

Annual Research & Development Plan and Budget 2015/16





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 and the University of South Australia. 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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Department of Environment, Water and Natural Resources



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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.



SARDI



SOUTH AUSTRALIAN RESEARCH AND DEVELOPMENT INSTITUTE



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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 areas for research impact: 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 2015, 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, which is documented in the form of a Project Agreement that has been signed by the Chairman of the Management Board.

During the execution of an approved 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 may involve financial consequences will be prepared in consultation with the Director and in consultation with 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 2014/15

A summary of the Goyder Institute projects up to the end of the 2014/15 financial year are identified in the table below. The projects listed consist mostly of projects approved during the first five years of the institute that were completed during 2015 or are still to be finalised. This status is based on that at 30 June 2015. Additional information on each of the projects is provided in the following sections of this report.

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	Active
		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	Finalisation
		E.1.14	River Murray Operations DSS	Finalisation
		E.1.15	Chowilla Regulator Murray Cod Ecology	Finalisation
		E.1.16	R Murray Coorong Productivity	Completed
		E.1.17	Indigenous Knowledge	Finalisation
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	Finalisation
		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	Finalisation
		I.1.5	Torrens Dilution Trial 2	Completed
		I.1.6	Adelaide Plains Groundwater Study	Finalisation
		I.1.7	Water Quality Model	Completed
		I.1.8	NAP 90 Day/Water Stocktake	Active
I.2	Mining & outback water	I.2.1	G-FLOWS	Completed
		I.2.2	G-FLOWS 2 –Northern Eyre Peninsula	Finalisation
		I.2.3	Lake Eyre Basin Eco-Hydrological Indicators	Finalisation
		I.2.4	Outback Water Supplies	Completed
		I.2.5	Marine Park Regional Assessment	Completed
		I.2.6	SARDI Commercial Fishery Assessment	Active

Theme	Roadmap	Project Number	Project Title	Status
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	Active
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	Active

2.1 Project Expenditure to end of FY 2015/16

A detailed description of Goyder Institute expenditure in FY 2014/15 can be found in the 2014/15 Financial Report. As there is no new funding available for research investment until the new Agreement is established, research investment during 2015/16 will be small and will build on previous research investment, knowledge adoption activities and finalising existing research projects. Some effort will be maintained in initial scoping of the larger projects planned for 2016-17.

Theme	Roadmap	Approved Projects/Activities	APPROVED Total Budget	APPROVED CASH	CASH ACTUALS to 30 June 2015	PARTNER IN-KIND	EXTERNAL CASH AND IN-KIND	Cash Variance
1	Climate Change	Roadmap C.1.1. Climate Change Downscaling	7,012,255	3,411,877	3,393,439	4,177,564	144,212	18,438
2	Environmental Water	Roadmap E.1. River Murray Totals	7,259,256	3,489,617	3,193,032	3,659,580	1,133,290	296,585
		Roadmap E.2 Surface water, groundwater and wetlands Totals	5,648,492	2,544,410	2,191,906	2,818,664	568,954	352,504
3	Water for Industry	Roadmap I.1 WAP and Water Quality Totals	8,746,125	4,341,594	3,965,957	4,500,676	4,011,765	375,637
		Roadmap I.2 Outback Water Totals	6,582,415	3,282,962	2,895,815	3,459,867	1,588,542	387,147
4	Urban Water	Roadmap U.1 WSUD Totals	2,035,904	1,017,833	952,833	1,042,482	57,000	65,000
		Roadmap U.2 Water Resource Mix Totals	6,172,329	2,974,423	2,870,998	3,456,760	5,128,979	103,425
		Total Research Approved Cash and Expenditure	43,456,776	21,062,716	19,463,980	23,115,593	12,632,742	1,598,736
5	Research Adoption	PhD Supplements	750,000	750,000	750,000	2,060,998	0	0
		PhD Comms Activity	30,000	30,000	23,441	0	0	6,559
		ANZSOG	700,000	277,145	247,227	354,468	0	29,918
		DEWNR Model Warehouse	72,855	72,855	0	0	0	72,855
		Knowledge Management Spend to Date	400,000	400,000	389,330	10,000	12,000	10,670
		Research Adoption Totals	1,952,855	1,530,000	1,409,998	2,425,466	12,000	120,002
6	Institute Office	Director's Office	4,007,231	2,388,043	2,388,043	1,714,744	0	0
		Institute Office Total	4,007,231	2,388,043	2,388,043	1,714,744	0	0
		INSTITUTE TOTAL	49,416,862	24,980,759	23,262,021	27,255,803	12,644,742	1,718,738

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 still at the heart. These impact areas will build on the 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 hence how they contribute to 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 in all research programmes.

3.2 Investment across Research Themes

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 per each of the three Impact Areas and Goyder Institute Leadership and Administration:

Research Impact Area	Cash Contributions	Matching Partner Contributions	Other*	Total
Economic Productivity	\$3,600,000	\$3,600,000	\$2,400,000	\$9,600,000
Healthy Ecosystems	\$2,000,000	\$2,000,000	\$1,200,000	\$5,200,000
Climate Action	\$1,000,000	\$1,000,000	\$300,000	\$2,300,000
Knowledge Management	\$400,000	0	0	\$400,000
Institute Leadership and Administration	\$2,000,000	0	0	\$2,000,000

*Target for external funding

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 science impact areas will be 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 in the first year of the Institute and 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 month – 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 – 3 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. 3 – 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	Total Investment
Short Term Projects <1 year	10-15%
Medium Term Projects 1-3 years	25-30%
Long Term Projects 3years	55-60%

3.4 Proposed Budget 2015/16

The focus of investment during 2015/16 will be to finalise all remaining Goyder Institute 2010-2015 projects. A small amount of funding will be available through the accrued interest to support development of research projects whilst the Agreement and Research Strategy are being finalised. New major investment will occur once these are in place and the cash contributions received by the new Institute Manager, being ICEWaRM.

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.

- 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.

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);
- Understand and support the principles of Goyder;
- Previous experience in managing cross agency, multi-disciplinary programs and projects;
- Understand the context within which the results will be used;
- Demonstrated experience in transferring outputs into outcomes; and
- Research Leaders will be recommended by the RAC.

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

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.

4.1 Knowledge Pathways

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 a mandated water sensitive design

policy for SA and the research that informed SA's negotiation with the other states on the Basin Plan (etc). 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 delivery 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 programs, such as those administered by the NCGRT and ICE WaRM.

Indicative areas of activity under the knowledge pathways program 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 SA training provider programs (for example ICEWaRM, NCGRT, Tafe SA)

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 program continues to be available beyond the life of the Institute.

Various numerical models have been produced by Goyder Institute research projects. These models and associated data are not currently managed or stored in a centralised location, with each research team currently housing or archiving their model and data products in different ways. During 2015/16, Goyder Institute and DEWNR established the Model and Data Management Strategy for Goyder Institute. This project will expand the capability of the DEWNR Model Warehouse to enable it to house a greater variety of models and data types and integrate the models and associated data from the Goyder Institute into the DEWNR Model Warehouse. The project will provide secure storage, version-control, ongoing discoverability and client support for Goyder Institute models into the future. On completion of this work, the integrity and value of Goyder Institute models and data-sets will be preserved in a central and secure archive, ensuring that they can provide future value for science based policy solutions, particularly within SA State Government. The Model and Data Strategy project also incorporates a component of knowledge transfer from Goyder Institute research partner teams to DEWNR personnel to enable DEWNR to provide advice on archived models to interested parties in future.

5 Goyder Institute Activity 2015-16

5.1 Stakeholder Consultation Workshops

A total of at least seven stakeholder consultation workshops are to be convened by the Institute during 2015-16.

The purpose of these is to allow Goyder stakeholders and potential users of Goyder Institute research (primarily within State Government departments) to explore and identify knowledge gaps that currently create impediments to their business activity and which could be addressed by Goyder Institute research. Workshops already organised or held in the 2015-16 financial year are:

1. Goyder Institute Research Plan Consultation Workshop, 10th November 2015
2. Climate Change and Adaptation Knowledge Needs, 9th October 2015
3. Coastal and Marine Research Knowledge Gaps, 3rd November 2015
4. River Murray Knowledge Gaps and Research Needs 27th November 2015
5. International Engagement, 11th December 2015
6. Water Planning Knowledge Gaps, 15th December 2015
7. SA Marine Park Monitoring and Evaluation Methods, 11th February 2016

The outcomes of the workshops have been collated into a selection of research focus areas that address the range of knowledge gaps and research needs identified by stakeholders. The highest priority research focus areas identified will be considered for research investment by the Institute in coordination with the Institute's partners, key stakeholders and research providers.

Some further proposals for project or research focus areas were received from stakeholders independently of these workshops. These proposals will be considered along with the research focus areas identified during the stakeholder consultation workshops to identify the highest research priorities, corresponding stakeholders and potential research project participants.

5.2 Research Activity 2015-16

i. Northern Adelaide Plains Water Stocktake

This project brings together information and knowledge regarding the existing and potential water resources of the Northern Adelaide Plains (NAP) prescribed wells area and the potential growth zones north of the Gawler River as far north as the Wakefield River, consistent with the NAP 30 Year Plan being developed by the Department of State Development. This study is a first step in bringing together existing information and new research and it is anticipated that there will need to be additional investigations on key issues that are identified from this project, including the feasibility of any development proposals submitted to government. The final report of this project will be finalised in April 2016, following input from the NAP Water Stocktake Steering Committee and approval of the Goyder Institute Research Advisory Committee and Board.

ii. Marine Parks MER planning

The Goyder Institute is supporting DEWNR in the development and implementation of baseline reports and the monitoring, evaluation and reporting (MER) program for SA's 19 Marine Parks. The MER program is required to target specific components of the marine parks network, based upon a variety of considerations including predicted changes, community expectations, the logistics and budget of the MER program, strategies in the marine park management plans, and the objects of the *Marine Parks Act 2007*. The Institute is coordinating the independent external reviews of the marine parks baseline reports by scientists with expertise in socio-economics and ecology. The Institute is also coordinating a workshop to provide independent advice on the development of the marine parks MER program.

iii. Water for Mineral Resources Stakeholder Workshop

The Department of State Development (DSD) has launched its Copper Strategy which will have a level of water dependence depending on the evolving path of implementation. The Goyder Institute for Water Research is in a unique position to support DSD and industry in determining what water information and strategy is required, what water information is available, identifying what gaps in information exist to support the need and strategy and developing appropriate research strategies to fill the gaps in a timely manner, allowing support of the Copper Strategy. The Copper Strategy includes a project titled 'Water for Mineral Resources', which aims to:

- understand existing information on suitable water resources for mining activities across SA,

- identify and assess priorities across the state's mining regions to address gaps in groundwater resources information, and
- identify and secure funding to address gaps.

In partnership with DSD and DEWNR, the Goyder Institute will convene a workshop with key stakeholders in May 2016. The purposes of the workshop will be to engage stakeholders in the Copper Strategy and those who can contribute water information to:

- establish a collaborative environment among stakeholders
- clarify the current industry needs in terms of water information and strategy
- identify available water information and resources
- identify the gaps and agree which need to be addressed in respect of water information and resources
- prioritise activity to ensure tangible outcomes for contributing to the preparation of a 3-year plan prior December 2016.

iv. Goyder Institute Finding Long-term Outback Water Solution (G-FLOWS)

The project planning of the G-FLOWS Stage 3 project is in progress, having been identified by SA Government and Goyder Institute research partners as a research priority. Planning and project establishment activity will continue through May 2016, with a view to the project commencing before the end of June 2016.

G-FLOWS Stage 3 will seek to better understand groundwater resource potential in the Braemar Corridor and Musgrave Province of South Australia. Both areas have been identified as key priority areas for exploration and mining development in low rainfall regions of South Australia. The proposed work aims to underpin policy in support of sustainable rural industries, including mining, pastoral activities and for securing resource for regional communities. This project aims to achieve this through the development and application of science, complementing activities already underway, or planned, by State agencies, industry and the community.

v. Murray Darling Basin Plan Implementation - Efficiency measures and Environmental Outcomes

In Partnership with SARDI, Deakin University and University of Adelaide, the Goyder Institute will undertake an ecological analysis and interpretation of the potential environmental outcomes associated with recovery of additional water through efficiency measures under the Basin Plan. The project seeks to understand the potential ecological effects of recovery of an additional 450 GL of environmental water under an SDL adjusted scenario independent of the easing of constraints. An expert panel workshop approach will be applied with the preparation of a brief report on the findings.

vi. Rajasthan Water Action plan

The South Australian Government, in conjunction with the Goyder Institute and ICEWaRM is seeking to provide advice and expertise to support the establishment of a Centre of Excellence in Water (and Resources) Planning and Management in Rajasthan, India. Such a centre would be a focus for the collaboration between South Australian and Rajasthan based research and Government institutions and provide a two-way exchange of scientific, technical and policy expertise across a number of key areas. The primary area relevant to the partners of the Goyder Institute is in the field of groundwater management. This area of activity was identified in the recent Sister State MOU between South Australia and Rajasthan and the details will be further developed with Rajasthan officials during 2016.

vii. Analysis of Extreme Rainfall Events

An analysis of rainfall intensity and frequency will be scoped and initiated, initially for the Northern Adelaide Plains region, as part of a detailed analysis of projected changes in rainfall patterns on the State's water infrastructure and water security. The analysis will utilise the SA Climate Ready dataset and will be undertaken as a trial desk top study in the first instance before any further analysis is conducted in other regions across South Australia. The project scope will also consider impacts of altered rainfall patterns on urban stormwater runoff to coastal waters, with a view to identifying

coastal impact effects to be considered within the scoping of a subsequent research project to focus on urban runoff and coastal water quality as an extension of current Goyder Institute research project U.2.5. *'Targeting stormwater interventions to support integrated urban water management that delivers improved coastal water quality'*.

5.3 Research Consultancy

Where relevant and aligned with the interests of partners, the Goyder Institute facilitates external research and peer review investigations that are funded outside of the core South Australian Government funding. These projects are developed with the client and are costed on a full cost-recovery basis. There are a small number of these research consultancy projects that are undertaken on an ad hoc basis, subject to the availability of personnel and appropriate expertise. This is not a core area of focus for the Goyder Institute in 2015-16.

5.4 Research Planning to be Undertaken in 2015-16

5.4.1 Research planning and scoping within programs identified in the Strategic Research Plan.

In view of the large array of research needs identified by stakeholders, Goyder Institute research projects must strike a balance between the priority of stakeholder research needs, the capability and capacity of research partners and the limits of available funding. This necessitates the need for effective consultation, to ensure projects meet several key requirements:

1. Address high priority research needs;
2. Contribute strategically to one or more of the Institute's identified impact areas;
3. Comply with the intents of the Goyder Institute Strategic Research Plan;
4. Can deliver outcomes within the Institute's required timeframes;
5. Can be achieved within the budgetary constraints of the Goyder Institute and contributing partners.

The research consultation and project development process will continue through to June 2016 with a view to establishing an integrated set of research projects early in 2016-17. This process will also result in the completion of a comprehensive Annual Research and Development Plan during Q1 of 2016-17.

It is planned to develop a small number of medium to large projects likely to be aimed at GFLows3, Northern Corridor, Murray-Darling Basin and Climate Action.

5.5 Planning Process for 2016-17

A draft 2016-17 R&D Plan will be discussed with partner representatives and other key stakeholders during July 2016, with the purpose of seeking input and feedback on the proposed research priorities. This process will enable consideration of any new and emerging priorities of Government, innovative approaches to meeting the identified knowledge gaps and priorities and identifying opportunities for leveraging funding. It is proposed that the 2016-17 Annual R & D Plan will be prepared early in 2016-17, seeking Board approval in August 2016. Subsequent R&D Plans will be prepared during March/April for Board approval by June.

The large scale projects, defined as being 3 years in duration, will need to be scoped and ready for commencement in early 2016-17. Preliminary scoping and development is occurring for the following priorities identified in the Strategic Research Plan:

1. Develop a Water Roadmap and Governance Plan for the Northern Corridor region, to include:
 - i. Identification of where water can be a trigger for the next stage of regional development;

- ii. How to optimise water supply within the region in alignment with projected demand for water for new development;
 - iii. Evaluation of opportunities to improve fit-for-purpose water quality and identify storage options
2. Commencement of the GFLAWS 3 project
3. Supplementary work to support the development of South Australia's mineral resources and to complement the GFLAWS 3 project, including development of a methodology to assess the cumulative impacts of multiple stressors on water resources
4. Commencement of research projects to support Basin Plan implementation, including:
 - i. Development of tool(s) to assess benefits of different river operations and planning scenarios to achieve multiple benefits, including integration of ecological response,
 - ii. Drought monitoring and detection diagnostic tools to support water planning strategy; agricultural risk management and natural resource planning in periods of drought or unusual water supply constraints, identifying indicators of need to trigger adaptive management responses.
5. Support development of a carbon sequestration strategy for South Australia
6. Support for the development of a program of research into the ecological and water quality implications in South Australia of a possible carp eradication program in the Murray Darling Basin

A number of supporting documents provide further information regarding these priority research areas, including the scope of the proposed research and the reasons for prioritisation of these research areas. The supporting documents include the following:

- Northern Adelaide Plains Water Stocktake (2016), Goyder Institute Technical Report Series No. 16/5
- A Governance Framework for a 21st Century Irrigation District' (2016), SA Water/PIRSA scoping document in preparation
- Goyder Finding Long-term Outback Water Solutions: Stage 3 (2016), Goyder Institute Project Plan prepared by DEWNR, Flinders University and CSIRO
- South Australia's Copper Strategy (2016), Government of SA strategy document
- Outcomes of Water for Mineral Resources Stakeholder Workshop 20th May 2016
- River Murray Decision Support System: Prototype (2016), Goyder Institute Technical Report Series No. 16/4
- A real time climate risk management system for agriculture (2016), University of Adelaide research proposal to Goyder Institute

The outcomes of two workshops to be held in May 2016 on 1) Water for Mineral Resources and 2) River Murray Carp eradication research needs, will provide further information and prioritisation details related to items 3 and 6 of the priority research areas listed above.

6 Key Progress Indicators for 2015/16

The key progress indicators for Goyder Institute will be the completion of the following tasks and objectives:

1. All Goyder Institute phase 1 projects are completed and closed
2. Projects agreed to proceed in the 2015/16 R & D Plan are initiated
3. A knowledge adoption strategy for 2015-19 is developed and established
4. Project governance arrangements are established
5. A statement of research capability of the Institute and its research partners is developed and disseminated

Appendix B: Outcomes of stakeholder consultation workshops

The outcomes of five stakeholder consultation workshops held between October 2015 – February 2016 have been collated into a selection of research focus areas that address the range of knowledge gaps and research needs identified by stakeholders. The research focus areas identified are tabulated, together with the corresponding stakeholders and potential research project participants, in the tables below. Many of the outcomes of the stakeholder consultation workshop align well with the indicative objectives and indicative areas of activity identified in Section 3.

Some further proposals for project or research focus areas were received from stakeholders independently of these workshops. These proposals have been incorporated into the workshop outcomes tables below, within the table that most directly relates to the individual proposal.

The key research focus areas identified by stakeholders are, in coordination with the Institute's partners, key stakeholders, research providers and the Institute's Research Advisory Committee, to be considered for research investment by the Institute during 2015-2019.

The Goyder-FLOWS project identified within Table A1 below is already in project planning, having been identified by SA Government and Goyder Institute research partners as a research priority.

Table A1: Economic Development

Impact Areas	Policy Driver	Focused Theme	Indicative Outcomes	Indicative Areas of Activity
<p>Economic Development</p> <p>This Impact Area aims to address the relevant State Government priorities by:</p> <ul style="list-style-type: none"> • Providing science to underpin sustainable water resource management for existing water resource developments. • Providing science to underpin identification of future sustainable water resource development opportunities. • Identify pathways and opportunities to support commercialisation of research by the private sector 	<ul style="list-style-type: none"> • Unlocking the full potential of South Australia's resources, energy and renewable assets, • Premium food and wine produced in our clean environment and exported to the world. • The Knowledge State – attracting a diverse student body and commercialising our research 	<p>Mining and Energy</p>	<ul style="list-style-type: none"> • New information to facilitate decisions on water source options for mining operations in South Australia. • Optimise water supply options for Northern Adelaide for irrigated agricultural development. • Facilitate progression of R&D across the value chain from concept to commercialisation, in particularly supporting SME's in partnership with the WIA to develop new technologies and services to grow their competitiveness • South Australia's capability in water resource knowledge and management is enhanced and attracts sustainable development, supporting jobs and prosperity 	<p>GFLWS, stage 3: Expand the application of GFLWS methodology to priority mining areas for the State and characterise groundwater resources in APY Lands Braemar and northern SA (Gawler Craton)</p> <ul style="list-style-type: none"> • Develop methodologies for making best use of AEM data for hydrology • Estimation of aquifer parameters using geophysical field techniques • Develop 3D geological models to estimate boundaries of palaeovalley aquifer systems in key case-study areas. • Estimate groundwater fluxes in aquifers identified with AEM. Estimates for recharge, groundwater flow pathways, aquifer transmissivities. • Develop simple groundwater flow model(s) to integrate multiple datasets and provide tools for assessment in key case-study areas. <p>Copper Strategy</p>
		<p>Food and agriculture</p>	<ul style="list-style-type: none"> • A strong irrigation industry that optimises the economic and social outcomes from water use and minimises environmental impacts. • Industry that is resilient to water resource impacts of climate change, variability and extreme events. • Water resource implications associated with industry driven land-use change are understood and management strategies developed. 	<p>Northern Corridor Governance for a 21st Century Irrigation District</p> <ul style="list-style-type: none"> • Identify the parameters and potential process(es) that could be used in design of a governance framework for a 21st century irrigation district <ul style="list-style-type: none"> - include regional planning and institutional arrangements - use of the optimal technologies available for monitoring, evaluation and reporting <p>Improved water balance, accounting tools and irrigation technology for optimising social, environmental and economic benefits of irrigation, including existing and new developments.</p> <p>Identify and assess low-tech/ small-scale desalination technology in partnership with NCEDA and the private sector</p> <p>Improving integration of water sources and demands in water planning</p> <ul style="list-style-type: none"> - Identify options for flexible and adaptive water management in an area with diverse supplies (e.g. North of NAP): - how to best conjunctively use SW, GW and other sources - including annual and inter-annual uncertainty - including all water demands (stock, domestic, industrial, enviro) - including influence of use of each source on capacity of others
		<p>International Engagement</p>		<p>Rajasthan Water Action Plan</p>

Table A2: Healthy Ecosystems

Impact Areas	Policy Driver	Focused Theme	Indicative Outcomes	Indicative Areas of Activity
<p>Healthy Ecosystems This Theme expands on the activities of the first five years of the Institute that included a significant amount of focus on the Murray-Darling Basin, inland waters such as the South-East and Lake Eyre Basin, and socio-economic assessment of Marine Park Sanctuary Zones. These areas continue to be a priority for State Government in achieving optimal outcomes for the environment while also achieving social and economic outcomes and in the context of a changing climate, stewardship and competing water demands.</p> <p>The Healthy Ecosystems Theme aims to address these Outcomes by:</p> <ul style="list-style-type: none"> • Provide knowledge to support the provision of water to environmental assets to ensure resilient, connected and healthy ecosystems. • Provide modelling tools and decision support frameworks that integrate hydrological, environmental and economic considerations in water management. • Provide enhanced scientific basis to test resource allocation scenarios for improved water planning outcomes and individual resource allocation decisions. • Provide leadership in environmental flow science and in the communication of the research outcomes to environmental managers. • Provide an evidence base to inform and evaluate environmental management commitments, including social and economic in addition to biophysical assessments. 	<ul style="list-style-type: none"> • Murray-Darling Basin Plan • Environmental Watering Plans • RAMSAR Wetlands of Significance • Lake Eyre Basin Intergovernmental Agreement • Marine Park Sanctuary Zone Legislation and Management Plans • Water Sensitive Urban Design and Stormwater Management Policy <p>Adelaide International Bird Sanctuary</p>	<p>Catchments</p>	<ul style="list-style-type: none"> • A robust socio-economic evaluation framework to assess the regional changes in relation to Marine Park Sanctuary Zones • Improved knowledge and tools to support stormwater management initiatives to reduce impacts on coastal water quality and maximise cost-effective use of stormwater in the urban environment • Implementation of WSUD to achieve water savings, improved water quality, enhance urban amenity and reduce heat island effects • Management of environmental water to maximise environmental benefits through effective and efficient delivery • Knowledge to enhance stewardship of inland waters to achieve environmental, social and economic outcomes 	<p>Murray-Darling Basin Plan Implementation</p> <ul style="list-style-type: none"> • Demonstrate that environmental flows are leading to an improvement in environmental assets in SA (demonstrating why SA needs particular flows for environmental outcomes. • Define EWR and RM ecosystem limits: what are the threshold metrics? • Identify the positive economic benefits of the Basin Plan implementation? What are the impacts on industries of the Basin Plan management constraints and the water trading rules? • How to prioritise agricultural development in view of the changes brought about by river management and the Basin Plan? How to link agricultural prioritisation to environmental objectives. • Further develop the RM DSS based on the framework developed in Goyder 1 project (subject to decision of Andrew Beale). • Methodology to optimise inflows to SA for env, irrig, public water supply (what is the best flow pattern for env, ind and PWS outcomes?) • How to plan for drier conditions and lower flows in the Murray? What are the implications of flows into SA below entitlement flows? • Development of a real-time climate risk management system for industry and environment dependent on RM flows. <p>Supporting adaptive water management with regard to water resource risks Methodologies to best quantify water resource condition limits for SW and GW resources.</p> <ul style="list-style-type: none"> - How to optimise monitoring in response to these limits. - How to incorporate these into MERI plans to improve consistency and effectiveness.
		<p>Coasts</p>		<p>Marine Parks Connectivity Study</p> <ul style="list-style-type: none"> • Provide the tools to identify whether marine parks are assisting with the maintenance of appropriate scales of connected (versus isolated) populations. • Apply genetic techniques to assess gene flow between Sanctuary Zones for a range of species. • Identify where trophic flow between different habitats within Sanctuary Zones might occur. <p>Carbon emissions assessment of coastal wetlands</p> <ul style="list-style-type: none"> • Generate information to contribute to the emissions assessment for coastal wetlands: <ul style="list-style-type: none"> - information on the spatial extent and condition of coastal wetlands; - collate current data on infrastructure, development and other impacts, database of threats relevant at the spatial scales appropriate; - document levels of carbon sequestration. <p>Synthesis report on coast and marine research programs and management programs in SA</p> <ul style="list-style-type: none"> • Synthesis study of existing research and programs to direct future investment and identify research needs: • Identify potential for integration of various existing and proposed lines of research
		<p>Communities</p>		<p>Understanding the impacts of water plans: economic, social, environmental</p> <ul style="list-style-type: none"> • Development of a cost-benefit analysis framework for various water planning options that accounts for social, economic and environmental costs and benefits, weighted against an agreed set of community values. • Demonstrate this framework with a number of water planning options and scenarios for a case study area. • How to identify the highest value water use. <p>Early identification of triggers, tipping points and trade-offs in water plans</p> <ul style="list-style-type: none"> • Scenario modelling and stress testing of water plans with regional communities, accounting for forecast conditions and potential extreme events relating to the climate. Identify indicators of need to trigger adaptive management options. Identify frequency of stress situations under water plans.

Table A3: Climate Action

Impact Areas	Policy Driver	Focused Theme	Indicative Outcomes	Indicative Areas of Activity
<p>Climate Action</p> <p>The Climate Change Research Program addresses the Government's objectives and outcomes for proactive responses to climate variability and longer term change to ensure that South Australia has resilient water infrastructure, sufficient environmental water and is able to provide water security for industry and urban settlements.</p> <p>The Government is developing a new Climate Change Strategy that will outline the State's plan to achieve a low carbon, resilient future. At the centre is a commitment to make the City of Adelaide the world's first carbon neutral city and the development of a low carbon investment plan for South Australia as well as partnering with regional leaders to deliver regional climate change adaptation plans. The Climate Change Research Program aims to address these Outcomes by;</p> <ul style="list-style-type: none"> • Applying the SA Climate Ready data to improve the understanding of risks, vulnerabilities and opportunities associated with climate change in South Australia; • Developing tools that water and environmental managers in South Australia can use to develop the most appropriate mitigation strategies that incorporate an integrated assessment of climate change on water resources • Providing a science base to underpin the delivery of Carbon Neutral Adelaide • Undertaking risk assessments of water and related natural resources in the catchment and coastal zone 	<ul style="list-style-type: none"> • Adelaide, the heart of the vibrant state • State Climate Change Strategy • Premium food and wine produced in our clean environment and exported to the world. • Water for Good - Water security planning <p>Carbon Neutral SA</p>	<p>Water Resource Assessment</p>	<p>Water security assessment of future water supplies at a regional scale</p>	<p>Integrated Urban Water Scenarios</p> <ul style="list-style-type: none"> • Integrated modelling for decision support: <ul style="list-style-type: none"> Urban environment integrated model for water planning strategy; Agricultural environment integrated model for agricultural risk and land use planning. • Real-time climate risk management tool for water management and agriculture. <p>Climate-ready water allocation planning</p> <ul style="list-style-type: none"> • What does a climate-ready WAP look like? <ul style="list-style-type: none"> - How to reapportion a smaller water resource in a drier climate? - How to readjust objectives of a WAP due to drying climate? - What should future WAP conservation targets be? How to map resilient environments.
		<p>Carbon Neutral Adelaide</p>	<p>Identification of carbon offset opportunities in SA</p>	<ul style="list-style-type: none"> • A synthesis of carbon accounting regulations and practices with a particular focus on their application within SA. • An examination of where the best carbon per dollar benefit can be achieved in the carbon sequestration and offset options available in SA. • An assessment of carbon offset opportunities achievable through NRM in SA
		<p>Extreme Events</p>	<p>South Australia has resilient water infrastructure, sufficient environmental water and is able to provide water security for industry and urban settlements in the face of climate change and variability.</p> <p>Water resource management arrangements are adaptive and responsive to future climates and ongoing variability without further degrading our water ecosystems and the important natural assets and values they provide.</p>	<ul style="list-style-type: none"> • Analysis of decadal variations in rainfall vs climate change trend in SA • Analysis of rainfall intensity and frequency of extreme events at a local scale utilizing SA Climate Ready • Analysis of flood frequency - past and future • Potential impacts of altered rainfall intensity on MAR schemes in greater Adelaide region • Estimates of climate change risks for quality and quantity of water resources including both surface and groundwater. • Estimates of climate change risks for agricultural production, including irrigation demands, urban demand, and infrastructure. • Undertake risk assessments of climate change on natural and built assets and apply the SA Climate Ready data to assess the effect of climate by regional and sector • Communication of the value of climate data sources (use outcomes of (1), above, to demonstrate) • Undertake small scoping studies and/or reviews to bring together the best available knowledge on topics that may require long-term, strategic science to understand and assess risk