

Annual Research & Development Plan and Budget 2012/13



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The Goyder Institute for Water Research is a partnership between the South Australian Government through the Department for 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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CONTENTS

1	Introduction	1
1.1	Strategic Research Plan.....	1
1.2	Annual R&D Program and Budget.....	1
1.3	Approved Research Projects	1
2	Current Research Investment	2
2.1	Project Overview 2011/12	2
2.2	Key Achievements: Completed and Active Projects	3
2.3	Project Expenditure to end of FY 2011/12.....	6
3	Future Research Investment.....	7
3.1	Investment Profile.....	7
3.2	Desired Investment across Research Themes	9
4	Approved Research Projects in FY 2012/13.....	10
4.1	Continuation of Active Projects	10
4.1	Knowledge Management and Dissemination	10
4.2	ANZSOG Appointment	11
4.3	Projects to be Initiated in FY 2012/13	11
5	Potential New Research Projects.....	14
5.1	Potential Areas of Research Activity.....	14
5.2	Process for Developing EOI's	16
A.1	Financial report to end of FY 2011/12	17
A.2	Investment profile.....	19

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 2011-2015 details 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. The Strategic Research Plan links the ongoing and proposed research activities to these outcomes through Roadmaps.

1.2 Annual R&D Program and Budget

Each strategic Roadmap will be implemented through an integrated set of Research Projects with associated Research Project Plans. The Annual R&D Program and Budget describes this annual rolling portfolio of projects that are the mechanism for achieving the outputs required to contribute to the Roadmaps.

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

The Annual R&D 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 also be identified. These figures are indicative only and are designed to support strategic investment in research projects that will deliver by 30 June 2015, which is the current expiry date 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 approved by the Board. Board approval is documented in the form of a Project Agreement that has been signed by the Chairman of the 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 Research Advisory Committee 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 Research Advisory Committee. After endorsement of these modified Project Plans by the RAC, the Director will formulate recommendations for approval by the Management Board.

2 Current Research Investment

2.1 Project Overview 2011/12

A summary of the Goyder Institute projects and PhD Students by Roadmap up to the end of the 2011/12 financial year are identified in the tables below. The projects listed are at various stages from newly approved through to complete. This status is based on that at 30 June 2012. Additional information on each of the projects is provided in the following sections of this report.

Theme	Roadmap	Project Number	Project Title	Status
Climate				
C.1	Regional downscaling	C.1.1	Downscaled Climate Projections for SA	Active
Environmental				
E.1	River Murray	E.1.1	MDB Review	Completed
		E.1.2	Murray Flood Ecology Urgent	Completed
		E.1.3	Murray Flood Ecology	Active
		E.1.4	Expert Panel MDB draft Plan	Closing
		E.1.5	River Murray Scoping	Active
E.2	Surface water, groundwater, wetland relationships	E.2.1	South East Urgent	Completed
		E.2.2	South East Phase 1	Closing
		E.2.3	South East Regional Water Balance	In prep
		E.2.4	Improved modelling of catchments and drains	Active
		E.2.5	Water Requirements of Wetlands	In prep
Industry				
I.1	Water allocation planning & water quality improvement	I.1.1	AMLR WAP Scoping	Active
		I.1.2	Torrens River Water Quality Improvement Trial	Active
		I.1.3	Salinity Management of Irrigating with Recycled Water	In prep
I.2	Mining & outback water	I.2.1	G-FLOWS	Active
		I.2.2	G-FLOWS 2	In prep
Urban				
U.1	Water sensitive urban design	U.1.1	WSUD Targets	Completed
		U.1.2	WSUD Impediments and Opportunities	In prep
U.2	Water resources mix for Adelaide	U.2.1	MARSUO	Active
		U.2.2	Optimal Water Mix for Adelaide	In prep

The Goyder Institute for Water Research has awarded PhD Supplements, each valued at \$10,000/pa for three years, to 17 PhD students across the three University Partners. Eight of the supplements commenced in 2011 and the remaining nine supplements commenced in 2012.

PhD Students	Title	Road Map	Candidature
ADELAIDE UNIVERSITY			
Chris Stokes	Methods for the Reduction of Greenhouse Gas Emissions Associated with Water Distribution Systems	U2 Water Mix	02/2011 to 02/2014
Eva Hooi Ying BEH	Optimal Sequencing of Water Supply Options at the Regional Scale Incorporating Sustainability and Uncertainty	U2 Water Mix	02/2010 to 08/2013
Michael Di Matteo	Multi-objective decision analysis for blending of urban water resources for potable and non-potable water supply	U2 Water Mix	02/2012 to 08/2015
Deborah Jane Furst	The Chowilla Floodplain: The influence of water regime on the development and transport of zooplankton and the implications for native fish	E1 Murray	02/2010 to 08/2013
Chaturangi Wickramaratne	Synergistic effects of nutrients and climate change on cyanobacteria	I.1 WAP & WQ	03/2012 to 03/2015
FLINDERS UNIVERSITY			
Jessica Liggett	An analysis of surface-subsurface exchange and solute transport processes in a fully integrated code	E2 Wetlands	02/2010 to 08/2013
Saskia Noorduijn	Quantifying surface water-groundwater fluxes in a heterogeneous environment	E2 Wetlands	08/2010 to 08/2013
Megan Sebben	Numerical modelling of ephemeral, transient wetland systems using a fully integrated code	E2 Wetlands	03/2012 to 09/2015
Kelly Wiltshire	Connection and Continuity - Investigating Ngarrindjeri history and life ways of Waltowa Wetland	E1 Murray	03/2010 to 02/2014
Harriet Whiley	Detection of opportunistic intracellular pathogens in potable and reuse water	U2 Water Mix	03/2011 to 09/2014
Matthew Knowing	Effect of climate change and groundwater management approaches on the Uley South Basin, Eyre Peninsula	I2 Outback	02/2012 to 08/2015
UNIVERSITY OF SOUTH AUSTRALIA			
Mostafa Razzaghamanesh	Climate change and stormwater quality effects from green roof design in Adelaide	U1 WSUD	10/2011 to 10/2014
Hamideh Nouri	Precision Irrigation of the Adelaide Parklands with Recycled Wastewater	U1 WSUD	08/2010 to 12/2013
Kelly Hill	Development of low-clogging permeable pavements suitable for harvesting and reusing stormwater runoff from roads, car parks and industrial areas.	U1 WSUD	03/2012 to 04/2015
Sina Alaghmand	A conceptual model to capture salinity risks from the River Murray floodplains	E1 Murray	05/2011 to 07/2013
Sithara Gamage	Probabilistic nature of hydrologic losses in South Australian forest catchments	E2 Wetlands	03/2010 to 09/2013
Mamunur Rashid	Assessment of climate change impacts on the spatial variability of rainfall and its influence on runoff generation	C1 Climate	02/2012 to 02/2015

2.2 Key Achievements: Completed and Active Projects

The 2011/12 year has been a productive year for the Goyder Institute, with several projects completing and delivering significant pieces of work. A comprehensive report on research outcomes and project activities are included in the 2011/12 Annual Report. Some of the key achievements include:

Climate Change Theme: Programme C.1 Regional downscaling	
C.1.1. Downscaled Climate Projections for SA Development of an agreed set of downscaled climate projections for South Australia.	Key Achievements: - Initial set of downscaled climate projections for the eight South Australian NRM Board areas for consultation.

Urban Water Theme: Programme U.1 WSUD	
<p>U.1.1 WSUD Targets Identify interim WSUD targets that are appropriate for the climate and urban environmental conditions of the greater Adelaide region</p>	<p>Key Achievements:</p> <ul style="list-style-type: none"> - The outcomes of the work have been incorporated into a WSUD consultant statement by the Department for Water and this has now been issued to government agencies for consultation.
Urban Water Theme: Programme U.2 Water Resources Mix for Adelaide	
<p>U 2.1 MARSUO Assessment of the safety, public acceptance, economics and environmental impacts of alternative options for stormwater use in Australia through a case study in Adelaide.</p>	<p>Key Achievements:</p> <ul style="list-style-type: none"> - A research plan for pathogen fate in aquifers was produced to inform future revisions of the NWQMS Guidelines for Groundwater Protection and MAR. Work undertaken in MARSUO is providing foundational information to inform the revision process. - The catchment risk assessment approach developed in MARSUO has been adopted by Water Proofing the South and Water Proofing the West projects.
Industry Theme: Programme I.1 Water Allocation Planning and Water Quality Improvement	
<p>I 1.1 AMLR WAP Scoping Review and set research priorities to aid the development of a decision support tool for the development of water allocation plans (WAPs) in South Australia, with the initial focus on the Mount Lofty Ranges.</p>	<p>Key Achievements:</p> <ul style="list-style-type: none"> - Preparation of a draft scoping report identifying key research priorities for investment by the Goyder Institute.
<p>I 1.2 Torrens River Water Quality Improvement Trial Determining the feasibility of an 'amenity flow' for the Torrens Lake (including what the source water should be) to reduce or eliminate algal blooms.</p>	<p>Key Achievements:</p> <ul style="list-style-type: none"> - Detailed analysis of the formation of an algal bloom. The research outcomes will be used to inform flow management for water quality outcomes in future management and operational decisions.
<p>I.2.1 G-FLOWS Building a knowledge base on the location and characteristics of aquifers, and their relationship to environmental and cultural assets, to support water management in the State's far north.</p>	<p>Key Achievements:</p> <ul style="list-style-type: none"> - Development of AEM methodology that can utilise data collected for resource exploration to undertake aquifer characterisation and groundwater resource assessments. - Using this methodology, the hydrogeology of the Musgrave Ranges has been documented.
Environmental Water Theme: Programme E.2 Surface Water, Groundwater, Wetland Relationships	
<p>E.2.2 South East (Phase 1) A research program to support the sustainable management of water in the South East.</p>	<p>Key Achievements:</p> <ul style="list-style-type: none"> - Finalisation of the two project Tasks, including publication of the two Technical reports, and the development of new research activity building on the outcomes of this research. Two projects have been supported by the Goyder Institute and will be commencing in 2012/13.
<p>E.2.4. Improved modelling of catchments and drains. Development of a software tool based on conceptual and stochastic modelling designed to improve the ability to estimate flow volumes of drains in the SE drainage network.</p>	<p>Key Achievements:</p> <ul style="list-style-type: none"> - This project has only been operational since May 2012. Development of the conceptual model in the study catchment has commenced.

Environmental Water Theme: Programme E.1 River Murray

E 1.3 Murray Flood Ecology
Ecological responses to flooding in the Lower River Murray following drought.

Key Achievements:
Understanding of system processes and ecological responses that will provide a science base to planning and operating environmental watering events, for example:

- Red Gum response to flooding was greatest when inundated between 7 and 60 days
- Radio-tracking Murray Cod movements during high flows and in response to blackwater events.
- Investigation of the recruitment triggers for Golden Perch
- Identification of flow drivers influencing the composition of macro invertebrates and in-channel productivity

E 1.4 Expert Panel MDB draft Plan
Expert advice on the potential ecological implications, risks and consequences of the draft Basin Plan.

Key Achievements:

- the key findings and recommendations from the Expert Panel report contributed to the SA Government response to the draft Basin Plan and provided the scientific basis for the Government’s recommendations to the MDBA.

E 1.5 River Murray Scoping
Review and set research priorities in the broad area of River Murray flows and environmental flow management in South Australia.

Key Achievements:

- Workshop held with key stakeholders to identify research gaps within the River Murray Road Map and the provision of expert advice regarding the options available to address these gaps

2.3 Project Expenditure to end of FY 2011/12

The expenditure (cash + in-kind) in active projects up until the end of FY 2011/12 can be summarised as follows.

Goyder Institute						
Budget Expenditure from 2010/11 through 2011/12 & Total						
Total Actual Expenditure to 30 June 2012						
		Expenditure (cash + in-kind)				
		Financial Years 10/11 - 11/12			Total Approved	
		Budget	Actual	Actual %	Budget	Actual %
Research	CSIRO	5,177,029	4,970,395	96%	9,065,388	55%
Research	Flinders	711,765	650,022	91%	1,132,770	57%
Research	Uni of Adelaide	1,437,476	1,560,027	109%	2,928,518	53%
Research	Uni of SA	969,324	1,087,297	112%	1,974,340	55%
Research	SARDI	1,161,470	1,032,977	89%	1,395,006	74%
Research	AWQC	164,435	26,810	16%	240,368	11%
Research	Dept for Water	53,760	-	-	144,212	0%
Total Research		9,675,259	9,327,529	96%	16,880,602	55%
Non Research	ANZSOG	800,000	-	-	2,000,000	-
Non Research	Know ledge Management	100,000	30,049	30%	400,000	8%
Non Research	PhD Cont - Goyder Office	417,360	417,360	100%	626,040	67%
Total Non Research		1,317,360	447,409	34%	3,026,040	15%
Admin	Goyder Office	1,270,178	1,306,170	103%	4,407,971	30%
Goyder Total		12,262,797	11,081,107	90%	24,314,613	46%
		Expenditure (cash + in-kind)				
		Financial Years 10/11 - 11/12			Total Approved	
		Budget	Actual	Actual %	Budget	Actual %
Roadmap	Project					
Climate Change	C.1 Regional Downscaling	2,510,204	2,786,724	111%	6,681,967	42%
Environmental Water	E.1 River Murray	2,235,069	2,207,762	99%	2,406,227	92%
Environmental Water	E.2 Surface w ater, groundw ater, w etland relationship	663,170	627,052	95%	988,479	63%
Industry Development	I.1 Water allocation planning & w ater quality improvement	547,597	316,528	58%	547,597	58%
Industry Development	I.2 Mining & outback w ater	2,676,137	2,306,477	86%	3,055,986	75%
Urban Water	U.1 Water sensitive urban design	284,383	308,809	109%	284,383	109%
Urban Water	U.2 Water resources mix for Adelaide	508,699	534,176	105%	2,135,964	25%
	PhD Stipend TopUps	250,000	240,000	96%	780,000	31%
Total Research		9,675,259	9,327,529	96%	16,880,602	55%

After a relatively slow start to projects in the first financial year of the Goyder Institute, the project activities and expenditure have accelerated considerably during the last financial year. Whereas the total project expenditure at the end of FY 2010/11 was only 75% of the budgeted expenditure, this has been improved considerably during FY 2011/12 so that we see that the actual project expenditure is now at 96% of the budgeted expenditure and that we are on target for most projects.

The budgeted and actual expenditures for each individual active project are given in detail in Table A1 in Appendix 1.

3 Future Research Investment

3.1 Investment Profile

The planned investment profile of the Goyder Institute for the lifetime of the Institute is given in Table A2 in Appendix 2. This table also shows the global total budgets for Research and Non-research activities for the Goyder Institute for the term of the Agreement from 2010 to 2015.

Table A2 shows that there is approximately \$16.1M of research budget already committed to approved projects (excluding PhD supplements). The total approved budget for PhD supplements over the lifetime of the Institute is \$780k. In addition, there is a further \$11.97M of research budget committed to a number of projects for which project plans are currently being developed and/or are in the process of being evaluated by the RAC. This “pre-approved” budget is expected to be fully approved during the first half of the financial year FY 2012/13. This information is also summarised in Table 3.1 (below).

The overall investment profile shows that there is a total research budget available of approximately \$41.45M. Deducting the approved, pre-approved and PhD supplements budgets from this total leaves \$12.6M of research budget that is yet to be committed to projects in the future.

The choice of future research projects for the \$12.6M will require strategic choices to be made regarding prioritisation of future activities and the desired level of investment over the various themes. At the moment, several approved projects have indicated that there are possibilities for additional future work on these projects. The project leaders have provided indicative budgets for these potential activities. Table 3.1 also provides a summary of the projects that have identified potential future activities and the indicative budgets for these activities. As can be seen in this table, the total value of these requests for future funding is about \$12.7M (including \$2.5M for targeted research & development advice projects).

However, there is also a desire to undertake some new strategic research projects in the coming years to compliment the strategic outcomes of the Goyder Institute and to assist in policy development in areas that have not yet been addressed in existing projects. Any proposal for new strategic projects must also be funded from the available \$12.6M. Obviously, it will not be possible to honour all of the above future funding options as well as additional, new strategic projects. This means that all future proposals and requests for research funding must be evaluated and prioritised appropriately to assess whether any new proposals should take precedence over requests from existing projects for possible future work. The RAC will play an important role in this process of evaluation and prioritisation through extensive engagement with stakeholders and agencies. The process for undertaking this evaluation and prioritisation is described in Section 5.2.

Table 3.1 Future funding options

	Currently committed	Pre- approved commitment	Indicative budget future work	TOTALS
C.1.1 Climate Change	6,681,967			6,681,967
E.1.1 MDB Review	477,229			
E.1.2 Murray Flood Ecology Urgent	41,927			
E.1.3 Murray Flood Ecology	1,526,738			
E.1.4 Expert Panel MDB Plan Review	161,149			
E.1.5 Scoping River Murray Catchment	199,184			
E.1.x River Murray Catchment proposed research		2,000,000	1,000,000	
E.1.x Riverbank Collapse			1,000,000	
				6,406,227
E.2.1 SE Urgent	92,522			
E.2.2 South East – Phase 1	533,900			
E.2.3 SE Regional Water Balance		800,000	1,386,000	
E.2.4 Improved modelling of catchments & drains	362,057			
E.2.5 Wetlands in SE		1,100,000		
				4,274,479
I.1.1 Scoping AMLR Water Allocation Planning	209,935			
I.1.2 Torrens Lake Amenity Flows	337,662			
I.1.3 Salinity & Recycled Water		329,221		
1.1.x AMLR WAP proposed research		2,000,000	1,000,000	
I.1.x Torrens Lake Amenity Flows (2nd trial)			300,000	
				4,176,818
I.2.1 G-FLOWS - Stage 1	3,055,986			
I.2.2 G-Flows - Stage 2		1,500,000	1,000,000	
I.2.x LEBRA			500,000	
				6,055,986
U.1.1 WSUD Targets	284,383			
U.1.2 WSUD Impediments & opportunities		1,500,000	1,000,000	
				2,784,383
U.2.1 MAR & Stormwater Use Options	2,135,964			
U.2.2 Optimal Water Mix		2,739,000	3,000,000	
				7,874,964
PhD Supplements	780,000			
				780,000
New Strategic Projects				0
Targeted R&D advice projects			2,500,000	
				2,500,000
	16,880,603	11,968,221	12,686,000	41,534,824
	AVAILABLE BUDGET		12,599,103	41,447,927

NOTE: The inclusion of indicative budgets in this table in no way indicates a preference or priority for these projects, and must not be construed as a guarantee for future funding of these activities.

3.2 Desired Investment across Research Themes

The selection of future research projects must also take into account the desired mix of research investment across the strategic research themes of the Institute.

The following table provides an indication of the desired distribution of future funding across the Themes based on current SA Government priority directions. This will help to guide the prioritisation and choice of future projects to be funded. The final distribution of funding will depend on the actual prioritisation and choices that are made by the RAC and Board, in consultation with stakeholders.

THEME	Approved Budget	Future research	TOTAL	%
Climate Change	6,681,967	0	6,681,967	16.1%
Environmental Water	7,294,706	4,100,000	11,394,706	27.5%
Water for Industry	7,432,804	6,500,000	13,932,804	33.6%
Urban Water	6,659,347	2,000,000	8,659,347	20.9%
PhD Supplements	780,000	0	780,000	1.9%
	28,848,824	12,600,000	41,448,824	100.0%

4 Approved Research Projects in FY 2012/13

4.1 Continuation of Active Projects

The following projects are continuations of projects that were already active in FY2011/12. Project performance and progress is provided in the 2011/12 Annual Report. Details of project activities can be obtained from the respective project plans.

4.1.1 Project C1.1 Downscaled climate projections for SA

Continuation of approved project. Expected completion date: June 2014.

The mid-term review of project C1.1 *Downscaled climate projections for SA* will be undertaken during FY 2012/13. A terms-of-reference for this review will be developed in consultation with the project leader and the Management Board. This is not expected to lead to a change in funding for this project, but may lead to a refocus of particular activities within the ongoing project.

4.1.2 Project E.1.3 Murray Flood Ecology

Continuation of approved project. Expected completion date: August 2012

4.1.3 Project E.1.5 River Murray Scoping Study

Continuation of approved project. Expected completion date: August 2012.

The outcomes of this scoping study will form the basis for a project plan to undertake essential research in this area during FY 2012/13 (see below).

4.1.4 Project E.2.4 Improved Modelling of Catchments and Drains in the South East

Continuation of approved project. Expected completion date: April 2014.

4.1.5 Project I.1.1 AMLR Water Allocation Planning Scoping Study

Continuation of approved project. Expected completion date: August 2012

The outcomes of this scoping study will form the basis for a project plan to undertake essential research in this area during FY 2012/13 (see below).

4.1.6 Project I.2.1 G-FLOWS Phase 1

Continuation of approved project. Expected completion date: November 2012.

The outcomes of this project will form the basis for a project plan to undertake essential research in this area during FY 2012/13 (see below).

4.1.7 Project U.2.1 MARSUO

Continuation of approved project. Expected completion date: April 2014.

4.1 Knowledge Management and Dissemination

To further improve the collaborative approach to science and policy integration in Goyder Institute projects and to assist in capacity building within stakeholder agencies, regular test-bedding workshops between scientists, policy-makers and other stakeholders will be organised by the Goyder Institute Office, in consultation with the project teams.

In addition to these stakeholder engagement activities, attention must be paid to the format of delivery of the Goyder Institute research results. In many projects, reference is made to the development of decision-support tools. The contribution of Goyder Institute research projects to underpin policy will generally consist of the delivery of calibrated and validated models and data sets. This information will need to be made available to decision makers and stakeholders in a concise, easy to use manner. It must also be consistent with national standards and activities related to the integration of water and information systems.

The annual budget of \$100,000 will be used for stakeholder engagement activities of the Goyder Institute and will include test-bedding workshops, capacity building workshops, the Annual Goyder Institute Water

Forum, networking activities, support to visiting fellows, and scoping of the knowledge encapsulation requirements for project outcomes.

4.2 ANZSOG Appointment

The Goyder Institute has agreed to support and co-finance the appointment an expert in the area of water policy and water management through the Flinders University Institute of Public Policy and Management and the Australia New Zealand School of Government (ANZSOG). This professorial position will assist in the development of projects to link research outcomes to government policy priorities in water management and will promote strategic linkages with government policy officers both in South Australia and from around Australia through ANZSOG.

4.3 Projects to be Initiated in FY 2012/13

A number of project proposals were developed during FY 2011/12 and it is expected that the project plans and budget packs for these projects will be submitted for approval in the first or second quarter of FY 2012/13. These projects proposals are described below. These projects are listed in Table 3.1 under the column pre-approved commitment.

4.3.1 Project E.1.x River Murray Programme

The outcomes of project E.1.5. River Murray Scoping will identify the research priorities for further investment within this programme. It is anticipated that some, but probably not all, of the following topics that have previously been identified in the Roadmap will be considered in the prioritisation process:

- A water resources accounting tool;
- Hydrological scenario model development for whole of river and operational scenarios;
- Impacts of climate change on River Murray Flows;
- Specific issues regarding implementation of the MDB plan;
- River Murray and Floodplains, including salt in the landscape;
- Role of engineered structures in the management of environmental water;
- Ecological restoration and transition processes;
- Ecological/hydrological response model;
- Systems understanding of SA River Murray; and
- Riverbank collapse.

Key outcomes of the proposed research should ensure that the SA Government has the science base to support strategic and operational decision making in relation to the River Murray and implementation of the Basin Plan.

4.3.2 Project E.2.3 South-East Regional Water Balance

This is a proposed 12 month project, which will lay the foundations for the development of a regional water balance model and to facilitate future water allocation planning for the Lower Limestone Coast region. The project aims to deliver:

1. Development of a regional water balance framework;
2. A preliminary assessment of the spatial variability and indicative fluxes of groundwater discharge to the marine environment; and
3. Assessment of the role of geological faults on regional groundwater flow and inter-aquifer leakage.

The major output from this 12 month package of work will be a framework for the development of a regional numerical groundwater flow model for the Lower Limestone Coast region. This will comprise the datasets, conceptual model and the suggested approach for the full development of a fit-for-purpose regional model. This Project Plan is currently being considered for approval. The project plan has a proposed commencement date in August 2012.

4.3.3 Project E.2.5 Water Requirements for Wetlands in the South East

The aim of the project is to develop a spatially explicit ecological response model to support water management and water allocation planning in the South-East region of South Australia. Information developed from the ecological response model will be used to inform the decision support system (DSS) that is being developed for the region. This will assist in achieving wetland health and biodiversity goals for the region by optimising management of surface water and groundwater.

The project will utilise outputs from the groundwater modelling project (E.2.3. led by Nikki Harrington) and inform the DSS project (E.2.4. led by Matt Gibbs). The project will also generate data that can be used in the future for regional conservation planning for maintaining wetland and species diversity.

This Project Plan is currently being considered for approval. The project plan has a proposed commencement date in September 2012.

4.3.4 Project I.1.3 Salinity and Recycled Water

This project proposal represents a combined project between the Australian Water Recycling Centre of Excellence (AWRCoE) and the Goyder Institute for Water Research. The AWRCoE and the Goyder Institute are both members of the Australian Water R&D Coalition (AWRDC). The AWRDC aims to foster an environment of cooperation and collaboration in the area of urban water research, in which research dollars will go further, through pooling resources and eliminating duplication, and in which knowledge and adoption can be leveraged across all partners.

This project will investigate the effects of irrigating with recycled water in relation to soil salinity and sodicity, soil moisture, salt concentrations in leaves and fruit, yield and vegetative growth in the McLaren Vale and North Adelaide Plains. Based on the outcomes of these investigations, methodology and guidelines will be developed to support both the long-term use of recycled water for a range of irrigated crops as well as having relevance to amenity plantings by councils. The outcomes of this research are intended to benefit both traditional irrigators as well as informing the states recycling guidelines (for both urban and rural communities) and will contribute to informing recycled water irrigation practices across the Nation.

This Project Plan is currently being considered for approval. The project plan has a proposed commencement date in August 2012.

4.3.5 Project I.1.x Water Allocation Planning

The proposed research needs were founded on a risk management framework and evidence-based water allocation planning based on the Mount Lofty Ranges as a test bed for a framework that can be used both in the Mount Lofty Ranges and elsewhere in the state.

Key outcomes of the Scoping Study indicated the following key priorities for essential research in FY 2012/13:

- A framework that will underpin the WAP process across the whole of South Australia
- A hydro-ecological decision support tool to underpin resource allocation consultation and decision making
- Catchment water quality management practices, including salinity, such as efficient management of the application of recycled water for irrigation

4.3.6 Project I.2.x G-FLOWS Phase 2

Investment in G-FLOWS Phase 2 is dependent upon the outcomes of the first phase of the G-FLOWS project. Due to delays in the first phase of this project, the EOI process for G-FLOWS Phase 2 is expected to be completed by September 2012. The RAC have suggested that G-FLOWS2 also be expanded to include other areas of Eyre Peninsula. Mining and water are big issues for the Eyre Peninsula, in particular the non-prescribed water resources. Evaluation of technologies, such as groundwater desalination, could be investigated as part of this research area.

Key outcomes from I.2.1. G-FLOWS Phase 1 have indicated the following key priorities for consideration in the development of the G_FLOWS Phase 2 EOI:

- Evaluation framework
- Characterisation of regional water resources, improved water data and modelling capacity for water resources of the Far North and Eyre Peninsula
- Model to apply to other regional areas
- Optimal (cost-effectiveness-O&M-environmental-secure) technical solutions to deliver fit-for-purpose water
- Understanding of cultural flows and ecological and environmental assets that have groundwater dependencies.
- Understanding, through on-ground verification, of aquifer characteristics and groundwater resources in priority areas earmarked for development, while taking account of cultural, ecological and environmental assets

4.3.7 Project U.1.2 WSUD Impediments and Opportunities

The WSUD Impediments and Opportunities project aims to provide government agencies and other stakeholders with the scientific, technical, social and economic basis to elevate implementation of WSUD. In addition, this project will strongly align the activities and outcomes to support the WSUD capacity building program initiative by NRM Boards, EPA SA and DEWNR. One of the primary objectives of the WSUD project is to address the knowledge gaps that will support the capacity building initiative and the Blueprint for Urban Water, which would ultimately result in strategic uptake of WSUD.

The outcomes of this project will also inform the “Optimal Water Resources Mix for Metropolitan Adelaide” project (U.2.2.) with data for examining optimal water resource supply options at the macro scale.

This Project Plan is currently being considered for approval. The project plan has a proposed commencement date in August 2012.

4.3.8 Project U.2.2 Optimal Water Mix for Adelaide

State Government has identified the need for a decision support tool to inform decision making at the operational level, in infrastructure investment and Statewide policy and planning. To meet this need, this study will quantify water quantity and quality implications of utilising the various sources of water in Metropolitan Adelaide. This will be combined with analysis of the key behavioural drivers of household water use, economic costs, public acceptability of options and examine appropriate governance arrangements. These inputs will be brought together through a multi-objective decision support tool with the aim of testing different scenarios to support short and long term urban water planning decisions in relation to identifying the optimal water mix to meet the needs of Metro Adelaide, whilst transparently recognising trade-offs.

The optimal solutions will have the potential to optimise the delivery of water to achieve multiple benefits, in a socially acceptable, cost-effective and sustainable manner. The project outputs are designed to inform the annual review of Water for Good, inform operational planning and the development of an IUWM master plan for the Metropolitan Adelaide Region. The decision support tool developed in this study could be expanded to other regions of South Australia to explore the impact of various urban water policy options and climate change scenarios on urban water supplies.

This Project Plan is currently being considered for approval. The project plan has a proposed commencement date before the end of 2012.

5 Potential New Research Projects

It is critical during FY 2012/13 to ensure that any new strategic research projects initiated at this time can deliver strategic outcomes before 30 June 2015, the current expiry of the Goyder Institute Agreement. Priority areas of investment will build further on the activities identified in each of the Roadmaps. In addition, it is also recognised that some investment may be needed to support activities that integrate across themes and for targeted research & development advice projects that bring together existing pieces of information to support policy development and decision-making.

Section 5.1 identifies some potential areas of investment for new research activities based upon current SA Government priority directions. The prioritisation and selection of actual research projects will be undertaken in conjunction with the RAC and Board through the process described in Section 5.2.

5.1 Potential Areas of Research Activity

A small number of new research areas have been identified through consultation with Goyder Institute stakeholders, including the Annual Water Forum, the Research Advisory Committee and Management Board. The new research areas described below may form the basis for developing EOI's during the course of 2012/13.

5.1.1 Murray-Darling Basin Plan

The Murray-Darling Basin Plan has a large focus of activity in South Australia in a number of areas. The Goyder Institute will focus any investment to those activities that will add value to the State Government regarding implementation of the Basin Plan, including providing evidence based assessment of scenarios, evaluating the outcomes of environmental watering, quantifying changes in ecosystem function and health.

5.1.2 Riverbank Collapse

Focus on addressing critical scientific knowledge gaps regarding processes, triggers and dynamics of riverbank collapse in the lower River Murray of South Australia (Blanchetown to Wellington). This will enable a greater understanding of the processes and principal drivers contributing to riverbank collapse. The result should be a process-based predictive modelling capability to inform long-term planning and management for government agencies and local authorities.

5.1.3 Regional Groundwater

Groundwater is fundamental to underpinning water supplies and development in regional areas. There are gaps in knowledge regarding the identification and mapping of South Australia's groundwater resources. Advances in this area, together with other partners such as the NCGRT, AGSO and International Partners, will be a focus of investment for the Goyder Institute to support the South Australian Government in providing the underpinning science to support water allocation planning in regional SA. Another focus will be providing advice on the ability to utilise saline and brackish groundwater, through application and testing of available technologies in partnership with NCEDA.

Aspects of urban groundwater resources are addressed below under the Urban Water Blueprint.

5.1.4 Lake Eyre Basin

The Lake Eyre Basin is an iconic natural asset of South Australia. There are increasing pressures on this asset and an improved understanding of the water resources of the LEB, including its hydrology and groundwater dependant ecosystems, are needed to develop and implement sustainable water resource plans. Of particular interest would be systems such as Cooper Creek and the Coongie Lakes. In addition, development and/or implementation of an existing decision framework that identifies monitoring requirements to support evaluation and assessment of the desired regional outcomes sought.

5.1.5 Urban Water Blueprint

With the development of the Urban Water Blueprint for Adelaide, there is a need for the Goyder Institute to develop an overarching Roadmap that describes the outcomes and research needs under this broader umbrella. The two existing Roadmaps (WSUD and Optimal Water Mix) provide a greater level of detail for two of the currently identified focus areas of the Urban Water Blueprint.

Other areas that would be encompassed by the overarching Urban Water Blueprint Roadmap include:

a) *Metropolitan Adelaide groundwater resources*

- Feasibility of using aquifers as reservoirs to manage existing surface water supplies
- Investigation of governance issues surrounding the concept of water banking & conjunctive use, ownership and carry-over
- Economic and social analysis

b) *Flooding*

- Extent and frequency in metropolitan Adelaide
- Adaptation to climate change scenarios

c) *Environmental water requirements*

- River Torrens & other urban creeks and tributaries
- A drought strategy for managing surface water flows with other supplies to manage consumer and environmental requirements in a economically and socially acceptable manner
- Definition of principles for drought planning

d) *Coastal discharges and impacts on marine water quality*

Complementary investigations by the Goyder Institute could assist to respond to the findings of the Adelaide Coastal Waters Study in an adaptive and cost effective manner. In this context SA Water is about to commission the construction of biogeochemical model of the coastal waters. By using the model, SA Water is hoping to identify the optimal locations and nutrient concentration for its wastewater discharges to support seagrass recovery.

Additional studies and appropriate catchment modelling by the Goyder would assist to assess the importance and contributions originating from the urban catchments and would establish their relative impact on the marine environment. This additional work would inform the identification of appropriate stormwater quality targets and discharge locations. This work would supplement the coastal biogeochemical model and complement investigations to target WSUD and link future achievement of stormwater quality improvements to support efficient capital investment and outcomes in the metropolitan coastal zone.

5.1.6 Targeted Research & Development Advice Projects

There are a number of issues that require targeted projects to inform specific policy questions. These projects will typically have a duration of no more than three to six months. For example, projects could include such issues as:

- Legislative framework analysis (comparative studies, WAP, licensing)
- Education and community engagement (public engagement, influencing behaviour/demand)
- Assessment of water supplies, for example Kangaroo Island

5.2 Process for Developing EOI's

In order to support the development of timely and relevant EOI's, the Goyder Institute will implement a process to facilitate the preparation and clarify the scope of research. In addition to the normal review and approval processes currently implemented by the Goyder Institute, a series of workshops with stakeholders will be held to define the research proposals in each of the new areas of investigation described above. The EOI development and approval process will include the following components:

Defining the Research Scope

- A stakeholder workshop to identify the relevant policy questions and external stakeholders
- A research workshop to identify emerging issues, fundamental science gaps and external research partnership opportunities
- A combined workshop to define project scope, resourcing (including external stakeholders/partnerships and research providers) and timeframes
- EOI's for each of the proposed new research issues will be developed separately, except where the Director deems it beneficial to combine more than one project area into one workshop.
- Where practical, workshops on a research issue will be held on the same day.

EOI Selection process

- A call for EOI's based on the defined research scope, budget, timing and external partnerships as identified through the workshop process.
- RAC review submitted EOI's and make recommendations to Board
- Board approve EOI/s, subject to the development of a project plan consistent with the budget, timing and scope of the EOI.

Project Plan Approval

- Project Plan developed by successful proponents and incorporates any RAC and Board feedback.
- RAC review project plan and make recommendations to Board.
- Board approval.

Project Commencement

- Project commences once Project Plan signed by all participating organisations and confirmed in writing by the Goyder Institute.
- Quarterly and Milestone Reporting
- Monthly Effort Logging

In relation to the Policy-related projects, these will be well-defined projects, in scope, budget and timing, and will not require workshops to develop. Expressions of Interest will be called against these projects as required. The Goyder Institute, on advice of the RAC, may directly commission these projects from within the Goyder Institute Research Partners and Associates if justified.

A.1 Financial report to end of FY 2011/12

Goyder Institute Annual Research and Development Plan Annual Budget										
	Participant	Goyder Budget						Goyder Cash Total	In-Kind Budget Total	In-Kind to Goyder
		2010/11	2011/12	2012/13	2013/14	2014/15	Total			
Research	CSIRO	1,553,477	3,623,552	2,492,354	1,396,006	-	9,065,388	4,582,506	4,482,882	98%
Research	Flinders	250,927	460,838	220,424	170,581	30,000	1,132,770	678,811	453,959	67%
Research	Uni of Adelaide	179,509	1,257,967	858,583	602,459	30,000	2,928,518	1,587,571	1,340,947	84%
Research	Uni of SA	238,225	731,100	493,402	481,613	30,000	1,974,340	1,103,998	870,342	79%
Research Partners	Sub Total	2,222,137	6,073,457	4,064,763	2,650,659	90,000	15,101,016	7,952,886	7,148,130	90%
Research	SARDI	448,667	712,803	173,524	60,012	-	1,395,006	690,870	704,136	102%
Research	AWQC	6,588	157,847	37,058	38,875	-	240,368	125,281	115,087	92%
Research	Dept for Water	10,500	43,260	44,558	45,895	-	144,212	-	144,212	-
Research Total	Total	2,687,892	6,987,367	4,319,903	2,795,440	90,000	16,880,602	8,769,038	8,111,564	93%
Non Research	ANZSOG	400,000	400,000	400,000	400,000	400,000	2,000,000	1,000,000	1,000,000	100%
Non Research	Knowledge Management		100,000	100,000	100,000	100,000	400,000	400,000		-
Non Research	PhD Contributions - Goyder Office	208,680	208,680	208,680	-	-	626,040	-	626,040	-
Non Research	Total	608,680	708,680	708,680	500,000	500,000	3,026,040	1,400,000	1,626,040	116%
Admin	Goyder Office	443,882	826,295	999,987	1,046,370	1,091,436	4,407,971	2,547,300	1,860,671	73%
Goyder Institute Total	Total	3,296,572	7,696,047	5,028,583	3,295,440	590,000	19,906,642	10,169,038	9,737,604	96%

Other Funding (non Goyder Institute)	Expenditure						Other Cash LTD	In-Kind LTD	In-Kind to Goyder
	YTD	2011/12	2012/13	2013/14	2014/15	LTD			
Projects with other Funding	1,743,324	1,679,037	1,087,232	430,641	-	4,940,234	2,457,597	2,482,637	
Goyder Office other Funding	152,403	-	-	-	-	152,403	152,403	-	
Total Other Funding	1,895,727	1,679,037	1,087,232	430,641	-	5,092,637	2,610,000	2,482,637	

Program	Project	Goyder Budget						Goyder Cash Total	In-Kind Budget Total	In-Kind to Goyder
		2010/11	2011/12	2012/13	2013/14	2014/15	Total			
	PhD Stipend TopUps	Total	-	250,000	260,000	180,000	90,000	780,000	780,000	-
Urban Water	U.2.1 MAR & Stormwater Use Options	Total	15,500	493,199	1,261,558	365,707	-	2,135,964	1,065,000	1,070,964
Environmental Water	E.1.1 MDB Review	Total	477,229	-	-	-	-	477,229	237,148	240,081
Environmental Water	E.2.1 SE Urgent	Total	92,522	-	-	-	-	92,522	38,601	53,921
Environmental Water	E.1.2 MFE Urgent	Total	41,927	-	-	-	-	41,927	20,963	20,964
Environmental Water	E.1.3 Murray Flood Ecology A & B	Total	671,692	683,887	171,158	-	-	1,526,738	754,958	771,780
Climate Change	C.1.1 Climate Change	Total	504,540	2,005,665	2,061,047	2,110,715	-	6,681,967	3,324,626	3,357,341
Urban Water	U.1.1 WSUD Targets	Total	95,729	188,653	-	-	-	284,383	142,073	142,310
Industry Development	I.2.1 FLOWS - Stage 1	Total	572,400	2,103,737	379,849	-	-	3,055,986	1,527,994	1,527,992
Environmental Water	E.2.2 South East - Phase 1	Total	216,352	317,547	-	-	-	533,900	245,272	288,628
Environmental Water	E.1.4 Expert Panel MDB Plan Review	Total	-	161,149	-	-	-	161,149	80,576	80,573
Environmental Water	E.2.4 South East Drainage DSS	Total	-	36,748	186,291	139,018	-	362,057	179,267	182,790
Industry Development	I.1.2 River Torrens (quality) Improvement	Total	-	337,662	-	-	-	337,662	168,000	169,662
Industry	I.1.1 Scoping MLR Water Allocation Plan	Total	-	209,935	-	-	-	209,935	104,967	104,967
Environmental Water	E.1.5 Scoping River Murray Catchment	Total	-	199,184	-	-	-	199,184	99,592	99,592
Research Total			2,687,892	6,987,367	4,319,903	2,795,440	90,000	16,880,602	8,769,038	8,111,564

Goyder Institute Annual Research and Development Plan

Annual Actuals as at 30 June 2012

Program	Project	Participant	Expenditure					LTD	Goyder Cash LTD	In-Kind LTD	In-Kind to Goyder
			2010/11	2011/12	2012/13	2013/14	2014/15				
Research		CSIRO	1,183,698	3,786,697	-	-	-	4,970,395	2,138,712	2,831,683	132%
Research		Flinders	179,295	470,727	-	-	-	650,022	343,092	306,930	89%
Research		Uni of Adelaide	216,441	1,343,586	-	-	-	1,560,027	659,262	900,765	137%
Research		Uni of SA	264,205	823,092	-	-	-	1,087,297	490,710	596,587	122%
Research Partners			1,843,640	6,424,102	-	-	-	8,267,742	3,631,776	4,635,966	128%
Research		SARDI	318,893	714,084	-	-	-	1,032,977	451,774	581,203	129%
Research		AWQC	6,513	20,297	-	-	-	26,810	48,656	-21,846	-45%
Research		Dept for Water	-	-	-	-	-	-	-	-	-
Research Total		Total	2,169,046	6,918,483	-	-	-	9,327,529	4,132,206	5,195,323	126%
Non Research	ANZSOG	Flinders						-	-	-	
Non Research	Knowledge Management	Total		30,049				30,049	28,566	-	
Non Research	PhD contributions	Total	208,680	208,680	-	-	-	417,360	-	417,360	
Non Research Total		Total	208,680	238,729	-	-	-	447,409	28,566	417,360	-
Admin	Goyder Office	Total	444,268	861,902	-	-	-	1,306,170	724,138	179,029	25%
Goyder Institute Total		Total	2,821,994	8,019,113	-	-	-	11,081,107	4,884,910	5,791,712	119%

Other Funding (non Goyder Institute)			Expenditure					LTD	Other Cash LTD	In-Kind LTD	In-Kind to Cash
			2010/11	2011/12	2012/13	2013/14	2014/15				
Projects with other Funding			1,161,383	2,209,379	-	-	-	3,370,761	2,359,055	1,011,706	48%
Non Projects other Funding			152,403	152,404	-	-	-	152,403	152,403	-	
Total Other Funding			1,313,786	2,361,783	-	-	-	3,523,164	2,511,458	1,011,706	

Program	Project	Participant	Expenditure					LTD	Goyder Cash LTD	In-Kind LTD	In-Kind to Goyder
			2010/11	2011/12	2012/13	2013/14	2014/15				
PhD Stipend TopUps		Total	-	240,000	-	-	-	240,000	240,000	-	
Urban Water	U.2.1 MARSUO	Total	14,127	520,049	-	-	-	534,176	241,400	292,776	121%
Environmental Water	E.1.1 MDB Review	Total	238,689	239,093	-	-	-	477,783	237,148	240,635	101%
Environmental Water	E.2.1 SE Urgent	Total	84,175	-	-	-	-	84,175	38,601	45,574	118%
Environmental Water	E.1.2 MFE Urgent	Total	30,298	-	-	-	-	30,298	20,963	9,335	45%
Environmental Water	E.1.3 Murray Flood Ecology	Total	534,083	906,448	-	-	-	1,440,531	599,297	841,234	140%
Climate Change	C.1.1 Climate Change	Total	515,442	2,271,282	-	-	-	2,786,724	1,363,477	1,423,247	104%
Urban Water	U.1.1 WSUD Targets	Total	95,837	212,971	-	-	-	308,809	142,073	166,736	117%
Industry development	I.2.1 FLOWS - Stage 1	Total	466,974	1,839,503	-	-	-	2,306,477	892,599	1,413,878	158%
Industry development	E.2.2 South East - Phase 1	Total	189,419	332,224	-	-	-	521,644	241,071	280,573	116%
Environmental Water	E.1.4 Review MDB Plan	Total		153,541	-	-	-	153,541	7,871	145,670	1851%
Environmental Water	E.2.4 South East Drainage Decision Supp	Total		21,234	-	-	-	21,234	25,625	-	-17%
Industry Development	I.1.2 River Torrens (quality) Improvement	Total		161,233	-	-	-	161,233	41,000	120,233	293%
Industry	I.1.1 Scoping MLR Water Allocation Plan	Total		155,296	-	-	-	155,296	41,081	114,215	278%
Environmental Water	E.1.5 Scoping River Murray Catchment	Total		105,608	-	-	-	105,608	-	105,608	-
Total			2,169,046	7,158,483	-	-	-	9,327,529	4,132,206	5,195,323	126%

A.2 Investment profile

A.2 Investment Profile															
	Budget Approvals ToDate			Budget Approvals 2012_13			Budget Approvals 2013_14			Budget Approvals 2014_15			Total LifeTime		
	Budget	Cash	In-Kind	Budget	Cash	In-Kind	Budget	Cash	In-Kind	Budget	Cash	In-Kind	Budget	Cash	In-Kind
Research															
C.1 Regional Downscaling	6,681,967	3,324,626	3,357,341	-	-	-	-	-	-	-	-	-	6,681,967	3,324,626	3,357,341
E.1 River Murray Surface water, groundwater, E.2 wetland relationship	2,406,227	1,193,238	1,212,990	2,000,000	1,000,000	1,000,000	-	-	-	-	-	-	4,406,227	2,193,238	2,212,990
I.1 Water allocation planning & water quality improvement	988,479	463,140	525,339	1,900,000	950,000	950,000	-	-	-	-	-	-	2,888,479	1,413,140	1,475,339
I.2 Mining & outback water	547,597	272,967	274,630	2,329,221	1,164,611	1,164,611	-	-	-	-	-	-	2,876,818	1,437,578	1,439,240
U.1 Water sensitive urban design	3,055,986	1,527,994	1,527,992	1,500,000	750,000	750,000	-	-	-	-	-	-	4,555,986	2,277,994	2,277,992
U.2 Water resources mix for Adelaide	284,383	142,073	142,310	1,500,000	750,000	750,000	-	-	-	-	-	-	1,784,383	892,073	892,310
(new) Strategic Projects				1,000,000	500,000	500,000	5,000,000	2,500,000	2,500,000	4,099,103	2,049,552	2,049,552	10,099,103	5,049,552	5,049,552
(new) Targeted R&D advice projects				700,000	350,000	350,000	900,000	450,000	450,000	900,000	450,000	450,000	2,500,000	1,250,000	1,250,000
PhD Supplements	250,000	250,000	-	260,000	260,000	-	180,000	180,000	-	90,000	90,000	-	780,000	780,000	-
Research Total	16,350,603	8,239,038	8,111,564	13,928,221	7,094,111	6,834,111	6,080,000	3,130,000	2,950,000	5,089,103	2,589,552	2,499,552	41,447,927	21,052,700	20,395,226
Non Research															
Knowledge management & dissemination	100,000	100,000	-	100,000	100,000	-	100,000	100,000	-	100,000	100,000	-	400,000	400,000	-
Additional in-kind PhD	506,765		506,765	549,699		549,699	457,978		457,978	352,188		352,188	1,866,630		1,866,630
ANZSOG	800,000	400,000	400,000	400,000	200,000	200,000	400,000	200,000	200,000	400,000	200,000	200,000	2,000,000	1,000,000	1,000,000
Non Research Total	1,406,765	500,000	906,765	1,049,699	300,000	749,699	957,978	300,000	657,978	852,188	300,000	552,188	4,266,630	1,400,000	2,866,630
Admin															
Goyder Institute Office	1,270,177	713,471	556,706	999,987	594,843	405,144	1,046,370	612,174	434,196	1,091,436	626,812	464,624	4,407,970	2,547,300	1,860,670
Admin Total	1,270,177	713,471	556,706	999,987	594,843	405,144	1,046,370	612,174	434,196	1,091,436	626,812	464,624	4,407,970	2,547,300	1,860,670
Goyder Institute Total	19,027,545	9,452,509	9,575,035	15,977,907	7,988,954	7,988,954	8,084,348	4,042,174	4,042,174	7,032,727	3,516,364	3,516,364	50,122,527	25,000,000	25,122,526

*about \$122k extra in-kind in projects to-date