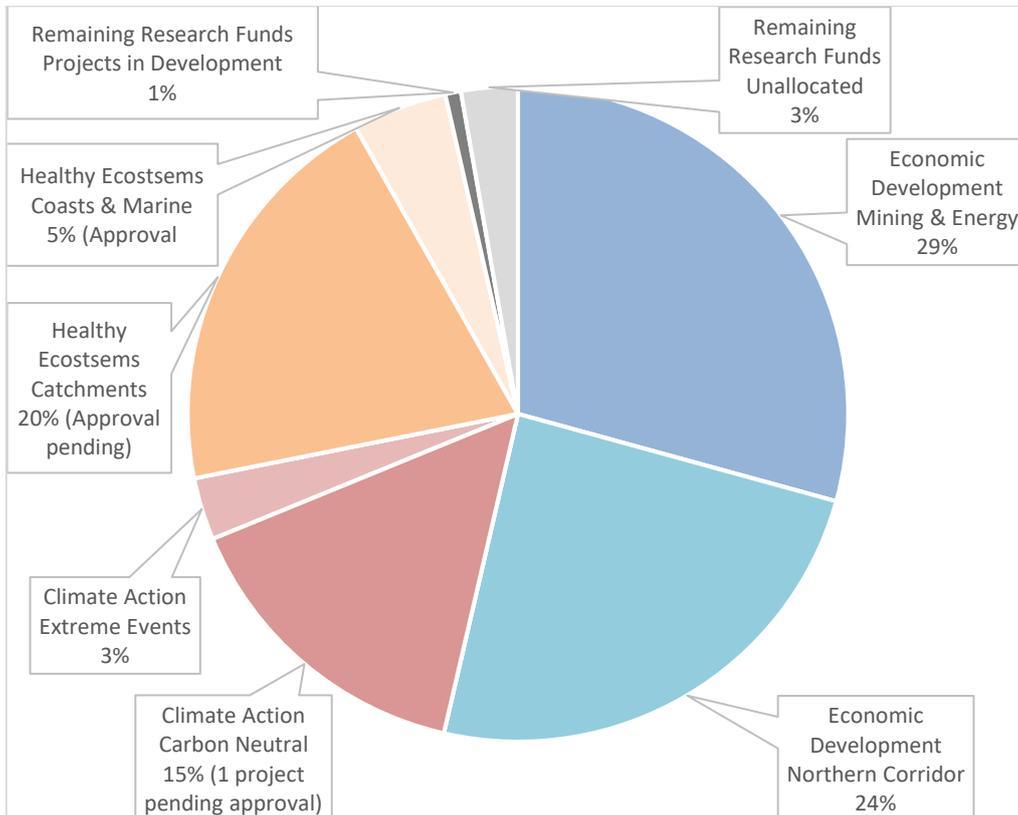
6 Budget

The budget and its alignment with the impact areas outlined Strategic Research Plan 2015-2019 is presented in the table on page 17. The proposed research and administrative expenditure of \$8,970,547 is 98% of the Institute whole-of-life cash budget. Of the proposed funding, \$150,000 has been left unallocated to undertake targeted expert panel advice on key issues. A balance of approximately \$170,000 has not yet been allocated. Interest earned during the 2017-19 period has not been included in this balance.

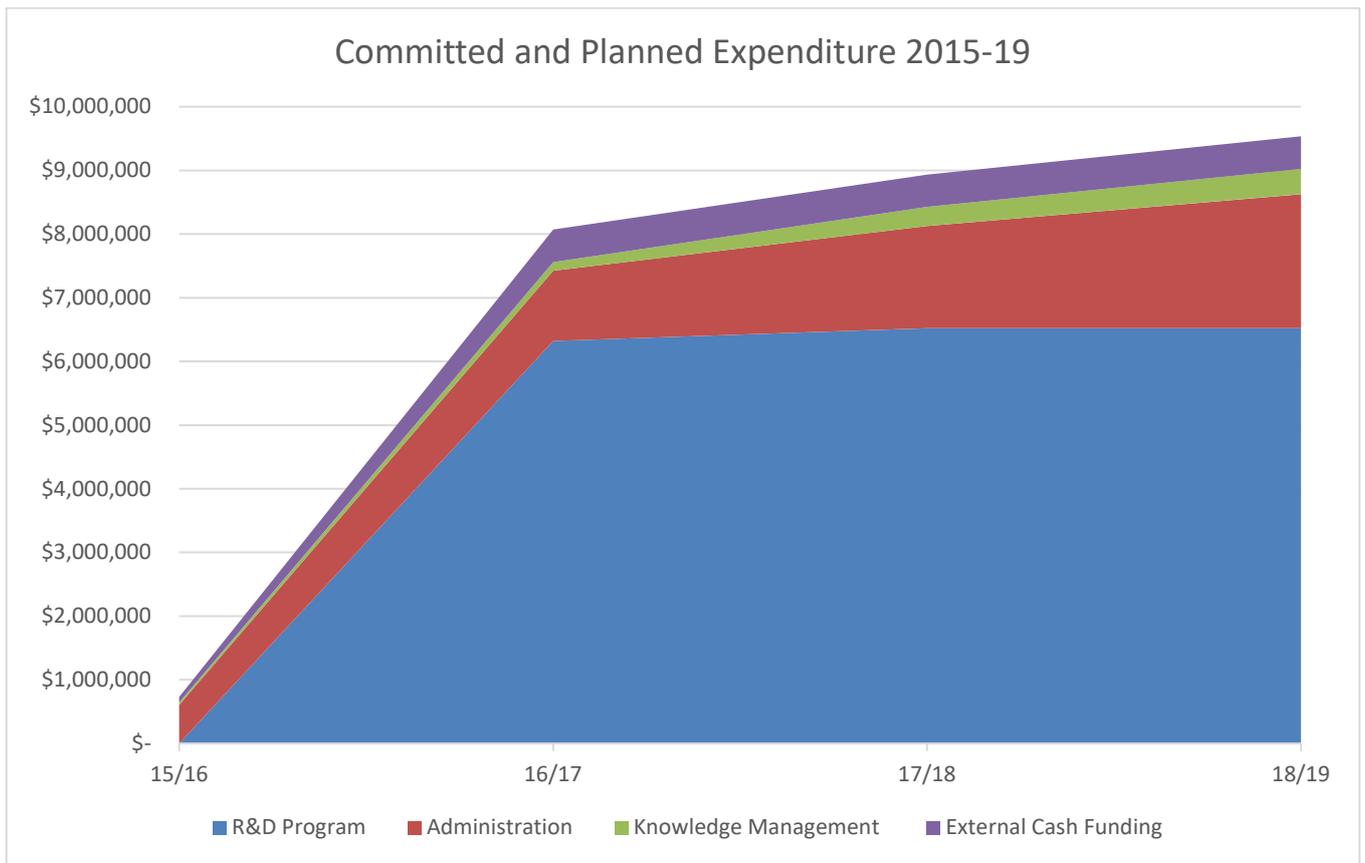
The allocation of the research budget, including projects approved and RAC endorsed, to partners is as follows:



The allocation of research funds across the impact areas and streams including projects approved and RAC endorsed, is as follows:



The overall Goyder Institute (2015-19) funding across research, administration, in-kind contributions and external in-kind and cash funding is as follows:



Goyder Institute: Research and Administration Budget - Detailed							
Impact Area	Project ID	Project Title	Total Cash Budget	2015-17 Actual	2017-19 Committed	Total Partner In-kind	Total External Funds
Economic Development							
Mining & Energy	ED-17-02	GFLOWS3	1,904,400	155,000	1,749,400	1,904,400	2,540,000
Northern Corridor	ED-17-01	Northern Corridor	1,550,253	490,579	1,059,674	1,550,253	0
	ED-16-03	Low Tech Desal trial	30,000	30,000	30,000	32,000	30,000
International			0	0	0	0	0
TOTAL			3,484,653	675,579	2,839,074	3,486,653	2,570,000
Healthy Ecosystems							
Catchments	HE-17-02	River Murray Environmental Pathways [#]	1,299,970	0	0	1,299,970	\$1,665,000
	TBA	Expert Panel activities (as required) [#]	150,030	0	0		
Coasts & Marine	HE-17-01	SGEDI [#]	300,000	0	0	647,082	300,000
Communities		Indigenous Water Management (proposed)	50,000		0	50,000	
TOTAL			1,800,000	0	0	1,997,052	1,965,000
Climate Action							
Water Security			0	0	0	0	0
Carbon Neutrality	CA-16-04	Blue Carbon	400,021	0	400,021	1,458,583	165,000
	CA-16-08	Salt to C	336,000	12,620	323,380	1,360,645	783,500
	CA-17-01	Knowledge Gap Analysis	50,000	0	50,000	50,000	0
	CA-17-02	Co-benefit Evaluation Framework [#]	250,000	0	0	612,062	0
Extreme Events	CA-16-01	CRAFT	199,873	89,397	110,476	199,872	0
TOTAL			1,235,894	102,017	883,877	3,681,162	948,500
Administration and Communication							
Business Development Activities 2017-19			50,000				
Knowledge Management			400,000	135,139	264,861	0	2,757
Administration	Office Administration		2,000,000	745,727*	1,254,273	0	19,381 [^]
TOTAL			2,450,000	880,866	1,519,134	0	22,138
INSTITUTE TOTAL			\$8,970,547	\$1,658,462	\$5,242,085	\$9,911,4867	\$5,505,638

*ICEWaRM costs only. Period prior to relocation managed by CSIRO from the Goyder 1 funding

[^]subtracted from administration total cash budget

[#] Projects endorsed by RAC but not approved by Board as of 30 June 2017

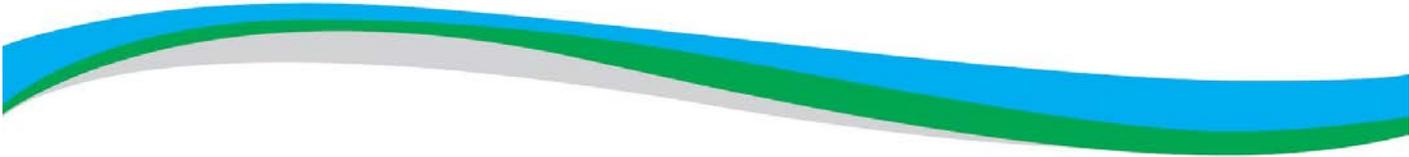
7 Key Performance Indicators

Key performance indicators were established in the 2016-17 Research and Development Plan. Progress against these indicators is presented below.

Progress Indicators 2016-17	Progress 2016-17
1. All Goyder Institute phase 1 projects are completed and closed	All Phase 1 projects were completed by 30 June 2017
2. Projects agreed to proceed in the 2016-17 Research and Development Plan are initiated	Seven research projects approved by the Management Board. Another three projects endorsed by the RAC prior to 30 June, but not yet endorsed by the Management Board. These are included in the 2017-18 Research and Development Plan.
3. A knowledge adoption strategy for 2015-19 is developed and established	A Board and RAC workshop was held on 1 st June 2017. From this a draft Communication Strategy was prepared.
4. Project governance arrangements are established	Completed and included in the Strategic Research Plan
5. A statement of research capability of the Institute and its research partners is developed and disseminated	Not yet completed, other than the water focus prepared for International delegations on the State's water capabilities (waterindustry.com.au).

Appendix A: List of Goyder Institute projects 2010-15

Goyder Institute: 2010-2015				
Theme	Roadmap	Project Number	Project Title	Status
Climate Change				
C.1	Regional downscaling	C.1.1	Downscaled Climate Projections for SA	Completed
Environmental Water				
E.1	River Murray	E.1.1	MDB Review	Completed
		E.1.2	Murray Flood Ecology Urgent	Completed
		E.1.3	Murray Flood Ecology	Completed
		E.1.4	Expert Panel MDB draft Plan	Completed
		E.1.5	River Murray Scoping	Completed
		E.1.6	Peer review	Completed
		E.1.7	River Murray Program	Completed
		E.1.8	Riverbank Collapse	Completed
		E.1.9	River Murray Channel EWRs	Completed
		E.1.10	SDL Adjustment Technical Panel	Completed
		E.1.11	Modelling Floodplain Salt Dynamics	Completed
		E.1.12	Operating Environmental Infrastructure on SA Floodplains	Completed
		E.1.13	Monitoring Strategy for Environmental Water	Completed
		E.1.14	River Murray Operations DSS	Finalisation
		E.1.15	Chowilla Regulator Murray Cod Ecology	Completed
		E.1.16	R Murray Coorong Productivity	Completed
		E.1.17	Indigenous Knowledge	Completed
E.2	Surface water, groundwater, wetland relationships	E.2.1	South East Urgent	Completed
		E.2.2	South East Phase 1	Completed
		E.2.3	South East Regional Water Balance	Completed
		E.2.4	Improved modelling of catchments and drains	Completed
		E.2.5	Water Requirements of Wetlands	Completed
		E.2.6	SE Regional Water Balance Phase 2	Completed
		E.2.7	SE Risks	Completed
Water for Industry				
I.1	Water allocation planning & water quality improvement	I.1.1	AMLR WAP Scoping	Completed
		I.1.2	Torrens River Water Quality Improvement Trial	Completed
		I.1.3	Salinity Management of Irrigating with Recycled Water	Completed
		I.1.4	AMLR WAP Program	Completed
		I.1.5	Torrens Dilution Trial 2	Completed
		I.1.6	Adelaide Plains Groundwater Study	Completed
		I.1.7	Water Quality Model	Completed
		I.1.8	NAP 90 Day/Water Stocktake	Completed
I.2	Mining & outback water	I.2.1	G-FLOWS	Completed
		I.2.2	G-FLOWS 2 –Northern Eyre Peninsula	Completed
		I.2.3	Lake Eyre Basin Eco-Hydrological Indicators	Completed
		I.2.4	Outback Water Supplies	Completed
		I.2.5	Marine Park Regional Assessment	Completed
		I.2.6	SARDI Commercial Fishery Assessment	Completed
Urban Water				
U.1	Water sensitive urban design	U.1.1	WSUD Targets	Completed
		U.1.2	WSUD Impediments and Opportunities	Completed
		U.1.3	WSUD Contributions to Urban Water Blueprint	Completed
U.2	Water resources mix for Adelaide	U.2.1	MARSUO	Completed
		U.2.2	Optimal Water Mix for Adelaide	Completed
		U.2.3	Governance for the Urban Water Blueprint	Completed
		U.2.5	Stormwater Interventions	Completed



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