2011 Summary

Summary of CWI performance in 2011

The UNSW Research centre was approved in January 2009 and builds on the pre-existing CWI, which was not formally operating as a UNSW Research Centre. Key Performance Indicators as detailed in the application to become a UNSW Research Centre were:

- To become the first point of contact by Government for advice on groundwater matters and 3D geology in particular. This will include working with the BoM on updated groundwater data networks.
- To establish a field training centre on the UNSW farm at Wellington for training of UNSW students and extension training.
- To carry out significant fundamental research in Groundwater and to have this published in international journals.
- To attract significant international collaborators to the Centre.
- To attract further Category 1 and 2 funding from the Government.

With respect to these indicators, in 2011 the CWI:

- Published 27 journal articles, 57 conference presentations and 3 technical reports
- Attracted international collaborators including Jim Hendry (Saskatchewan), Denis O’Carroll (Western Ontario), Matthew Jones (Nottingham), Julian Ortez (Chile), John Bridgeman, Ian Fairchild and Mark Cuthbert (Birmingham)
- Completed NCGRT staffing expansion with the addition of a three more new post doc appointments. Successfully met NCGRT Key Performance Indicator targets.
- Continued the use of the Wellington Field Training facility for undergraduate student training.
- Launched the NCGRT Centrifuge Permeameter Facility at the UNSW Water Research Laboratory
- Continued the successful management of the DIISR Super Science funding program for the Groundwater Education Infrastructure Fund (GEIF), including an official opening of the headquarters at the UNW Water Research Laboratory.
- Completed major drilling programs as part of the NCGRT and Super Science expenditure.
- Continued to expand the successful CWI Web pages.

In 2012, the major goals are:

- To attract further research funding, including category 1 and 2 funding from the Government
- Continue to meet NCGRT Key Performance Indicator targets and to prepare for a rebid for National Centre of Excellence for ‘NCGRT2’ (2014-2019, rebid due to be submitted early in 2013)
• To continue to successfully manage the DIISR Super Science funding programme for the GEIF towards completion in mid-2013.
• Continued expansion in the use of the Wellington Field Training facility, including undergraduate field teaching in both Engineering and Science.
• To support the development of centre staff, especially the development of NCGRT early career researchers and professional staff.
• To undertake the UNSW Centre Review

Publications, Research Projects, Consultancies and other scholarly achievements in 2011

See also:

For hyperlinks to journal articles see:

Journal articles


Mattison, NT, **O’Carroll, DM**, Rowe, RK & Petersen EJ (2011). Impact of porous media grain size on the transport of multi-walled carbon nanotube. *Environmental Science and Technology* vol. 45 (22) pp. 9765-9775


**Conference Papers**

Peer-reviewed


Baker, A,Kelly, BFJ & Mariethoz Gregoire (2011). Quantifying the value of laminated...


Non-peer-reviewed


Neilson, KL, Andersen, MS, & Acworth, RI (2011). An investigation into recharge sources in a semi-arid mountain front aquifer using stable isotopes signatures and groundwater


Abstract only


**Poster**


**Technical Reports**


**Research Projects**

**Cotton Catchment Communities CRC**

The NWC (National Water Commission)/NPSI (National Program for Sustainable Irrigation) 3-year project on heat as a groundwater tracer was successfully completed in December 2011. The final report was approved by both NWC and NPSI with very favourable feedback from both organisations. Gabriel Rau submitted his PhD thesis based on experimental laboratory work in this project in December 2011. It is anticipated that Mr Rau will graduate in mid-2012. Two journal articles based on his work were submitted in 2011 and have now been
accepted for publication in Water Resources Research. The current state of the heat tracing methodology was presented at a combined IAH regional meeting - New South Wales Office of Water (NOW) workshop in Tamworth on 19th July 2011 by Gabriel Rau. The meeting was attended by about 20 NOW regional hydrogeologists from different areas in NSW and by professional consultants from major regional centres. The availability of computational tools for simplified analysis and interpretation of temperature data was promoted. Gabriel Rau and Martin Andersen both participated in planning, convening and chairing sessions as well as presenting invited talks at the 2011 AGU conference in San Francisco based on the heat project work.

The Cotton Catchment Communities CCC funded an Honours student scholarship over the summer 2010-2011 to UNSW Civil Engineering undergraduate Garth Cooper. Garth was supported by Martin Andersen, Andrew McCallum and Gabriel Rau in a numerical study: A Numerical Analysis of Groundwater Abstraction on Aquifer-River Interactions. The CCRC also funded an Undergraduate Summer Scholarship in 2011-2012 to UNSW Advanced Science undergraduate Mukhils Mah. Supported by Wendy Timms, Bryce Kelly, Adam Hartland and Andy Baker, Mukhils undertook a baseline organic and inorganic water quality survey of the Namoi catchment.


Andersen, M.S. (2011) Water quality and ecological implications of changing dynamics in surface water groundwater interactions. Talk presented at a New South Wales Office of Water (NOW) workshop in Tamworth on 19th July 2011. The meeting was attended by about 20 NOW regional hydrogeologists from all over NSW.


National Centre for Groundwater Research and Training
The NCGRT provides ~$7M of research funding from 2009-2014, focussed on post-doctoral research salaries and PhD and honours training scholarships. NCGRT recruitment continued in 2011, focussing on postdoctoral appointments. These included Adam Hartland, Alessandro Comunian, Sanjeev Jha, and Gabriel Rau, leading to a near-full NCGRT staffing by the end of the year. The major NCGRT equipment item, the Centrifuge Permeameter facility, was commissioned and launched in 2011. NCGRT supported researchers produced the majority of the papers and conference presentations in 2011 and this is expected to continue to be the case for the next few years.

For further details see:
NSW Science Leveraging Fund
NSW SLF funding in 2010 was used to construct the research and training facility at the UNSW Wellington Field Station. The fixed-term site manager (Peter Graham) continues to be funded primarily from the NSW SLF, with additional support from UNSW Facilities and the NCGRT. Peter continued to oversee research and training at the site in 2011. This included regular visits by NCGRT supported postdoctoral research and PhD students, including intensive field campaigns by Matt McCabe and team, and support of undergraduate field classes at the field station.

For further details see:

Super Science
Australian Government Super Science Initiative funding (2009-2013) continued throughout the reporting period. Four quarterly milestone reports were submitted and approved by DIISR, as well as the second Annual Business Plan. A new subcontract was set up with Monash to manage an additional Super Science site in Victoria. Management of the project activities at most of the sites has proceeded satisfactorily and milestone payments have been made to sub-contractors at ANU (Data Management project), Queensland University (Stradbroke and Bribie Islands) and Monash University (Ovens Catchment). However, progress has remained very slow with the Flinders University subcontract (Ti Tree and Willunga) when compared to the timelines contained in the Business Plan.

Ground water EIF activities directly run by UNSW focuses on the Namoi and Wellington sites. At Namoi, improved weather mid-year permitted significant activity in 2011, including the installation of a second gravity station is underway on the Liverpool Plains at Breeza and commencement of the installation of extra climate stations and monitoring equipment in the upper part of Maules Creek. Unfortunately, work was again delayed due to heavy rain and flooding in December. At Wellington, new infrastructure included further boreholes as part of the “fractured rock investigation and monitoring facility”. By the end of the year, 11 boreholes had been completed with a mixture of open hole completions and double piezometers. A total depth of 497 m drilling was achieved. The rigs will return to site in 2012 to complete a further 11 boreholes and a small pumping test bore. This will complete the works at the Wellington Research station. In 2011, further water level and temperature loggers and weather stations were installed, and the year also saw the delivery and commissioning of a rainfall radar. The GEIF infrastructure was utilised by UNSW honours and PhD researchers, NCGRT post-doctoral researchers and external collaborators including ANSTO and Macquarie University.

For further information see:
ARC Discovery, Linkage, LIEF and other grants
The ARC DP11 Discovery Grant investing lipid and lignin phenol biomarkers commenced in 2011; Catherine Jex was appointed as the post-doctoral researcher and this project focussed on establishing new laboratory methods in collaboration with Stuart Khan (Wrc). Progress was good with the first ARC end-of-year report submitted on time.

The ARC LE11 infrastructure grant to establish a carbonate mass spectrometry facility at UNSW commenced and was completed in 2011, with the successful commissioning of the equipment within the Biomedical Mass Spectrometry Facility in late 2011. This equipment is now being utilised by project partners from ANSTO and Newcastle Universities, and collaborators from Wollongong.

For further information see:

Consultancies
The Technical Reports listed above were prepared as a result of consultancy contracts operated through the Water Research Laboratory at Manly Vale and reports written as part of Cotton CRC commitments. The total number continues to decline, and this trend is expected to continue.

Significant managerial or personnel changes
Prof Andy Baker started 2011 as Acting Director of the CWI and acting leader of NCGRT Program 1. From April 2011 he became Program Leader of NCGRT Program 1, with Prof Ian Acworth returning as CWI Director. These changes allowed Prof Acworth to focus on the management of the GEIF project, and Prof Baker to focus on the management of the NCGRT project.

CWI post-doctoral researcher Dr Gregoire Mariethoz was appointed to the School of Civil and Environmental Engineering in August 2011. Correspondingly, be became a co-investigator in the NCGRT.

Dr Denis O’Carroll joined the CWI in July 2011 for one year, on sabbatical from the University of Western Ontario.

CWI personnel at the end of 2011 comprised (funding source in brackets):
Academic Staff. Prof Ian Acworth, Dr Martin Andersen, Dr Gregoire Mariethoz, Dr Wendy Timms (all CVEN), Dr Bryce Kelly (BEES), Prof Andy Baker (CWI)
Professional Staff. Mark Whelan (NCGRT), Sam McCulloch, Jodi Adams, Antonio Woo (all GEIF), Peter Graham (NSW SLF/UNSW FM / NCGRT).
Post-doctoral staff. Joshua Larsen, Adam Hartland, Anna Greve, Alessandro Comunian, Sanjeev Jha, Hamid Roshan, Hoori Ajami, Josiah Strauss (all NCGRT), Catherine Jex (ARC), Gabriel Rau, Andrew McCullum (CRDC).
PhDs. Mark Peterson, Cecilia Azcurra, Ali Ershadi (all NCGRT).
List of teaching and research supervision carried out by the centre on behalf of units

Centre staff employed by the Schools of CVEN and BEES contributed the following teaching and research supervision in 2011:

GEOS2291 Ground and Surface Water  
CVEN3501 Water Resources Engineering  
CVEN4503 Groundwater Resource Investigation  
CVEN4703 Advanced Water Quality  
CVEN4501 Catchment And Water Resources Modelling  
GEOS9632 Groundwater Management  
GEOS9633 Geophysical Techniques in Groundwater, Engineering and Agriculture  
GEOS9634 3D Geological Computer Models and Spatial Data Analysis  
CVEN9612 Catchment and Water Resources Modelling  
CVEN9884 Environmental Engineering Science 1  
CVEN9885 Environmental Engineering Science 2  
CVEN9631 Hydrogeochemistry

Honours Theses

Masters Projects
Amy Becke (2011). Quantifying groundwater discharge into Barratta Creek, north Queensland, Australia. School of Biology, Earth and Environmental Science.  
Melissa Woltmann (2011) 3D Geological Model of the Phanerozoic Cover for the Kintyre Area, Western Australia. Supervisor Bryce Kelly
Statement of in-kind contributions including academic/other salaries, infrastructure and resources provided to the centre

Academic salaries are contributed by the Schools of BEES and CVEN and the DVC Research; related infrastructure and resources including offices, website hosting and administration support are provided by BEES and CVEN, the latter including a substantial base at the Water Research Laboratory, Manly Vale.

Record of dates and attendance of management and advisory committee

5th Management Board Meeting, Thursday 14th April 2011, BEES
Prof. Merlin Crossley, (Dean Science), Prof. Graham Davies (Dean Engineering), Prof. David Waite (HoS CVEN), Prof. Ian Acworth (Director CWI), Prof. Andy Baker (Deputy Director CWI), Mr Antonio Woo (Manager - EIF Super Science), Dr Ian Turner (Acting Director WRL).
Apologies: A/Prof. David Cohen (HoS BEES)

6th Management Board Meeting, 7th September 2011, WRL
Prof. Graham Davies (Dean Engineering), Prof. David Waite (HoS CVEN), Prof. Ian Acworth (Director CWI), Prof. Andy Baker (Deputy Director CWI), Dr Bill Peirson (Director WRL).
Apologies: A/Prof. David Cohen (HoS BEES), Prof. Merlin Crossley, (Dean Science), Mr Antonio Woo (Manager - EIF Super Science).
Statement of Financial Performance  
For CWI - Connected Water Initiative  
Period between 1st of January 2011 – 31st December 2011

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
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<tbody>
<tr>
<td>Research Income / Sundry Grant / Other</td>
<td>5,667,268</td>
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<tr>
<td>Interest Revenue (GEIF)</td>
<td>343,986</td>
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<tr>
<td>Internal Revenue (RF accounts)</td>
<td>271,586</td>
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<tr>
<td><strong>Total Income</strong></td>
<td><strong>6,282,840</strong></td>
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**Other Payments**

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<td>1,814,755</td>
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<td>Equipment</td>
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<td>Other Expenses</td>
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<tr>
<td>Repairs and Maintenance</td>
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<td>Contract Services</td>
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<td>Consumables</td>
<td>75,646</td>
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<td>Scholarships</td>
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<td>Investment Expenses</td>
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<td>Overheads</td>
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<tr>
<td>Internal Expenses</td>
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<td>Travel Domestic</td>
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<td>Travel International</td>
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<td>Internal Travel</td>
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<td><strong>Total other payments</strong></td>
<td><strong>5,453,390</strong></td>
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**Operating Result**

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<td>B/Forward from 2010</td>
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<tr>
<td><strong>Operating Result</strong></td>
<td><strong>829,450</strong></td>
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**Accumulated funds Surplus (Deficit)**

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<th>Description</th>
<th>Amount</th>
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<tr>
<td><strong>Accumulated funds Surplus (Deficit)</strong></td>
<td><strong>6,940,030</strong></td>
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</table>

**Unpaid Invoices (including GST):**

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<tr>
<th>Description</th>
<th>Amount</th>
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<tbody>
<tr>
<td><strong>Unpaid Invoices (including GST):</strong></td>
<td><strong>783,161</strong></td>
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</table>

**Connected Waters Initiative chart field**

| PS18850 | STRATEGIC HIRE : ANDREW BAKER | RM07764 | DIISR Educ Invest Fund EIF |
| PS20578 | Faculty Admin support for CWI | RM07765 | DIISR Educ Invest Fund EIF |
| PS24923 | 2011-12 Strategic P-I. Acworth | RM07766 | DIISR Educ Invest Fund EIF. |
| PS18224 | ENG Gary Johnston Chair | RM07767 | DIISR Educ Invest Fund EIF. |
| PS23647 | IT Infrastructure WRL | RM07768 | DIISR Educ Invest Fund EIF. |
| PS23704 | LE110100045_Baker,A | RM07769 | DIISR Educ Invest Fund EIF |
| PS23850 | 2011 MREII_Baker, Andrew Blair | RM07808 | CRC for Cotton Catchment Community |
| RM06822 | CottonRes&Dev Ex Land&WaterAus | RM07904 | NSW Dept of Environment & Climate |
| RM07914 | NSW Dept of State & Regional D | RM08646 | ARC LP110102124 PROJ Baker, A |
| RM07362 | ARC/NWC Co-Funded Centre for G | RM08936 | ARC LE110100045 PROJECT |
| RM07363 | ARC/NWC Co-Funded Centre for G | RM09016 | UniOfNewcastl Shared Gmt LIEF |
| RM07364 | ARC/NWC Co-Funded Centre for G | RM09017 | ANSTO Shared Gmt Mass Spectrometer |
| RM07365 | ARC/NWC Co-Funded Centre for G | RM09038 | Numerical modeling river-aquif |
| RM07366 | ARC/NWC Co-Funded Centre for G | RM09860 | Main RM07764_ Ovens Valley Sit |
| RM07367 | ARC/NWC Co-Funded Centre for G | RM09883 | Main RM07764_North Stradbroke |