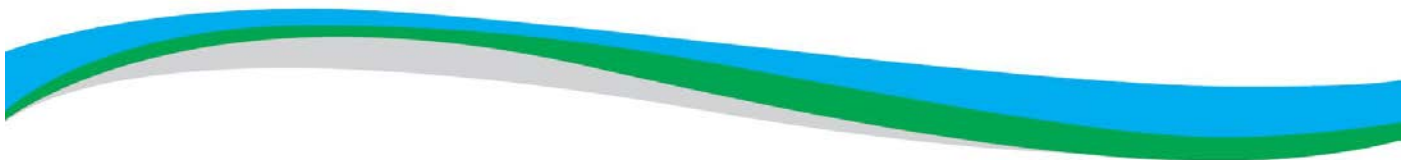


Annual Research and Development Plan and Budget 2019-2020



www.goyderinstitute.org



The Goyder Institute for Water Research is a partnership between the South Australian Government through the Department for Environment and Water, CSIRO, Flinders University, the University of Adelaide, the University of South Australia and the International Centre of Excellence in Water Resources Management. The Institute enhances 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.



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 Associate organisations below have contributed to outcomes of Goyder Institute research projects.



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CONTENTS

1	Introduction.....	1
1.1	Research program	1
1.2	Knowledge management.....	2
2	Overview of progress during 2018-2019.....	3
2.1	Strategic planning.....	3
2.2	Research program	3
2.3	Knowledge management.....	3
3	Planned activities for 2019-2020.....	13
3.1	Institute funded research projects.....	13
3.2	Knowledge management activities	13
3.3	Additional research opportunities.....	13
4	Budget	17
4.1	Research program	17
4.2	Administration and knowledge management – 2019-2020.....	17
4.3	Financial position.....	20

1 Introduction

The Goyder Institute for Water Research is a partnership between the South Australian Government through the Department for Environment and Water (DEW), CSIRO, Flinders University, the University of Adelaide, the University of South Australia and the International Centre of Excellence in Water Resources Management. The Institute enhances the South Australian Government's capacity to develop and deliver science-based policy solutions in water management.

The Institute is currently in its second-term (2015-2020) following a successful first-term (2010-2015). The *Strategic Research Plan 2015-2019* provides a high-level overview of the long-term strategic outcomes for the Goyder Institute research program for its second term. It identifies three broad research Impact Areas that were identified based on extensive consultation with stakeholders, where research effort of the Institute will be focussed:

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.

Water is central to each of these Impact Areas and is implemented through an integrated set of research projects that contribute to the achievement of the objectives of the Institute. The *Annual Research and Development Plan and Budget* provides an overview of planned activities and budget for the current year, consistent with the *Strategic Research Plan 2015-2019* and Approved Research Projects.

1.1 Research program

The research projects within each Impact Area builds upon research by the Institute undertaken in the first-term - harnessing the research outcomes and partnerships to build and inform the new research investments. Within each Impact Area there are themes that target research investment designed to deliver specific outcomes and/or policy directions that have been identified as priorities by both government agencies and other water industry partners.

The *Strategic Research Plan 2015-2019* identified the proposed distribution of research funding across the three Impact Areas (Table 1). To ensure that the Goyder Institute continues to deliver relevant outcomes for government in the short-, medium- and long-terms, the *Strategic Research Plan 2015-2019* identified the proposed distribution of research funding across different project horizons, with:

- 10-15% to short-term (less than 12 months) targeted science advice projects with clear and immediate uptake in policy and management;
- 25-30% to medium-term applied research projects (1-2 years); and
- 55-60% to longer-term applied research projects (2-3 years).

A target of 30% external co-investment in research projects was established for the second term of the Institute (Table 1).

Table 1. Proposed Investment for each of the three Impact Areas outlined in the *Strategic Research Plan 2015-2019*.

Impact Area	Cash contributions	In-kind partner contributions	External contribution target	Total
<i>Economic Development</i>	\$3,600,000	\$3,600,000	\$2,400,000	\$9,600,000
<i>Healthy Ecosystems</i>	\$2,000,000	\$2,000,000	\$1,200,000	\$5,200,000
<i>Climate Action</i>	\$1,000,000	\$1,000,000	\$300,000	\$2,300,000
Total	\$6,600,000	\$6,600,000	\$3,900,000	\$17,100,000

The investment by the Goyder Institute considered the following principles in the development and evaluation of research project proposals:

- 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 will 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.

The Research Program is managed through the Goyder Institute Office. This includes undertaking knowledge management activities that are focussed on facilitating direct and indirect uptake of research outputs into decision-making in both the short- and long-terms.

1.2 Knowledge management

A focus of the Goyder Institute is to ensure that the research outcomes inform decision-making. This includes undertaking focussed knowledge management activities that ensure that the Goyder Institute science is available in accessible and meaningful formats now and in the future. This will help to ensure that the expert science created by the Goyder Institute is embedded in partner organisations and other stakeholders that could benefit from the outcomes of the research investment.

2 Overview of progress during 2018-2019

2.1 Strategic planning

In 2017-2018, the Management Board decided to extend the second-term of the Institute from 30th June 2019 to 30th June 2020 using the current tranche of funding. This decision was made in order to allow the Institute to successfully complete the current research program and knowledge management activities; identify and establish new collaborative research opportunities; and transition to the third-term.

During 2018-2019, testing of a new role of the Institute for the third-term was undertaken. Under the proposed new role, the Institute Office will broker new collaborative research and knowledge adoption opportunities on behalf of Partners. During 2018-2019, new research opportunities have been pursued through multiple sources, including State, Commonwealth, Interstate and International Governments. This testing phase has involved identifying potential opportunities and forming highly competitive, collaborative teams to address complex water issues. A number of opportunities are being explored with two new projects established during 2018-19:

- *Independent review of the science underpinning reductions to allocations in the proposed in the Lower Limestone Coast Water Allocation Plan.*
- *Urgent investigations for restoring the ecological character of the South Lagoon of the Coorong.*

These projects have a total value of approximately \$1 million. The successful testing phase has led to in-principle agreement by all Partners to establish the third-term of the Institute for 2020-2023.

2.2 Research program

Significant progress was made during 2018-2019 (Table 2) with the completion of the following three research projects in the three Impact Areas:

- *Independent review of the science underpinning reductions to allocations in the proposed in the Lower Limestone Coast Water Allocation Plan (Economic Development).*
- *Science advice for restoring the Ecological Character of the South Lagoon of the Coorong (Healthy Ecosystems).*
- *Carbon offsets research to support the State carbon sequestration strategy (Climate Action).*

Eight research projects are ongoing, with all nearing completion (Table 2).

Further details regarding the projects can be found on the Goyder Institute website (www.goyderinstitute.org).

2.3 Knowledge management

Knowledge management continued to be advanced during 2018-2019 (Table 2). This included the establishment of Project Advisory Committees for new research projects and ongoing involvement in Project Advisory Committees in existing projects. The direct involvement in government staff within projects continued to be a critical component of facilitating the uptake of the research into government decision-making. Additional specific highlights have included:

- Development of a 3-minute video by DEW presenting the Finding Long-term Outback Water Solutions (G-FLOWS) drilling program.
- A knowledge adoption workshop for the *Sustainable expansion of irrigated agriculture and horticulture in Northern Adelaide Corridor* project with 22 attendees from horticultural industry, the private sector, and several government agencies.

- Provision of advice to the state government regarding the development of a State Blue Carbon Strategy through briefings, workshops, site visits, and the preparation of a Blue Carbon synthesis paper and research agenda paper which brought together findings from two projects: the *Coastal carbon opportunities: demonstrating additionality and potential for future offsets in South Australia* and *From salt to C: carbon sequestration through ecological restoration at the Dry Creek Salt Field*.
- National attention given to *Salt to C* project as a possible pilot project to test methodologies for Blue Carbon under the Emissions Reduction Fund, notably through a site visit of a delegation from the Commonwealth Department of Environment and Energy.
- Presentation of the findings of the *Carbon offsets research to support the State carbon sequestration strategy* project during a water policy symposium hosted by the University of South Australia with support of the Murray Darling Basin Authority.
- An end-user workshop conducted halfway through the delivery of the *Ecological connectivity of the River Murray* project with river managers from DEW. The project team is also facilitating collaboration with the Commonwealth Environmental Water Office (CEWO)'s Long Term Intervention Monitoring Project, and a MDBA-CSIRO project that is modelling Dissolved Oxygen in Source to inform river management.
- Collation of valuable feedback from potential end-users about a new spatial tool called *Gulfview* developed as part of the *Socio-ecological assessment of the ecosystems, industries and communities of Spencer Gulf* project.
- Use of the preliminary findings from *Translating Ngarrindjeri Yannarumi into water resource risk assessment* project to inform a major revision of DEW's risk management approach to water planning.
- Provision of the findings of the *Science advice for restoring the Ecological Character of the South Lagoon of the Coorong* project to the Minister for Environment and Water resulting in the recommendations being used to develop a research program to support the restoration of the Coorong.
- Presentation of the findings of the *Independent review of science underpinning reductions to licensed water allocation volumes proposed in the Lower Limestone Coast (LLC) Water Allocation Plan (WAP)* project to the Minister for Environment and Water, the South East NRM Board's Steering Committee and Stakeholder Advisory Group leading to further implementation of the LLC WAP.

Table 2. Summary of progress for Research projects during 2018-2019.

Impact Area	Theme	Project title	Partners	Project aim	Science progress	Knowledge management progress
Economic Development	Mining and Energy	<i>Finding long-term outback water solutions</i>	CSIRO, Flinders University, DEW	Identify and characterise potential groundwater resources in the Musgrave Province of the Anangu Pitjantjatjara Yankunytjatjara (APY) Lands, including their capacity to provide viable water supplies.	<ul style="list-style-type: none"> • 11 wells drilled & core and water sampling conducted. Relatively high yields and low salinity groundwater (<1000 mg/L) in the targeted palaeochannel. Pumping tests on 2 wells. • Lab analysis of water samples completed for use in geochemical tracer modelling. • The initial integrated conceptual hydrogeophysical model completed. • Most of the ground-based geophysical field work completed as inputs to a constrained & validated regional geophysical model • Palaeovalley mapping, and 3D geological model development have made significant progress • Two numerical groundwater models developed. • Completion of the conceptual development of the groundwater knowledge integration system (GKIS). 	<ul style="list-style-type: none"> • ½ day technical workshop for project team and collaborators from Geological Survey SA to how field results can be used to better inform the conceptual model, verification of AEM data and GKIS mapping tool. • Conference presentations: 7th International Workshop on AEM (Denmark), IAH 2018 Congress (Daejeon, Korea), AGCC conference (Adelaide). • Development of a 3-minute video by DEW presenting the GFLOWS drilling program (including drone footage) • Media coverage (Sunday Mail, ABC) triggered by video clip, social media and online articles.
	Northern Corridor	<i>Sustainable expansion of irrigated agriculture and horticulture in Northern Adelaide Corridor</i>	SARDI, CSIRO, Flinders University, UniSA, DEW	Assess how the water resources available in the Northern Adelaide Corridor can be used sustainably for the development of industries that generate new employment opportunities in the region.	<ul style="list-style-type: none"> • Completion of final technical reports. • Preparation of journal articles. • Key findings presented in summary report: <ol style="list-style-type: none"> 1. Long-term modelling scenarios under the historical (1970-2017) and future climate (2018-2050), using the HYDRUS-1D UNSATCHEM model, were integral in assessing strategies to develop sustainable irrigation that minimise risk to the environment while maximising productivity. 2. Soil analysis identified the main soil constraints to be considered in relation 	<ul style="list-style-type: none"> • Establishment of Project Advisory Committee. • Knowledge adoption workshop with 22 attendees from horticultural industry, private sector, SA Water, SA DEW, SA EPA, PIRSA (not including project team & Goyder Office staff). • Conference presentations: The Hydrology and Water Resources Symposium (HWRS) (Melbourne); the Australian Geoscience Council Convention (AGCC) (Adelaide).

Impact Area	Theme	Project title	Partners	Project aim	Science progress	Knowledge management progress
					<p>to expansion of irrigated agriculture on the NAP.</p> <p>3. An Excel-based software tool was developed to facilitate decisions on the optimal water mix, treatment and storage requirements for covered cropping practices.</p> <p>4. Geophysical techniques that can be used to estimate the depth to water table, particle size (clay, sand gravel), hydraulic conductivity and to delineate between soil groups were demonstrated.</p>	
		<i>Assessment of small-scale desalination by capacitive deionisation for treatment of Northern Adelaide Plains waters</i>	UniSA	Assess the viability of capacitive deionisation (CDI) technology for the desalination of marginal-salinity groundwater and recycled water for horticultural production in the Northern Adelaide Plains.	<ul style="list-style-type: none"> • <i>Project completed in previous reporting period.</i> 	<ul style="list-style-type: none"> • Opportunities explored for further R&D on CDI technology through a collaborative research project with universities in Nanjing, China.
Climate Action	Carbon Neutral	<i>Coastal carbon opportunities: demonstrating additionality and potential for future offsets in South Australia</i>	University of Adelaide, CSIRO, SA Water, DEW	Estimate baseline carbon stocks and carbon storage in South Australian coastal ecosystems (seagrass, mangrove and saltmarsh environments) and demonstrate potential for future carbon offsets.	<ul style="list-style-type: none"> • The project team partnered with Geoscience Australia (GA) to carry out an aerial survey of case study site at Mutton Cove collecting high resolution elevation and positional data from across the entire site using expensive instruments supplied by GA. This allowed the evaluation of the change in surface elevation and vegetation cover since the seawall breached and the tidal inundation has changed. • Attempted to undertake a meta-analysis on blue carbon habitats ecosystem services, however found that there are no studies that include 	<ul style="list-style-type: none"> • Discussion of project outputs with Project Advisory Committee. • Project team involved in providing advice to the state government through the DEW Climate Change group regarding the development of a State Blue Carbon Strategy, including briefings, workshops, site visits, and the delivery of a Blue Carbon synthesis paper and research agenda paper (in conjunction with the “Salt to C” project team). • Discussions underway with one of the funding partners, Lendlease, around studying coastal wetland

Impact Area	Theme	Project title	Partners	Project aim	Science progress	Knowledge management progress
					<p>valuation for SA (and only a handful across the whole of Australia).</p> <ul style="list-style-type: none"> •Completion of 7 final technical reports. •Preparation of 3 journal articles. •Completion of a synthesis report in conjunction with the “Salt to C” project team on current Blue Carbon potential in South Australia. 	<p>restoration projects from start to finish, as they will be creating new wetland areas as part of their environmental offsetting obligations for the Northern Connector project.</p>
		<i>From salt to C; carbon sequestration through ecological restoration at the Dry Creek Salt Field</i>	Flinders University, University of Adelaide, UniSA, DEW	<p>Ascertain a proof of concept that reconnecting coastal wetlands to tidal flow will lead to a re-establishment of saltmarsh and mangrove vegetation, carbon abatement and the provision of other ecosystem services.</p>	<ul style="list-style-type: none"> •The field investigations, sample analyses, data analysis and synthesis completed. <ul style="list-style-type: none"> •Task 1. Carbon dynamics & sequestration: analysis of sediment samples to quantify carbon stocks. •Task 2. Revegetation experiments: analysis of monthly seed trap collections & revegetation. •Task 3. Carbon accounting and offset registration: development of a roadmap and engagement with government bodies on Blue Carbon methodologies and the use of this project as a pilot. •Task 4. Co-benefit analysis and upscaling: development of a shared database for coastal ecosystem values in collaboration with the “Coastal carbon opportunities” project. •The team explored using the Swan Alley area for measuring a time series on soil and biomass carbon, as the reconnection that occurred there several decades ago can provide further essential data on long term benefits for blue carbon. 	<ul style="list-style-type: none"> •Discussion of project outputs with Project Advisory Committee. •Dr Jeff Kelleway, lead author of the Technical Report on Blue Carbon methodology to the Government, has visited the site and acknowledged its relevance to progress the development of a respective method. •A project partner (Steve Crook) took Minister Speirs on a visit to restored salt ponds in San Francisco Bay, highlighting the Blue Carbon potential from reestablishment of vegetation. •The project continues to gain national attraction as a possible pilot project to test methodologies for Blue Carbon under the ERF. This was documented by a site visit of a delegation from the Commonwealth Department of Environment and Energy, who were interested in seeing the tidal re-connection activity. •Project team involved in providing advice to the state government through the DEW

Impact Area	Theme	Project title	Partners	Project aim	Science progress	Knowledge management progress
					<ul style="list-style-type: none"> • Completion of technical reports and journal articles. • Completion of a synthesis report in conjunction with the “Coastal carbon” project team on current Blue Carbon potential in South Australia. 	Climate Change group regarding the development of a State Blue Carbon Strategy, including briefings, workshops, site visits, and the delivery of a Blue Carbon synthesis paper and research agenda paper (in conjunction with the “Coastal carbon” project team).
		<i>Knowledge gap analysis and testing model fitness for offsetting greenhouse gas emissions through increasing soil organic carbon and improving nitrogen efficiency in clay modified soils</i>	SARDI, DEW	Identify knowledge gaps for offsetting greenhouse gas emissions through increasing soil organic carbon and improving nitrogen efficiency in South Australian clay modified soils.	<ul style="list-style-type: none"> • <i>Project completed in previous reporting period.</i> 	<ul style="list-style-type: none"> • Discussion of project outputs with Project Advisory Committee. • eNews article.
		<i>Carbon offsets research to support the State carbon sequestration strategy</i>	UniSA, University of Adelaide, DEW	Assess South Australian carbon offset supply opportunities and limitations and co-benefit opportunities for a range of available Emission Reduction Fund methods in different land use zones.	<ul style="list-style-type: none"> • <i>Project complete.</i> • Eight technical reports generated by this project were completed and published. 	<ul style="list-style-type: none"> • Discussion of project outputs with Project Advisory Committee. • Knowledge adoption workshop with SA Water conducted in March 2019 • Presentation of project findings during international water policy symposium hosted by UniSA in March 2019 (with support of the Murray Darling Basin Authority). • eNews article.
	Extreme Events	<i>Climate resilience analysis framework and tools</i>	University of Adelaide, CSIRO	Develop and demonstrate a methodology to assess the vulnerability of industries and natural resources to the impacts	<ul style="list-style-type: none"> • <i>Project completed in previous reporting period.</i> 	<ul style="list-style-type: none"> • Opportunity for further R&D using tools developed through the project are being pursued with interest from SA Water and DEW.

Impact Area	Theme	Project title	Partners	Project aim	Science progress	Knowledge management progress
Healthy Ecosystems	Catchments	<i>Ecological connectivity of the River Murray: managing ecological outcomes and water quality risks through integrated river management</i>	University of Adelaide, CSIRO, SARDI	of climate change and hydroclimate variability. Identify the optimal operations of multiple infrastructure assets to facilitate the transfer of resources, propagules and biota and manage water quality risks.	<ul style="list-style-type: none"> • Successful two years of field work and analysis of data with notable achievements including: <ul style="list-style-type: none"> • Velocity thresholds to support the drift and retention of Murray Cod larvae and zooplankton propagules identified. • Methods to dynamically lookup velocity relationships from hydraulic results in the Source Murray Model have been implemented, to related river operations to the above velocity thresholds. • Generic methods to model dissolved oxygen in Source have been developed and implemented in the Source Murray Model. • Implementation of a mixing criterion in Source to provide an indication of stratification likelihood. • The final summary report has been drafted and individual task outputs are now being processed as part of the integration task. 	<ul style="list-style-type: none"> • Review of research results with Project Advisory Committee. • First outcomes workshop took place with river managers (DEW Pathways Integrated Operations Technical Focus Group). • Ongoing collaboration with the CEWO Long Term Intervention Monitoring Project, comparing and contrasting approaches to using hydraulic models to evaluate ecological responses within the MDB (including the Goulburn and Edward-Wakool systems). • Ongoing collaboration with MDBA-CSIRO project modelling Dissolved Oxygen in Source to inform river management.
	Coasts and marine	<i>Socio-ecological assessment of the ecosystems, industries and communities of Spencer Gulf</i>	SARDI, University of Adelaide, Flinders University, DEW	Undertake a comprehensive assessment of the socio-economic status of the ecosystems, industries and communities of Spencer Gulf and develop tools for evaluating the benefits and impacts of current and future activities.	<ul style="list-style-type: none"> • Compilation of time series for suite of social, economic and ecological indicators complete and reporting underway. • Completion of technical report on the spatial tool (called "GulfView") developed to allow stakeholders to have easy access to key data. 	<ul style="list-style-type: none"> • Project Advisory Committee reviewed the spatial tool & discussed usage and further development. • The spatial analysis tool can potentially be made available through the PIRSA website. It delivers a capability that has been sought directly by key industry and government stakeholders. If the tool is incorporated into AgInsight as is proposed it will greatly assist

Impact Area	Theme	Project title	Partners	Project aim	Science progress	Knowledge management progress
						<p>the formulation and assessment of proposals for new developments.</p> <ul style="list-style-type: none"> • Presentation of <i>GulfView</i> to stakeholders & beneficiary statements obtained about the value of the spatial tool. • Business case being considered by PIRSA to incorporate tool into online data portal.
	Communities	<i>Translating Ngarrindjeri Yannarumi into water resource risk assessments</i>	Flinders University, DEW, Ngarrindjeri Regional Authority	Develop and trial a tool and methodology that supports the translation of Ngarrindjeri Yannarumi Assessments into Water Resource Plan risk assessments.	<ul style="list-style-type: none"> • Literature review completed. • “Translating Ngarrindjeri Yannarumi into water resource risk assessment: Two way sharing workshop” completed. • The project has identified where fundamental change is needed in DEW’s water planning process & has identified next steps in research which is to look at international guidelines and standards. • Journal articles; book chapter (in <i>Reclaiming Indigenous Governance: Reflections from the CANZUS Countries</i>, edited by Nikolakis et al.) 	<ul style="list-style-type: none"> • Project team continued to contribute to, and connect with, the State MDB water planning processes (via internal DEW teams and Water Planning Statement of Commitment), and to provide input into South Australian River Murray Water Resource Plan (WRP), which was made available to the SA Royal Commission enquiring into the MDB. • Presentations: 2018 Annual Conference of the Australian Marine Sciences Association (AMSA), Australian Freshwater Sciences Society (AFSS) 2018 Conference; DEW Lunchtime Science Seminar. • Indigenous representatives from project team supported Federal compliance process for MDB plan. • Early components of the Yanarrumi research project were incorporated into a major natural history book published by the Royal Society of SA: “2018 Natural History of the Coorong, Lower Lakes, and Murray Mouth Region (Yarluwar-Ruwe)”

Impact Area	Theme	Project title	Partners	Project aim	Science progress	Knowledge management progress
						<ul style="list-style-type: none"> • DEW team member playing a lead role in a major revision of DEW's risk management approach to water planning. • The development of part of the research component of the Healthy Coorong Healthy Basin (HCHB) research plan has relied heavily on the current project.
	Catchments	<i>Science advice for restoring the Ecological Character of the South Lagoon of the Coorong</i>	University of Adelaide, SARDI, Flinders University, CSIRO, DEW	Provide decision-makers with recommended actions for restoring the Ecological Character of the South Lagoon of the Coorong.	<ul style="list-style-type: none"> • <i>Project complete.</i> • Completion of technical report. 	<ul style="list-style-type: none"> • Findings presented to Minister Speirs. • Recommendations used to develop a research program to support the restoration of the Coorong.
Commissioned projects	South East	<i>Independent review of science underpinning reductions to licensed water allocation volumes proposed in the Lower Limestone Coast (LLC) Water Allocation Plan (WAP)</i>	Flinders University, CSIRO	Provide input to the overarching LLC WAP Science Review being conducted by the South East NRM Board at the request of the Minister for Environment and Water.	<ul style="list-style-type: none"> • <i>Project complete.</i> • Completion of a series of meetings with stakeholders and State government staff in order for the expert panel to better understand key issues and to discuss scope of review. • Completion of analyses of hydrographs from relevant management areas, and scenario testing and sensitivity analysis of the risk assessment method. • Completion of a final technical report (which benefitted from an independent peer-review). • Completion of an additional report analysing likely causes of changes in groundwater levels. 	<ul style="list-style-type: none"> • Presentation of findings to Steering Committee and incorporation into program of LLC WAP implementation. • Participation in briefings to Minister David Speirs. • Presentation of findings to Stakeholder Advisory Group with positive feedback. • Release of plain language summary (fact-sheet) on SE NRM and Goyder websites. • Outputs used in WAP implementation process with positive feedback from Natural Resources SE.
	Catchments	<i>Urgent investigations for restoring the</i>	CSIRO, DEW, Flinders	Conduct priority investigations and project planning to support	<ul style="list-style-type: none"> • Completion of Trials and Investigation section of Business Case for Healthy Coorong, Healthy Basin Plan Stage 1. 	<ul style="list-style-type: none"> • Close engagement of Goyder Institute researchers with DEW to develop the project scope.

Impact Area	Theme	Project title	Partners	Project aim	Science progress	Knowledge management progress
		<i>ecological character of the South Lagoon of the Coorong ('phase 0' of Healthy Coorong Healthy Basin Program)</i>	University, SARDI, University of Adelaide, University of SA	program for restoring the South Lagoon of the Coorong	<ul style="list-style-type: none"> • Completion of field work to assess the potential habitat value of wetlands surrounding the Coorong to support high value and vulnerable waterbird populations. • Completion of draft project plans for 5 components of the proposed Trials and Investigations project of the Healthy Coorong, Healthy Basin Plan. • Completion of two draft technical reports (waterbird refugia). • Expert scientific advice provided about the recommended design, including locations, for the establishment of Coorong aquatic plant refugia. • Interim reports delivered relating to Integration, Foodweb and Aquatic vegetation/algae tasks. 	<ul style="list-style-type: none"> • Involvement of lead researchers in Phase 1 planning workshop which identified linkages and collaboration opportunities.

3 Planned activities for 2019-2020

3.1 Institute funded research projects

There are eight research projects that will be completed during 2019-2020 (Table 3). This will include the completion of field, laboratory and desktop-based research and the development and publication of technical reports. There remains \$188,389 for new research projects and expert panel assessments for the second term of the Institute. These funds will be allocated to strategic priorities of the State Government as they arise under the direction of the Research Advisory Committee and Management Board.

3.2 Knowledge management activities

Knowledge management activities will remain a priority during 2019-2020 (Table 3). This will include the ongoing involvement of Project Advisory Committees in all projects. With the completion of all existing research projects, additional knowledge management activities will be undertaken, including:

- The publication of technical reports.
- The publication of e-newsletter articles summarising the outcomes of research projects.
- Briefing subject matter experts and policy leaders in government agencies on the research outcomes.
- The production of synthesis papers and fact-sheets.
- The storage of data and models in publicly-accessible formats.
- Knowledge adoption workshops and training sessions.
- Presentations of Goyder Institute projects in the Water Industry Alliance's *Lunch and Learn* series (or equivalent).
- Presentations of Goyder Institute projects in ICE WaRM's webinar series.
- Presentations of Goyder Institute projects at international science and management conferences.

3.3 Additional research opportunities

With the majority of the Institute's research budget for the second-term allocated, attention will be focussed on generating new research opportunities for the Institute partners, consistent with the strategic planning. Several future opportunities have been identified by the Institute, which will be pursued during 2019-2020. These include:

- A food-energy-water nexus research program.
- A research program to support the restoration of wetlands of the Murray Darling Basin.
- A Murray-Darling Basin Freshwater Research Consortium.
- A research project on urban water management practices for the protection of coastal waters.
- A research project supporting climate adaption within South Australia.
- Research projects with international partners that have been identified as part of International Trade Missions with the State Government.

Table 3. Summary of planned activities for 2019-2020. A detailed workplan of knowledge management activities is currently being prepared.

Project title	Planned science activities	Planned knowledge management activities
Finding long-term outback water solutions	<ul style="list-style-type: none"> • Completion of ground-based geophysics. • Completion of updated conceptual groundwater model and a groundwater knowledge integration system. • Completion of final technical reports. • Preparation of journal articles. 	<ul style="list-style-type: none"> • Presentation of project findings to Project Steering Committee and to APY Lands management board. • Presentation of findings at a stakeholder knowledge adoption workshop, webinars and Lunch & Learn series. • Production of synthesis papers or fact sheets. • E-newsletter article summarising project outcomes. • Publication of final technical reports on website. • Data storage with SA Government corporate systems.
Sustainable expansion of irrigated agriculture and horticulture in the Northern Adelaide Corridor	<ul style="list-style-type: none"> • Publication of technical reports and papers. 	<ul style="list-style-type: none"> • Discussion of knowledge adoption activities with Project Advisory Committee. • Presentation of findings at a stakeholder knowledge adoption workshop, webinars and Lunch & Learn series. • Production of synthesis papers or fact sheets. • E-newsletter article summarising project outcomes. • Publication of final technical reports on website. • Data and model storage with SA Government corporate systems.
Assessment of small-scale desalination by capacitive deionisation for treatment of Northern Adelaide Plains waters	<ul style="list-style-type: none"> • Project complete. 	<ul style="list-style-type: none"> • Production of synthesis papers or fact sheets.
Coastal carbon opportunities: demonstrating additionality and potential for future offsets in South Australia	<ul style="list-style-type: none"> • Publication of technical reports and papers. 	<ul style="list-style-type: none"> • Further presentations as required to contribute to development of State's blue carbon strategy. • Discussion of further knowledge adoption activities with Project Advisory Committee. • Publication of final technical reports on website. • Presentation of findings at webinars and Lunch & Learn series. • E-newsletter article summarising project outcomes, along with that of Salt to C project • Maintenance of project website (Uni of Adelaide) and social media. • Data storage with SA Government corporate systems.
From salt to C; carbon sequestration through ecological restoration at the Dry Creek Salt Field	<ul style="list-style-type: none"> • Publication of technical reports and papers. 	<ul style="list-style-type: none"> • Further presentations as required to contribute to development of State's blue carbon strategy. • Discussion of further knowledge adoption activities with Project Advisory Committee. • Publication of final technical reports on website.

Project title	Planned science activities	Planned knowledge management activities
		<ul style="list-style-type: none"> • Presentation of findings at webinars and Lunch & Learn series. • Production of synthesis papers or fact sheets. • E-newsletter article summarising project outcomes, along with that of Coastal Carbon project. • Data storage with SA Government corporate systems.
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	<ul style="list-style-type: none"> • Project completed in 2017-18. 	<ul style="list-style-type: none"> • Production of synthesis papers or fact sheets.
Carbon offsets research to support the State carbon sequestration strategy	<ul style="list-style-type: none"> • Project complete. • Preparation of additional journal articles. 	<ul style="list-style-type: none"> • Discussion of knowledge adoption activities with Project Advisory Committee. • Presentation of findings at webinars and Lunch & Learn series. • Production of synthesis papers or fact sheets.
Climate Resilience Analysis Framework and Tools	<ul style="list-style-type: none"> • Project completed in 2017-18. 	<ul style="list-style-type: none"> • Production of synthesis papers or fact sheets.
Ecological connectivity of the River Murray: managing ecological outcomes and water quality risks through integrated river management	<ul style="list-style-type: none"> • Completion of analyses and modelling. • Completion of final summary report. • Preparation of journal articles. 	<ul style="list-style-type: none"> • Presentation of project findings to Project Advisory Committee & discussion of knowledge adoption activities. • Presentation of findings at a stakeholder knowledge adoption workshop. • Production of a synthesis paper and fact sheets. • E-newsletter article summarising project outcomes. • Publication of final technical reports on website. • Data and model storage with SA Government corporate systems.
Socio-ecological assessment of the ecosystems, industries and communities of Spencer Gulf	<ul style="list-style-type: none"> • Completion of database for information used to estimate ecological, economic and social performance indicators and establish time-series. • Completion of the assessment of socio-ecological status of Spencer Gulf and guidelines for future assessments. • Completion of final technical reports. • Preparation of journal articles. 	<ul style="list-style-type: none"> • Presentation of project findings to Project Steering Committee & discussion of knowledge adoption activities. • Presentation of findings at a stakeholder knowledge adoption workshop, webinars and Lunch & Learn series. • Production of synthesis papers or fact sheets. • E-newsletter article summarising project outcomes. • Publication of final technical reports on website. • Data storage with SA Government corporate systems.

Project title	Planned science activities	Planned knowledge management activities
Translating Ngarrindjeri Yannarumi into water resource risk assessments	<ul style="list-style-type: none"> • Recommendations on how to adapt DEW's risk assessment process. • Completion of final technical reports. 	<ul style="list-style-type: none"> • Presentation of project findings to Project Steering Committee. • Presentation of findings at a stakeholder knowledge adoption workshop, webinars and Lunch & Learn series. • Production of synthesis papers or fact sheets. • E-newsletter article summarising project outcomes. • Publication of final technical reports on website and preparation of journal articles.
Science advice for restoring the Ecological Character of the South Lagoon of the Coorong	<ul style="list-style-type: none"> • Project complete. 	<ul style="list-style-type: none"> • Production of synthesis papers or fact sheets.
Independent review of science underpinning reductions to licensed water allocation volumes proposed in the Lower Limestone Coast (LLC) Water Allocation Plan (WAP)	<ul style="list-style-type: none"> • Project complete. 	<ul style="list-style-type: none"> • None planned (knowledge management completed with findings already taken up by South East Natural Resources Management and Department for Environment and Water).
Urgent investigations for restoring the ecological character of the South Lagoon of the Coorong	<ul style="list-style-type: none"> • Finalisation of waterbird technical reports. • Finalisation of 5 detailed project plans for components of the proposed Trials and Investigations project (nutrients, aquatic plants and algae, foodwebs, waterbirds and climate adaptation). • Completion of technical report on the effects of temperature on algal bloom development and improvement in the accuracy of algal bloom modelling. • Completion of technical report detailing the key knowledge gaps for improving the accuracy of water quality modelling in Coorong. • Completion of technical report assessing food availability and nutritional value based on field surveys in different sub-regions in the Coorong. • Completion of technical report on distribution of Ruppia and filamentous algae in Coorong. • Completion of technical report on options to remove filamentous algae in the Coorong, including a summary of consultation with the Ngarrindjeri Aboriginal Corporation. 	<ul style="list-style-type: none"> • Establishment of Project Advisory Committee. • Use of interim reports to provide opportunity for research end-users to provide preliminary feedback. • Presentation of project findings to Project Advisory Committee. • E-newsletter articles summarising project outcomes. • Social media releases about field & laboratory activities.

4 Budget

4.1 Research program

There is good agreement between target budgets for the research program as outlined in the *Strategic Research Plan 2015-2019* and actual budgets for the three Impact Areas. A total of \$6,392,908 of Goyder Institute cash has been allocated to second-term research projects (Table 4), with the following breakdown to each of the three Impact Areas:

- 55% to *Economic Development*, compared to a target of 55%;
- 26% to *Healthy Ecosystems*, compared to a target of 30%; and
- 19% to *Climate Action*, compared to a target of 15% (Table 5).

A total of \$4,471,853 has been paid from Goyder Institute funds to research partners for second-term research projects (Table 4). The remaining forecast expenditure for research projects to 30th June 2020 is \$1,732,666. This equates to an approved allocation of 97% of the research budget outlined in the *Strategic Research Plan 2015-2019*. The remaining funds consist of \$188,389 for research projects and expert panel assessments and will be allocated to specific projects as priorities arise for State Government under the direction of the Research Advisory Committee and Management Board.

The *Strategic Research Plan 2015-2019* included a target of 30% external co-investment into research projects for the second term of the Institute (Table 5). Currently, total external cash contributions represent 32% of the total cash budget and total external contributions represent 27% of the total research budget (cash and in-kind). External contributions consist of \$3,130,000 cash and \$2,515,667 in-kind and have resulted in a total value of the research program of \$20,919,407 compared to the target of \$17,100,000 (Table 5). The Goyder Institute has also established additional projects that complement the current research program. These projects are funded entirely by sources beyond the minimum State Government contribution to the Institute and have a total value of \$1,108,258.

The Goyder Institute Agreement requires that in-kind contributions to research projects match the cash contributions by the State. In-kind contributions by research partners exceeds the Institute cash contributions by \$2,676,313 with a total of \$9,069,221 of in-kind contributions provided by research partners.

4.2 Administration and knowledge management – 2019-2020

The Administration and Knowledge Management budget for 2019-2020 has been prepared and approved by the Management Board (Table 6). Consistent with the strategic planning of the Institute, this is allocated to second-term activities and activities associated with the transition to the third-term.

For second-term activities the total labour budget is \$209,344 and the total operating is \$103,875 - giving a total of \$313,319. The total Knowledge Management budget is \$110,000.

For third-term transition activities the total budget is \$340,371.

Table 4. Research Program budget. This does not include projects entirely funded by sources beyond the minimum State Government contribution to the Institute.

Impact Area	Theme	Project title	Institute cash	2015-17 actual	2017-19 committed	Partner in-kind	External cash	External in-kind	Total external	Total value
Economic Development	Mining & Energy	GFLWS3	\$1,904,400	\$1,070,950	\$833,450	\$1,904,400	\$2,570,000	\$0	\$2,570,000	\$6,378,800
	Northern Corridor	Northern Corridor	\$1,550,253	\$1,387,537	\$162,716	\$1,550,253	\$0	\$0	\$0	\$3,100,506
		Desalination trial	\$30,000	\$30,000	\$0	\$32,000	\$30,000	\$0	\$30,000	\$92,000
Economic Development subtotal			\$3,484,653	\$2,488,487	\$996,166	\$3,486,653	\$2,600,000	\$0	\$2,600,000	\$9,571,306
Healthy Ecosystems	Catchments	River Murray	\$1,299,970	\$890,522	\$409,448	\$1,299,970	\$0	\$1,665,000	\$1,665,000	\$4,264,940
		Coorong	\$23,866	\$20,589	\$3,277	\$24,916	\$0	\$2,167	\$2,167	\$50,949
	Coasts & Marine	Spencer Gulf	\$300,000	\$80,000	\$220,000	\$647,082	\$315,000	\$65,000	\$380,000	\$1,327,082
	Communities	Yannarumi	\$48,525	\$29,115	\$19,410	\$50,026	\$0	\$0	\$0	\$98,551
Healthy Ecosystems subtotal			\$1,672,361	\$1,020,226	\$652,135	\$2,021,994	\$315,000	\$1,732,167	\$2,047,167	\$5,741,522
Climate Action	Carbon Neutrality	Coastal carbon	\$400,021	\$274,887	\$125,134	\$1,430,445	\$185,362	\$0	\$185,362	\$2,015,828
		Salt to C	\$336,000	\$218,380	\$117,620	\$1,360,645	\$9,638	\$783,500	\$793,138	\$2,489,783
		Soil carbon	\$50,000	\$50,000	\$0	\$50,000	\$20,000	\$0	\$20,000	\$120,000
		Carbon co-benefits	\$250,000	\$220,000	\$30,000	\$519,612	\$0	\$0	\$0	\$769,612
	Extreme Events	CRAFT	\$199,873	\$199,873	\$0	\$199,872	\$0	\$0	\$0	\$399,745
Climate Action subtotal			\$1,235,894	\$963,140	\$272,754	\$3,560,574	\$215,000	\$783,500	\$998,500	\$5,794,968
Research program total			\$6,392,908	\$4,471,853	\$1,732,666	\$9,069,221	\$3,130,000	\$2,515,667	\$5,645,667	\$20,919,407

Table 5. Comparison of actual and target allocations to the Research Program Impact Areas. This does not include projects with majority funding from sources beyond the minimum State Government contribution to the Institute.

Impact Area	Target Institute cash	Actual Institute cash	Target partner in-kind	Actual partner in-kind	Target total external	Actual external cash	Actual external in-kind	Actual total external	Target total value	Actual total value
Economic Productivity	\$3,600,000	\$3,484,653	\$3,600,000	\$3,486,653	\$2,400,000	\$2,600,000	\$0	\$2,600,000	\$9,600,000	\$9,571,306
Healthy Ecosystems	\$2,000,000	\$1,672,361	\$2,000,000	\$2,021,994	\$1,200,000	\$315,000	\$1,732,167	\$2,047,167	\$5,200,000	\$5,741,522
Climate Action	\$1,000,000	\$1,235,894	\$1,000,000	\$3,560,574	\$300,000	\$215,000	\$783,500	\$998,500	\$2,300,000	\$5,819,968
Total	\$6,600,000	\$6,392,908	\$6,600,000	\$9,069,221	\$3,900,000	\$3,130,000	\$2,515,667	\$5,645,667	\$17,100,000	\$20,919,407

Table 6. 2019-2020 financial year Administration and Knowledge Management budget for second term activities and Administration budget for third-term transition activities.

Administration - second-term activities	2019-20 Budget
Director	\$86,026
Research Manager	\$87,154
Chair	\$13,665
ICE WaRM Support Services	\$22,500
Labour Total	\$209,344
Communications & marketing	\$59,600
Travel and events	\$8,000
Memberships and sponsorships	\$6,000
Accommodation	\$12,875
Tax, bank fees and auditing	\$4,400
Insurance	\$6,000
General operating	\$7,100
Operating Total	\$103,975
Total administration-second term activities	\$313,319
Knowledge Management - second-term activities	2019-20 Budget
Fact sheets and synthesis papers	\$40,000
Adoption workshops	\$25,000
Conference and panel sessions	\$20,000
Website maintenance and content	\$25,000
Total Knowledge Management	\$110,000
Administration - third-term transition activities	2019-20 Budget
Director	\$129,038
Research Manager	\$52,292
Chair	\$13,665
ICE WaRM Support Services	\$22,500
Labour Total	\$217,496
Accommodation	\$12,875
Business development support	\$35,000
Communications and marketing	\$10,000
Travel and events	\$20,000
Third-term agreement and handbook	\$45,000
Operating Total	\$122,875
Total administration- third term transition activities	\$340,371

4.3 Financial position

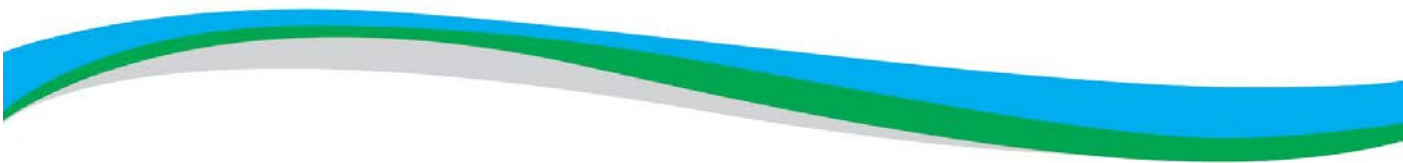
The cash balance of Goyder Institute funds held at ICE WaRM as at 30th June 2019 was \$3,467,637. This accounts for the annual payment from State Government; external project funding; interest received; and all Project, Administration and Knowledge Management expenses from 1st July 2018 to 30th June 2019. The calculations for the balance have been externally audited and are outlined below:

ICE WaRM balance of funds at 1 st July 2018	\$3,962,961
DEW State Grant 2017-2018 received November 2018	\$2,000,000
External project funding	\$342,002
SA Government contribution to third-term	\$150,000
Interest received to 30 June 2019 on funds balance	<u>\$79,357</u>
	\$6,534,320
Less: Project payments to 30 June 2019	(\$2,567,789)
Less: Administration costs	(\$484,699)
Less: Knowledge management costs	<u>(\$14,195)</u>
Balance 30 th June 2019	\$3,467,637

Accounting for future project income; forecast interest payments; and all forecast Project, Administration and Knowledge Management costs for 2019-2020 (Table 3 and 5), the forecast cash balance to 30th June 2020 is \$36,230. These calculations are summarised below:

ICE WaRM balance of funds at 1 st July 2019	\$3,467,637
2019-2020 project income	\$666,528
Estimate of interest to 30 June 2020	<u>\$10,000</u>
	\$4,144,165
Less: Remaining 2018-19 administrative costs	(\$10,000)
Less: Goyder Institute project payments	(\$2,109,444)
Less: Administration costs for 2019-20	(\$653,690)
Less: Knowledge management costs	(110,000)
Less: External project payments	(\$917,205)
Less: Third-term commitments	<u>(\$307,596)</u>
Forecast balance 30 th June 2020	\$36,230

It is intended that the balance will be used as a contribution to the administration costs of the third-term of the Institute, which is anticipated to begin on 1st July 2020.



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.