

Annual Report 2004-05



**Established and supported under the Australian Government's
Cooperative Research Centres Programme**

*enhancing Australia's industrial, commercial and economic growth through the development
of sustained, user-driven, cooperative public-private research centres that achieve high levels
of outcomes in adoption and commercialisation*



This Annual Report is issued in the format required by the Commonwealth Government. Those who wish a deeper knowledge of CRCSI activities are referred to the publications listed in this report, to the web page, and are welcome to contact the CRCSI office.

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cover :: Chairs of CRCSI; ANZLIC; ASIBA and President SSI at CRC launch & Annual Conference

Core Participants

Charles Sturt University	
Dept of Land Information, WA	 Department of Land Information Government of Western Australia
Dept Agriculture, WA	 Department of Agriculture Government of Western Australia
Dept of Lands, NSW	 Department of Lands <i>Reliable from the ground up</i>
Dept Natural Resources Mines & Energy, Qld	 Queensland Government
Dept Sustainability and Environment, Victoria	 Victoria The Place To Be
43 Pty Ltd	
Geoscience Australia	 Australian Government Geoscience Australia
University of Melbourne	
University of New South Wales	

Support Participants

ESRI Australia	
Defence Imagery and Geospatial Organisation	
Intergraph	

43pl members

AAMHatch



Alexander & Symonds Pty Ltd



Apogee Imaging International



Advanced Spatial Technologies



Beveridge Williams & Co Pty Ltd



B & P SURVEYS

Brown & Pluthero Pty Ltd



C. R Hutchison & Co Pty Ltd

CSBP Limited



D.M. Gerloff & Associates Pty Ltd

D.M. Gerloff
& Associates

Digital Mapping Solutions



Fractal Technologies



Fugro Spatial Solutions Pty Ltd



Geodata Information Systems



Geomatic Technologies



Glenndew Pty Ltd

GLENNDEW
PTY LTD

Howell Spatial Industries Pty Ltd



Intergraph



Land Equity International Pty Ltd



Lester Franks Survey & Geographic Pty Ltd



Lisasoft Pty Ltd



LogicaCMG Pty Ltd



Mapinfo Australia Pty Ltd



Max Braid Surveyors Pty Ltd



McMullen Nolan & Partners Pty Ltd



Navigate Pty Ltd



NGIS Australia Pty Ltd



Omnilink Pty Ltd



Omnistar



Peter W Burns Pty Ltd



PSMA Australia Limited



QASCO Surveys Pty Limited



Reeds Consulting Pty Ltd



Searle Consulting NQ



Sinclair Knight Merz Pty Ltd



Spatial Information Technology Enterprises Ltd



Webmap Pty Ltd



we-do-IT Pty Ltd

Wrenfeld Pty Ltd



Affiliate Participants

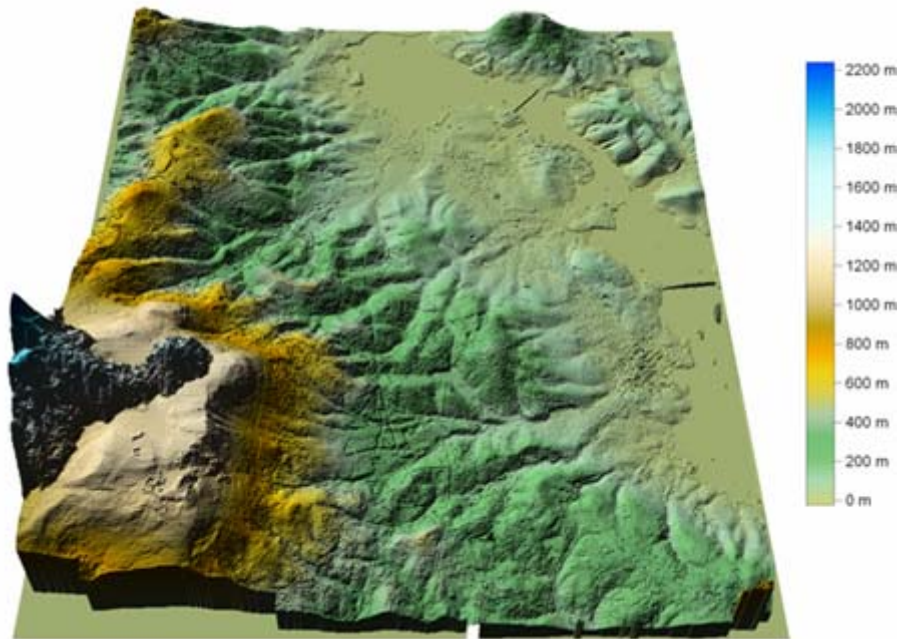
Bentley Systems Pty Ltd



ER Mapper Asia Pacific



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CRC for Spatial Information

Vision

To make the CRCSI a world leader in spatial information applications that is affordable, useful and readily available to all — at any time and in any place.

The application of the vision in Australia leads to the concept of *Virtual Australia*, ie the holistic representation of the vast array of information about our world in three dimensions and at any useful scale. In simple terms this means one can remotely access map-based information, combine it with information from other sources, conduct analyses, view the information in three dimensions, conduct forecasts, analyse historic trends, supply information and analyses to others, and know one's geographic position. Moreover it provides us with the ability to convey this position to others, at any time. Spatial information and its enabling technologies are therefore linked through the vision.

The same concept can be applied anywhere in the world and the CRCSI wishes to develop the application of the vision wherever there is a demand.

It is implicit in the vision that new or existing spatial information and other information will be seamlessly integrated for the benefit of the user at an affordable price, since it is recognised that for most applications spatial information is used with non-spatial information.

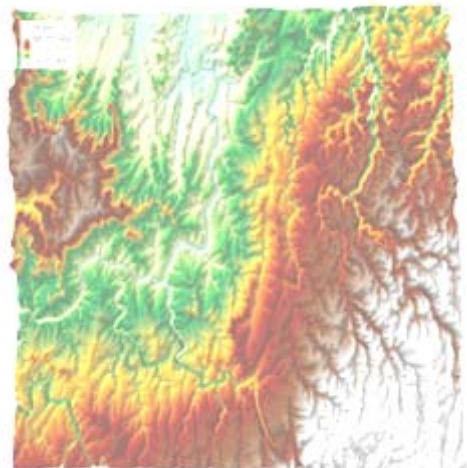
Statement of Purpose

To create new wealth for the participants of the CRCSI and for the nation, through research innovation and commercialisation; through educational activities; and through powerful collaboration to build institutional capacity.

1 Objectives

The CRC Commonwealth Agreement Objectives were refined in the Commercialisation and Utilisation plan approved by DEST in early 2005:

- Promote the seamless exchange of spatial information (SI) between all information users in Australia through new SI products, thereby enhancing commercial, environmental and social management activities
- Foster the flow and level of commerce in SI and the transfer of spatial data technology
- Create a long term partnership of users, from community groups, non-government organisations, small-to-medium enterprises and industry corporations, to local, state, federal and international governments and the education sector
- Enhance interoperability between the diverse but complementary SI collection, processing and delivery systems, namely: satellite positioning (GPS), geodesy and kinematic mapping, satellite earth observation, metric information retrieval, socio-economic and commercial inventory and accounting, geographic information systems and web-based decision-support services
- Become a player of significance in the international SI community, both in technology development and commercial innovation
- Provide the science and technology infrastructure to allow SI applications to grow and expand



2 Executive Summary

3 Chairman's Report

Board governance was instrumental in the efficient and effective operation of the CRC Board in its second year as it moved into a full operational mode. Every Board Director contributed substantially to one or more Board committees and to the formulation and implementation of a revised strategic plan late in 2004. This plan will be reviewed annually as CRCSI develops its programs.

The very effective inaugural annual conference in 2004 reviewed in detail all projects and modified those not seen to be performing adequately. The research and industry advisory committees have an important role in this task as does our Visitor Em Prof John Lovering. The founding of 43 Pty Ltd, the industry trust company, has proved effective in coordinating the industry participation and input to the CRC.

A joint appointment is planned with DPI Victoria will strengthen our interaction with the Victorian Government and sets a pattern for other states to follow for such activities.

An excellent result was gained from the Year 1 Review. The report gave very positive feedback on the CRCSI operation. Approval was sought and given for a modified set of performance indicators of less number. Minor criticism was made of the time taken to complete the Centre's many legal agreements but acknowledgment was made of our complex structure and the large number of participants. Stronger interaction with the CRC students was encouraged and action has begun by management to provide regular briefing of students on the wide range of centre activities.

The major impediment to implementation of the centre activities hinged on the raft of legal agreements required to ensure full industry and government participation in our activities. There remain some questions on tax issues for our industry members as is common with many other CRCs.

Two of our founding Board Directors left us this year - Dr Williams of Geoscience Australia and Prof Sutherland of UNSW. Neil Williams has been invaluable, providing critical strategic input on the future growth directions of the spatial information industry. Colin Sutherland brought a balanced outlook to the Board, with strong contributions to discussions and debates. We look forward to working with the replacement Directors Dr Bruce Thompson of DSE Victoria and Prof Les Field of UNSW as the CRC consolidates its position within the rapidly expanding spatial information industry.

Over the past year there has been an effective integration of the expectation of all stakeholders from industry, government and academic research sectors as the focus has been substantially moved to strongly outcome oriented projects and commercialisation of research and development initiatives. Central to this is the role of the Demonstrator Programme put in place to bring a quick realisation of developments stemming from the overall research programme.

On behalf of the Board I would like to especially acknowledge the outstanding effort from the management team led by the CEO Peter Woodgate, and the continuing guidance and advice of our Visitor Prof John Lovering.

Bill Charters



4 CEO's Report

It is with pleasure that I report the achievements of our CRC in its second year. The year was marked by a series of challenges: the need to consolidate the roles of our 50 partnering shareholders and three supporting participants, giving impetus to the \$28 million of approved research, and shaping the newly approved education program. Excellent progress has been made in the each of these areas.

Our projects span satellite-based positioning systems, airborne and terrestrial laser systems, satellite and airborne imaging (radar, multispectral and hyperspectral imaging systems), visualisation systems and advanced cognitive analysis. Emphasis has been placed in selecting research directions that will lead to new knowledge capable of application for significant gain by our government and corporate partners. All research is conducted as a partnership between the university, government and corporate sectors and we have now over 300 part and full-time researchers working in this spirit of collaboration.



Our first completed research project was a review of the spatial data infrastructure in key states, the Commonwealth and some overseas jurisdictions. Our thanks go to Dr Abbas Rajabifard for his leadership of the project. The outcomes provide momentum for us to develop a sophisticated blue-print of the concept of *Virtual Australia*, the flagship of the incredibly powerful network of information sources and analysis systems that will deliver the vision of our CRC *information to anyone, anywhere at anytime, at an affordable price*.

Our first demonstrator project, HAZWATCH, has been proved up for commercialisation. HAZWATCH is a web-enabled information system that tracks an emergency in near-real time and provides information about it to organisations responsible for its management or to those who are likely to be affected by it. Over 25 organisations from the emergency management, utilities and resources sectors contributed to its development. The WA Department of Land Information and NGIS Pty Ltd both played key roles and the project leader Mr Mark Carniello is to be congratulated. Our commercial activities in other projects have generated a patent application. These and a range of other business development activities suggest a demanding coming year for our Business Development Manager Dr Graeme Kernich.

The spatial information industry in Australia is currently enjoying high growth. Our 43 companies tell us that they are struggling to find the skilled labour needed to meet market demand, need help to help bring on the new technologies that are emerging with increasing rapidity, and wish to seek opportunities overseas. The CRC is responding to these needs in several ways. We conducted a workshop in Sydney that was attended by 27 of our companies specifically designed to identify their most important research needs. A dozen research ideas were identified and prioritised and these will be used to influence our forthcoming strategic review. We completed an industry-wide survey of skill requirements and the responses will be instrumental in designing our training programs. We have now approved 19 PhD scholarships and 5 Masters top-up awards.

Our companies, many of which are small to medium enterprise firms, are being strongly encouraged to treat the CRC as their own research division, capable of undertaking R&D projects of any size in a confidential, responsive and collegiate environment. Through KPMG we also undertook a benchmark survey of the collective economic picture of our 43 companies so that we track their changes year on year and get some measure of the impact of our CRC. We are encouraging our industry to do the same industry wide.

We have signed an MOU with the Bushfires CRC, and opened discussions with the Chinese Academy of Sciences and GEOIDE, a Canadian Centre of Excellence with similar principles and objectives to a CRC. A three-way agreement with the Victorian Department of Primary Industries and the University of Melbourne saw our appointment of Professor Kim Lowell, formerly of the University of Laval, Canada, to the CRC SI. Kim will significantly strengthen Australia's ability to apply spatial information science to improve agricultural productivity and manage our natural resources.

We restructured the management of our research program. Program Managers became Science Program Managers, with a CRC-wide mandate to apply their respective expertise. We are fortunate to have scientists of the calibre of Professors Ian Bishop (Visualisation), Clive Fraser (Image Analysis), Tony Milne (Remote Sensing) and Chris Rizos (Positioning). This move will integrate spatial technologies across projects and streamline the management with project leaders reporting directly to the Research Director. We also received the resignation of Professor Ian Williamson from his position as a Program Manager and wish Ian well for the future.

Our first annual conference was a great success. It was opened by Ms Elaine Carbine MLC and Victorian Parliamentary Secretary for Environment. Over 110 delegates spent a day and half reviewing each research project. We launched our CRC at the start of the event with the honours conducted by Mr Garn Nairn MP, Parliamentary Secretary for the Prime Minister. Particular thanks for the smooth organisation of the events go to Communications Director Mike Ridout and to Office Manager / Executive Assistant Ms Jane Inall. Mike also fills the role of 43pl liaison and Education Coordinator.

Our communications program is now most comprehensive with the development of our content-based web site that is now receiving over 4000 visits per month. The site has a comprehensive database of our activities. In addition to acting a sound communications medium, it will shortly offer a time-keeping system for the recording of in-kind contributions, a significant efficiency gain for all. We have completed 50 refereed journal papers and conference papers.

On the recommendation of our internal auditor Mr George Little and our external auditor Pitcher Partners, we set up our financial management system based on the Arrow package. We appointed Ms Melanie Plumb as own Finance Manager, and developed a full suite of delegations, protocols and guidelines to ensure a high level of probity in the management of our shareholders assets.

The governance and management structures of the CRC bear significant responsibility for the progress we have enjoyed. Our Project Leaders convene quarterly Project Management Group meetings and have their projects formally reviewed. The Research and Education Advisory Committee and the Industry Advisory & Commercialisation Committee, chaired respectively by Professor Clive Fraser and Jack de Lange, ensure rigour in the design of our investment proposals. My Chairman Bill Charters continues to govern the Board with impartiality and wisdom and together with his Deputy Mr Grahame Searle and the other Board members provide me with great support.

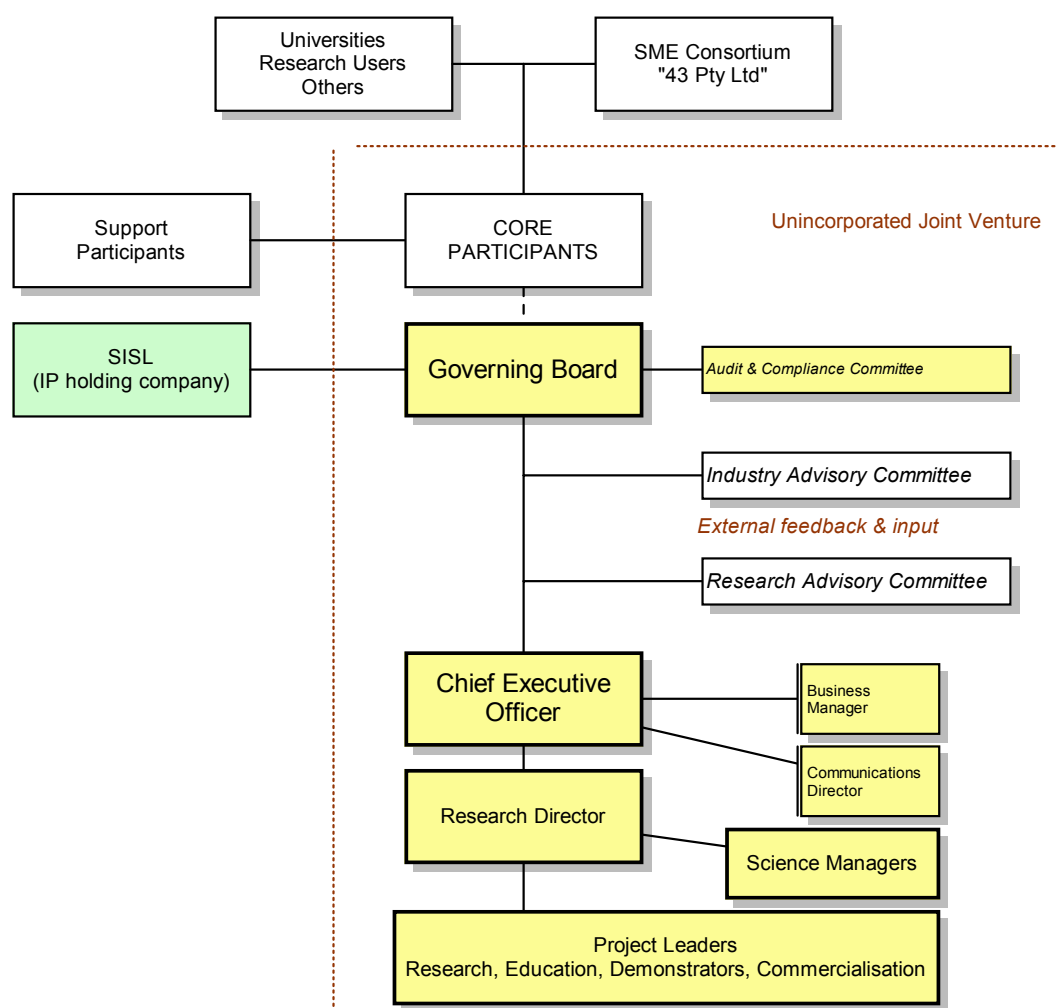
Spatial information and its supporting technologies provide fundamental infrastructure for Australia. It supports our emergency services, provides us with weather forecasts, underpins every land purchase transaction, is fundamental to our defence forces and much more. Increasingly it is becoming a seamlessly integrated component of the daily business of most enterprises. With the advent of Google Earth, Virtual Earth and NASA World Wind the spatial world has become ubiquitously available, on-line, all the time in the homes and businesses of all Australian's. The CRC SI is working hard to ensure Australia captures maximum benefit from developments like these.

Peter Woodgate

5 Governance, Structure and Management

Corporate Structure

The CRCSI is an unincorporated joint venture but operates as though it were a company. It has a board of directors with advisory committees and a CEO with executive staff. Spatial Information Systems Ltd is the IP holding company and commercial agent of the CRC. The structure provides a sufficiently flexible vehicle for parties agreeing to perform research and development jointly with a view to then, jointly or separately, commercialising the research under license or other such arrangements.



Roles and Accountabilities

Board	Executive	Science Managers	Project Leaders
Strategic direction	Strategic Planning	Independent project input and advice (project development; work quality; technical and commercial networks)	Research leadership
Policy	Operational Management	Internal links	Project stakeholder communication and relations
Budget	Business Development	Market interface	Project mgt (staff and budget), esp. meeting milestones & reporting
Achievement of Strategic Plan	Commercialisation	Research utilisation	Internal liaison
CEO appointment	Ensuring programs interconnect and link to the market		
	Member and client relations		

Governing Board

CRCSI is ultimately managed by the Governing Board of directors, which meets five times each year. There is a maximum of eleven directors, some of whom have alternates:

- an independent Chairman
- three independent directors including the CEO
- two representatives from each of 43pl and university colleges
- three representing the government college

Directors as at 30 June 2005 are listed below with attendance details at Appendix 2.

Each college operates independently and confers amongst itself so that views of any participant can be brought to consideration in a Board forum. The CRCSI Business Manager is the Company Secretary. Not all Members have Board seats, but all have equivalent access through rotation of

Directors that represent participants. Directors are made fully cognisant of the obligations of Corporations Law, which dictates that the interests of the CRCSI be placed above those of their own organisation while acting as a director. Comprehensive governance protocols have been designed for the CRC by Mr Henry Bosch AO.

The Board oversees operations and provides the CEO general policy direction. It is responsible for

- setting CRCSI's strategic direction and major policies
- allocating resources
- ensuring the program portfolio is in accordance with CRCSI objectives
- overall CRCSI performance, based on milestones, and including accountability to the CRC Programme and the legal requirements of the Australian Securities and Investment Commission.

Director	Organisation	Alternate Director
Bill Charters	Independent (Chair)	
Peter Woodgate	CRCSI Chief Executive Officer	
Mary O'Kane	Independent (Director, M O'Kane & Assoc)	
Roland Slee	Independent (<i>Vice President, Fusion Middleware Sales, Oracle Corporation Australia Pty Ltd</i>)	
Bill Richards	43pl (Fugro Spatial Solutions Pty Ltd)	John Lazarus, Managing Director, Fugro
Tony Burns	43pl (Land Equity Pty Ltd)	Chris Grant, Land Equity Pty Ltd
Bruce Thompson	Dept Sustainability & Environment	
Grahame Searle	Chief Executive Officer, Dept of Lands Information, WA (Deputy Chair)	David Hartley, WA Dept of Agriculture
Warwick Watkins	Director-General, Dept of Lands, NSW	Des Mooney, NSW Dept of Lands
Les Field	University of NSW	James Walsh, UNSW
Jannie van Deventer	Dean of Engineering, University of Melbourne	

Audit & Compliance Committee

The Audit and Compliance Committee meets as required to support the audit process and CRCSI fiduciary and other protocols. Terms of reference include internal audit and compliance review. The ACC met three times during the year and membership was Mary O’Kane (Chair), Warwick Watkins and Neil Williams/Bruce Thompson. Pitcher Partners is the appointed CRCSI auditor and the company is conducting the year’s audit in conjunction with this annual report.

Research & Education Advisory Committee

This independent committee provides advice and recommendations on, and review of, the research and education activities of the CRC. It met three times in the year, jointly with the Industry Advisory and Commercialisation Committee. The Chairman is an observer at Board meetings and delivers the REAC considerations to Directors. Its membership at 30 June was

Clive Fraser	Research Director, CRCSI
Roland Slee	Board Director, CRCSI
Peter Loughrey	Intergraph
Bruce Thompson	Dept Sustainability and Environment, Victoria
Peter Woodgate	CEO, CRCSI
Graeme Wright	Curtin University of Technology



Industry Advisory & Commercialisation Committee

The purpose of this committee is to advise the CRCSI Governing Board on issues concerning industry and commercialisation matters. It met three times in the year, jointly with the Research & Education Committee. Its membership was

Jack de Lange	43pl Director & Australian Spatial Information Business Association
Tony Burns	43pl representative CRCSI Board Director, and Land Equity Pty Ltd
Hun Gan	Starfish Ventures Pty Ltd (appointed June 04)
Bill Richards	43pl representative CRCSI Board Director, and Fugro
Grahame Searle	Board Director, CRCSI and Dept of Land Information WA
Peter Woodgate	CEO, CRCSI



Spatial Information Systems Limited (SISL)

CRCSI established SISL to hold its intellectual property and oversee its exploitation. The Governing Board is also the Board of SISL. SISL acts as the commercial agent for the CRCSI participants to identify, protect, use and commercialise the Centre Intellectual Property.

43pl – the SME consortium

43pl is a company established as a construct to help a large number of small to medium sized enterprises (SMEs) participate in the CRC in a manageable way. It has a board that oversees the trust, in which member companies hold units proportional to their annual cash subscription. Board directors come from each state involved in the CRC. Two 43pl representative directors on the CRC Board are elected from nominations by the membership of 43pl.



43pl is itself a core participant in the CRC. The proprietary limited company binds over 40 small to medium enterprise (SMEs) companies through a unit trust deed. Each SME is a unit trust holder. There are five shareholders, one from each of Tasmania/Victoria, Western Australia, South Australia/Northern Territory, New South Wales/Australian Capital Territory and Queensland. A company from each state/territory provides the Director for the Board of 43pl. At 30 June 2005 the 43pl Directors were Mark Judd (Chair, Victoria and Tasmania), Jack de Lange (Queensland), Dean Howell (SA), Bill Richards (WA), Ian Batley (NSW & ACT). All states and territories with the exception of the Northern Territory have headquarters of 43pl members.

CRC Visitor

CRCSI draws on the expertise and experience of Professor John Lovering AO, FAA, FTSE with regard to strategic direction and operations. John is an eminent Australian geologist and the former Vice Chancellor of Flinders University. He has been Chairman of a number of public and private company boards and formed Geotrack International Pty Ltd to market a new petroleum exploration technique. He has served on national and international scientific and government committees. He has considerable experience in natural resources management including as Presiding Officer of the Natural Resources Council of South Australia from 1992 to 1994, President of the Murray-Darling Basin Commission from 1994 to 1999 and Chairman of the Environment Conservation Council (Victoria) from 1998 to 2002.

He is currently a member of the Board of Southern Rural Water, Chair of the International Centre of Excellence in Water Resources Management (ICEWaRM) and Chair of the Melbourne Water Supply/Demand Strategy (WaterSmart). His role as CRC Visitor incorporates

- participation in reviews of CRCSI by the CRC Secretariat
- provision of general advice and guidance
- provision of independent advice to the CRC Secretariat on the potential impact of material changes being proposed or implemented by CRCSI



6 Commercialisation & Utilisation

6.1 Strategies and Activities

The CRC for Spatial Information has been established

'to create new wealth for the participants of the CRCSI and for the nation: through research innovation and commercialisation, through educational activities, and through powerful collaboration to build institutional capacity.'

This purpose is consistent with the objective of the CRC Programme

'to enhance Australia's industrial, commercial and economic growth through the development of sustained, user-driven, cooperative public-private research centres that achieve high levels of outcomes in adoption and commercialisation'.

The Commercialisation and Utilisation Plan as required by the Commonwealth has been approved by DEST.

Commercialisation of CRCSI Centre Intellectual Property (CIP)

Spatial Information Systems Limited (SISL) has been established as the holder of CIP. It is responsible for the commercialisation of CIP, including marketing, seeking potential licensees and seeking other commercial applications.

If SISL intends to commercialise any CIP, it must advise each CRC participant in writing and each participant has a period in which to express a desire to commercialise or participate in the commercialisation of the Centre Intellectual Property. By dint of the structure of 43pl, all of the SMEs involved can bid for commercialisation rights. If no participant desires to commercialise then SISL is free to commercialise the CIP. The details of the commercialisation plan for the CRC, including the patent and licencing strategies, is documented within the CRCSI Commercialisation and Utilisation Plan.

Projects

The CRCSI strategy for technology transfer is inherent in the way it selects and funds its activities. The technology transfer and commercialisation strategy



must be built into a proposal before the Governing Board will approve CRCSI funding and formalisation into a CRCSI project agreement contract.

Criteria for project funding approval include a requirement that prospective commercialisers and/or end users have significant involvement in the project; that there is a clear and credible route to market; that the work plan reflects market awareness; and that it is aimed at a demonstration of the project output.

Every project is governed by a Project Agreement which details intellectual property ownership, the proposed route to commercialisation / application, and the role to be played by the entities involved. All parties to the project sign the Agreement. The Project Management Group pro forma agenda for quarterly meetings includes consideration of any commercial aspects pertinent to project progress and output.

Where commercialisation within a project is evident, our strategy is simple; identify potential technologies for commercialisation early through the project proposal process; develop a business case, through quarterly project management group meetings, for presentation to the Governing Board. If

approved, this is passed for implementation to the CRCSI commercial agent, SISL. An expression of interest to develop the commercial proposition is then sought from CRC participants.

Key Commercialisation Activities 05

Key commercialisation-utilisation activities and results achieved in the year include

- Review of all research and demonstrator projects by a CRC Panel at the annual conference
- Initiation of preliminary business case for utilisation of outcomes for several of the more advanced CRC projects. Several projects have indicated promising early results and potential commercial opportunities are being explored
- Presentation of outcomes by two projects to the Governing Board for commercialisation discussion
- Commonwealth approval for the CRC Commercialisation and Utilisation Plan

The CRC has undertaken several consultancies during the year in the area of landscape management.

The effective management and commercialisation of intellectual property (IP) is fundamental to achieving the CRCSI purpose and the CRC Programme objective.

The CRCSI IP Management Policy provides a framework to the CRC participants and researchers to permit the utilisation and commercialisation of research outcomes of the CRC. The policy sets out ownership rights and the responsibilities of researchers and participants. It provides guidance on the identification, protection and commercialisation of CRC IP. The policy is based upon the IP ownership and management principles outlined in the CRC Centre Agreement, Commonwealth Agreement, and Centre Intellectual Property Trust Deed.

An IP register of Centre IP, Background IP and nascent IP has been disseminated to all project leaders. Each quarterly Project Management Group meeting discusses commercial issues, concepts and opportunities. These are also considered at Project Leader fora and at the annual conference. CRCSI largely relies on the expertise within the Executive to advise projects on IP and related strategies, accessing expert inputs when required, including that of the CRC Advisory Committees.

6.2 IP Management

6.3 Involvement of End-Users

End users are involved in all aspects of the CRCSI. The following tables list “research users” with active engagement in the CRCSI during the year. The nature of activities is reported in the project descriptions and personnel within the financial reporting to DEST. SME engagement is a particular strength of CRCSI and we report on this, as required, in the Communication Strategy section.

Core Participant	
Dept Agriculture, WA Dept Sustainability and Environment, Vic Geoscience Australia	Dept of Land Information, WA Dept of Lands, NSW Dept Natural Resources & Mines, Qld 43 Pty Ltd – see below
Support Participant	
ESRI Australia Defence Imagery and Geospatial Organisation	Intergraph
Third Party & Affiliates	
Austroroads (the national association of Australian and New Zealand road transport and traffic authorities)	
Horizon Geoscience Consulting Pty Ltd Bentley Systems Dept of Planning, Infrastructure & Natural Resources, NSW	ER Mapper (to join 43pl) CSIRO Dept of Primary Industries, Vic

43 Pty Ltd Member	
AAMHatch	LogicaCMG Pty Ltd
Alexander & Symonds Pty Ltd	Mapinfo Australia Pty Ltd
Apogee Imaging International	Max Braid Surveyors Pty Ltd
Advanced Spatial Technologies	McMullen Nolan & Partners Pty Ltd
Beveridge Williams & Co Pty Ltd	Navigate Pty Ltd
Brown & Pluthero Pty Ltd	NGIS Australia Pty Ltd
C. R Hutchison & Co Pty Ltd	Omnalink Pty Ltd
CSBP Limited	Omnistar
D.M. Gerloff & Associates Pty Ltd	Peter W Burns Pty Ltd
Digital Mapping Solutions	PSMA Australia Ltd
Fractal Technologies	QASCO Surveys Pty Limited
Fugro Spatial Solutions Pty Ltd	Reeds Consulting Pty Ltd
Geodata Information Systems	Searle Consulting NQ
Geomatic Technologies	Sinclair Knight Merz Pty Ltd
Glennend Pty Ltd	Spatial Information Technology Enterprises
Howell Spatial Industries Pty Ltd	Todd Alexander Surveyors Pty Ltd
Intergraph- Mapping & Geospatial Solutions	Webmap Pty Ltd
Land Equity International Pty Ltd	we-do-IT Pty Ltd
Lester Franks Survey & Geographic Pty Ltd	Wrenfeld Pty Ltd
Lisasoft Pty Ltd	

6.4 Progress against Contractual Targets / Milestones

Schedule 1 in the Commonwealth Agreement specifies the following milestones for the Commercialisation / Technology Transfer Program for 2005.

Outcome 8.1	Adoption of CRC-SI produced technology by Australian entities that leads to significant economic growth in the SI industry (ie in terms of total sector turnover, company profitability, SISL revenue and exports)		
Output 8.1.1	4 market ready technology packages in Year 3 for SISL to seek adopters		
		CommAg date	Achieved / forecast
Milestone	SISL incorporated as a bare trustee company	Jun 04	✓
Milestone	An IP due diligence and invention disclosure protocol established as part of the Project Management System	August 03	✓
Milestone	IP Management Manual prepared for all CRC-SI staff (drafts worked through and workshopped to maximise learning during Year 1)	: July 2004	✓
Milestone	Commercialisation Plan approved by Governing Board and Commonwealth CRC Program	Mar 04	✓
Milestone	Industry and Commercialisation Advisory Committee established	Dec 03	✓
Milestone	Demonstrator projects underway: 1 – Emergency Management 2 – Location Device 3 – To be determined	Dec 03 Dec 04 Jun 05	✓ ✓ March 06
Outcome 8.2	Increased level of technology awareness in wider industry		
Output 8.2.1	Industry/professional development program established & recognised by Jun 05		
Milestone	R&E Advisory Committee established and functional	Jun 04	✓
Milestone	Education Program established with Masters and PhDs enrolled and with influence on undergraduate courses	Jun 05	✓
Milestone	Recognition of driving the Action Agenda forward	Jun 05 - ongoing	✓

7 Research

7.1 Research Planning and Activities - Portfolio Overview

The CRCSI considers research to include the innovative use and application of emerging technologies as well as the development of new technologies. The CRCSI undertakes world class research that will lead to new applications of spatial information and enabling technologies that can be used to generate new wealth for its participants.

The Vision of the CRC will be realised when spatial information is made useful and available to all – at any time and in any place. Implicit in this vision is that the needs of SI users will be met through the development of the necessary supporting products and services. These will provide accessibility and knowledgeable use of SI within a favourable environment of regulatory policies and institutional frameworks. An enhancement of industry and user capabilities is essential if the broad spectrum of SI needs within society is to be satisfied. New developments in the acquisition, analysis, synthesis and delivery of SI are being continually called for. This in turn requires active research and development in the science and technologies of positioning, modelling and data processing, integration and archiving, and dissemination and visualisation of SI.

In formulating its projects the CRCSI focuses on the needs of the user of SI, and is responsive to the future needs of the Australian SI industry. This demands early stage planning for user adoption and utilisation of research outcomes, along with commercialisation of technological innovations for the benefit of CRCSI participants, the SI industry and Australia as a whole.

The activities of the CRCSI will be strongly user driven it will invest between 60 and 80 percent of its research budget in projects that promise strong commercial outcomes for the shareholders of the CRCSI. The remaining 20 to 40 percent of the research budget will devoted to commercial research projects or projects in the national benefit whose outcomes will be put in the public domain for the industry as a whole to use. All projects will take into consideration the need to generate balanced environmental, social and economic outcomes.

CRCSI Strategic Plan

Research Contracts and Consultancies				
Researcher / Participant	Title	Source	Period	Amount
P Woodgate	NSW Statewide Native Vegetation Condition Reporting	Dept of Infrastructure, Planning & Nat Resources, NSW	Year	24,000
Description	NSW Statewide Native Vegetation Condition Reporting - in conjunction with RMIT and Australian Greenhouse Office. Developed a framework to monitor the health and condition of Native Vegetation in NSW. Published in a report to NSW Dept of Infrastructure, Planning & Natural Resources.			
P Woodgate	Review of Specification and Testing Protocols	AustRoads	Year	15,000
Description	Review of Specification and Testing Protocols (GPS perspective) - in conjunction with RMIT and Geomatic Technologies. Conducted a review of specification and testing protocols for a system that will be implemented to monitor heavy vehicles to ensure they comply with their agreed operating conditions.			



Project Synopses

1.1: Enhancing Australia's Core Geodetic Infrastructure

Project 1.1 will enhance national and regional infrastructure of GPS receiver networks which support the operation of the entire Australian spatial information industry. The project aims to target problems that presently exist in GPS network site installation and data quality, concentrating on signal interference and site multipath. The project outcomes will deliver standards and protocols for creating seamless Continuous Operating Network (CORS) national geodetic infrastructure, and algorithms, software and devices that can be installed within GPS hardware to mitigate effects that impact on data quality.



1.2: Quality Control Issues in Real Time Positioning

Project 1.2 will develop a real-time quality control system (RT-QC) for the independent and robust determination of the quality of GPS positioning. Users of real-time mobile positioning systems require not only a knowledge of position, but also need a definitive statement as to the quality of that position. The developed quality strategies will alert users when positioning quality deteriorates, thereby informing decisions which may be position-critical.

1.3: Integrated Positioning and Geo-referencing Platform

This project aims to design, develop and test a generic hardware and software platform for positioning and geo-referencing applications. Based on an appropriate microprocessor /Field Programmable Gate Array, the new platform will offer the flexibility to integrate the latest MEMS-INS and GPS receiver hardware. A suite of software for controlling multiple data acquisitions as well as data processing/fusion will be developed to support positioning and mapping operations.





2.1: Automated Mapping and Feature Extraction from Space, Aerial and Terrestrial Imagery Project 2.1 aims to develop new and improved techniques and tools for geospatial information extraction from digital aerial and high-resolution satellite imagery. Research will be undertaken in the areas of sensor calibration and orientation modelling, 3D surface analysis, and image matching and registration. The techniques and software tools developed will enhance image-based change detection and automated updating of spatial databases.

2.2: Modelling, Analysis & Systems Development for Integrated Imaging & Positioning Sensors

This project aims to develop new algorithms that will enhance the productivity of airborne and terrestrial laser scanning systems. The research will focus on a feature-based, in-flight calibration technique for aerial scanners and automated extraction of man-made features from terrestrial laser scanner point clouds. The resulting software developments will help to improve aerial mapping accuracy and alleviate a significant processing bottleneck in feature extraction.



3.1: Virtual Australia Concepts and Principles

Aims to review selected state and national spatial data and SDI initiatives to identify their potential and limitations to assist in the development of an enabling platform to link public and private industries, facilitating the sharing of spatial data and services. From this a preliminary set of concepts, functions and principles will be identified to facilitate the development of Virtual Australia. The outcomes will provide a foundation for developing best practice and key performance indicators to aid in implementing the CRC's vision.

3.2: Intelligent Geocoding Project 3.2 aims to develop intelligent geocoding methodologies and models. Research will be undertaken in the areas of geocoding technologies, knowledge bases and learning agents. The techniques and software tools developed will enhance the geocoding processes required by many spatial applications. It will work closely with Australia's G-NAF (Geocoded National Address File) which links each street address in Australia with its geographic location.



3.3: Access to Spatial Data Project 3.3 aims to model access to spatial data for Web and mobile services according to user needs. The project has two objectives: to enable geographic referencing and reasoning from common language and induced contexts, and to evaluate and select data sets according to a given context. The project will improve the accessibility and hence the use of existing spatial data repositories. It is looking closely at what information mobile users actually need and the form in which they need it.

4.1: Automatic near real-time thematic mapping based on MODIS

Project 4.1 will investigate the derivation of thematic maps from MODIS imagery in a timely, automated, manner. The measurement of water vapour, ozone, and the aerosol content of the continental Australian atmosphere from MODIS imagery, will provide the parameters required to atmospherically correct imagery being acquired from other multi-spectral sensors with a similar overpass time to that of MODIS sensors. It will also look at mechanisms to help better correct for solar elevation and consequential terrain shadow. It is envisaged that this work will lead to increased value of remote sensing information for precision agriculture, environmental assessment, crop forecasting, automatic land cover change detection and assessing fuel load for wild fire management.



4.2: Digital elevation model generation and differential interferometric synthetic aperture radar (InSAR)

Project 4.2 aims to develop new and improved interferometric synthetic aperture radar (InSAR) techniques and tools for digital elevation model (DEM) generation and subtle ground movement detection from airborne and space-borne imagery. Research will be undertaken in the areas of InSAR for DEM generation, differential InSAR for sub-centimeter and permanent scatterer InSAR for mm-level ground displacement monitoring. The techniques and software tools developed will enhance image-based ground surface change detection (such as building movements and landslips) and DEM creation as spatial infrastructure.

4.3: Near real time crop and pasture package: integrated remote sensing technologies for improved farm management

Project 4.3 aims to develop an operational cost-effective farm package of information products extracted from satellite imagery. Research will be undertaken for pastures and crops in the areas of crop yield forecast, biomass and pasture quality prediction. The information products will allow producers to make better tactical and strategic decisions at paddock and farm level with products delivered over the web in near real time.



4.4: Development of imaging spectrometry products for characterising, mapping, monitoring and managing environmental stress

The project will develop methods and tools for mapping soils and vegetation using hyperspectral imagery. This will require the determination of the spectral properties of soils and vegetation under differing temporal, seasonal and illumination conditions. Software add-ons will be developed that will allow non-expert users to routinely use these methods.

5.1: Support Tools for Spatial Data Mining

The Project aims to integrate content-based image retrieval into satellite imagery search capability. The research will concentrate on the development of new models and algorithms for content-based image retrieval. The technology and algorithms developed, which will be incorporated into different tool sets, will enhance current spatial image search ability.



5.2: visualisation with SDI for collaborative decision making Project

5.2 will automate the creation of three-dimensional environmental models from on-line spatial data for both scientific and community use. The models, which can be visualised and explored using standard software, will also be combined with scientific process models of surface and sub-surface events to enhance understanding of land management decisions.



5.3: Communicating spatial data quality

Project 5.3 aims to improve techniques for communicating the quality of spatial data to users with different skill levels. Research will be undertaken in the areas of modelling variation in data quality, communicating new techniques for representing quality information, and understanding the quality of end products derived from environmental modelling processes. The methods and tools developed will permit data users to make more informed choices about the quality of the data needed for their tasks.



Demonstrator Program

The program brings together key groups in a cooperative relationship to complete demonstrator projects in a short period (about 18 months), typically using existing information and technologies in innovative ways to reveal new areas of research in support of the SI industry and to show the power of SI to existing or new users. This encourages adoption, and improves awareness, of SI applications.

6.1: Regional On-line Spatial Information Emergency Management System demonstrates how on-demand Spatial Information can be delivered to Emergency Management users via the web. The project has built prototypes for several scenarios developed in partnership with subject matter experts from the user community. The scenarios covered are: bushfire management, emergency notification, on-shore incidents and off-shore incidents.



6.2: The Location Positioning Device LPOD

will use a number of positioning technologies to build a portable positioning unit (LPOD) that will provide useable and consistent positioning. The five positioning technologies of GPS, INS, digital imagery, map referencing and mobile telephone Cell ID will be integrated into a system to provide a low cost prototype LPOD suitable for supporting new location-based services. Design of the first LPOD is underway and currently a bum-bag type configuration will be deployed with Bluetooth connectivity to an IMATE GPRS enabled phone.



7.2 Research Collaboration

Research collaboration is strong within the CRC SI as indicated by the number of participants in each project and the number of cross sectoral project teams. Indeed it is a project selection criterion that representation on projects must come from each of the private, public and academic sectors.

Project		43pl (Number of companies involved)	Geoscience Australia	Vic - Dept of Sustainability & Environment	NSW - Dept Lands	WA - Dept of Agriculture	WA - Dept of Land Information	Univ. of Melbourne	Univ. of New South Wales	Curtin Univ. of Technology	Charles Sturt University
1.1	Enhancing Australia's Core Geodetic Infrastructure	2	✓	✓	✓		✓		✓	✓	
1.2	Quality Control Issues for Real-Time Positioning	5		✓	✓		✓	✓	✓		
1.3	Integrated Positioning & Geo-referencing Platform	3			✓				✓		
2.1	Automated Mapping & Feature Extraction from Space, Aerial & Terrestrial Imagery	3	✓	✓	✓			✓	✓	✓	
2.2	Fundamental Modelling, Analysis and Systems Development for Integrated Imaging and Positioning Sensors	6						✓	✓	✓	
3.1	Design concepts for Virtual Australia		✓	✓	✓	✓	✓	✓			
3.2	Data integration, modeling and standards	5				✓	✓			✓	
3.3	Access to Spatial Data	3		✓				✓			
4.1	Near real-time remote sensing products from MODIS based on NADIR surface reflectance and bio-physical models	1	✓				✓		✓	✓	
4.2	Multi-sensor, multi-scale image and terrain system for environmental and natural resource analysis	2	✓						✓		
4.3	Agriculture, land cover classification, natural resource monitoring and assessment	2				✓	✓	✓		✓	
4.4	Imaging spectrometry (hyperspectral imagery) products for characterising, mapping, monitoring and managing environmental stress	2	✓					✓	✓		
5.1	Support Tools for Spatial Data Mining and Agent-Based Modelling	2			✓						✓
5.2	Visualisation with SDI for collaborative decision making	1	✓					✓			
5.3	Communicating Spatial Data Quality	1	✓	✓		✓		✓		✓	
6.1	Emergency Management Demonstrator System	2	✓	✓	✓		✓			✓	
6.2	Location Positioning Device	2		✓	✓				✓		

7.3 Progress against Contractual Milestones / Targets

The table below reports on the CRC's progress in relation to all the research milestones for 2004-05 – and any 'carry over' 2003-04 milestones which were met during the year.

Progress overall against milestones is satisfactory given the late start of many projects. Many projects have refined tasks within their original directions. A few projects are concluding in response to either a changing external environment or to capture new opportunities.

The following table follows Reporting Guidelines and presents the Milestones falling within the year being reported and the associated Outputs and Outcomes even when these latter fall outside the year. Any shortcomings in achievement are explained in footnotes referenced to the "Achieved / forecast" column.

Outcome 1.1	Reference Station Networks and Their Utility The development of strategies, algorithms and software for making GPS reference station networks capable of addressing an expanded range of user service demands. The ARGN (Australian Regional GPS Network) comprises 15 permanent GPS receivers across Australia and its offshore territories (including several in Antarctica) that have been operated by Geoscience Australia for almost 10 years. The data from this continent-wide network has been contributing to global and national geodesy programs, principally to scientific research into global / environmental / climate change. This data has also been used to support precise positioning in an off-line (i.e. non-real-time) mode via the web service AusPos. At the state level a GPS reference receiver network has been deployed across Victoria, and NSW has indicated its interest in deploying a similar state-wide network. This research project's outputs will be used by all GPS continuously operating reference station (CORS) networks, from the continent-wide to the regional and local scale CORS sub-networks.		
Output 1.1.1	Strategies for precise, scientific-level GPS data processing to support global / environmental / climate change studies by Geoscience Australia, as well as provision of products to other segments of the community (e.g. in support of AusPos and similar web-based services). <i>Delivery Targets:</i> Start January 2004. 24 months after commencement of project for completion to support scientific applications (Jan 2006), 36months for specialised products to support non-scientific positioning applications (Jan 2007).		
Milestone 1.1.1.1	Automated, continuous GPS data processing methodology, using data input from the ARGN and other sub-networks	Dec 2004	✓
Output 1.1.2	Real-time / near-real-time atmospheric products from Australia-wide / state-wide CORS GPS networks. By December 2004 demonstration of feasibility of atmospheric parameter estimation in off-line mode, by Dec 2006 for real-time product generation able to contribute to Output 1.3, by Dec 2007 for incorporation of outcomes into new wide-area real-time positioning service for high precision applications.		
Milestone 1.1.2.1	Atmospheric models appropriate for continent-wide or statewide application	Dec 2004	✓
Milestone 1.1.2.2	Tests of models in a variety of locations and seasons	Dec 2005	✓
Output 1.1.3	Bias modelling for sparse CORS networks to support decimetre (or higher) accuracy, real-time GPS positioning. By December 2005 for strategies and methodologies for generating real-time models of GPS measurement biases, By December 2006 for implementation into statewide CORS networks in support of real-time applications.		
Milestone 1.1.3.1	Evaluation of best candidates for bias modelling, for variety of spatial scales of CORS networks	Jun 2005	✓
Output 1.1.4	<i>Description:</i> Single-base RTK vis-à-vis network-RTK design strategies & validation. <i>Delivery Targets:</i> By June 2005 for strategies to integrate various RTK implementations (from single-base to CORS-based), by December 2006 for detailed design of GPS network elements and their implementation.		
Milestone 1.1.4.1	Characterisation of real-time kinematic (RTK) performance as a function of influencing factors such as baseline length, comms link latencies, user hardware, etc	Jun 2005	✓

Outcome 1.2	<p><i>Description:</i> Positioning Technologies for Precise Applications</p> <p>Development and implementation of a range of algorithmic innovations within GPS user equipment for carrier phase-based positioning with minimum constraints. GPS is a positioning technology that has revolutionised surveying and navigation over the last decade or so. Today, GPS forms the basis for the definition and maintenance of modern geodetic datums and the provision of geodetic infrastructure. Recent growth in consumer-based applications will ensure that GPS continues to evolve and the planned modernisation program by the U.S. will prevent the system from becoming obsolete. The EU will develop and deploy a similar system (known as Galileo) by the end of this decade. Clearly, R&D must continue in order to adapt and improve the performance of satellite-based positioning technologies, especially in regard to augmentation strategies that will enhance the capabilities, and overcome the shortcomings, of such systems. This project therefore has as its core objective the harnessing of satellite positioning expertise of the partners <i>to develop high accuracy, low-cost user equipment</i>, augmented where possible with complementary positioning systems such as pseudolites and INS (see Outcome 3), able to take advantage of CORS network infrastructure (see Outcome 1), for a range of professional applications.</p>		
Output 1.2.2	<p><i>Description:</i> Hybrid high accuracy GPS and pseudolite positioning systems.</p> <p><i>Delivery Targets:</i> December 2004 for completion of hardware studies concerned with GPS and pseudolite integration, by December 2005 for mixed data modelling, by December 2006 for incorporation of outcomes into new system (hardware/software design).</p>		
Milestone 1.2.2.1	<i>Description & Achievement date:</i> Guidelines on the use of pseudolites (hardware and signal propagation issues, etc.)	Dec 2004	<i>Change in research direction – Milestone no longer applicable</i>
Output 1.2.3	<p><i>Description:</i> High sensitivity, low-cost GPS surveying system.</p> <p><i>Delivery Targets:</i> by December 2005 receiver firmware design and test, by December 2006 for evaluation of receiver hardware & software operation vis-à-vis standard GPS receivers.</p>		
Milestone 1.2.3.1	<i>Description & Achievement date:</i> Low signal power (high sensitivity), carrier phase tracking firmware	Jun 2005	<i>Delayed – now due Dec 2005</i>
Output 1.2.4	<p><i>Description:</i> Web-based GPS positioning services.</p> <p><i>Delivery Targets:</i> June 2005 for upgrade of AusPos web service, by December 2006 for implementation of similar web service on state-wide / local CORS sub-networks.</p>		
Milestone 1.2.4.1	<i>Description & Achievement date:</i> AusPos upgrade to handle GPS data files from standard survey practice (e.g. single-frequency, short observation spans)	Jun 2005	<i>Delayed – now due Dec 2006</i>
Outcome 1.3	<p>Mobile and Automated Mapping Systems.</p> <p>Develop an integrated positioning/attitude determination system using the latest MEMS-INS sensor and GPS receiver hardware, and state-of-the-art software. Multi-sensor position and attitude determination systems, coupled with imaging sensors, are already being used from vehicle and airborne platforms. This project will develop a new generation of such systems that are more mobile, more compact, lower cost and more automated. This is exemplified by the objective to develop a miniature digital image-based system using the latest developments in mobile computing and sensor technology as a Demonstrator project.</p>		
Output 1.3.1	<p><i>Description:</i> Test and evaluate appropriate MEMS-INS sensor technologies.</p> <p><i>Delivery Targets:</i> by December 2004 for design of test strategy for MEMS sensors, by December 2005 for completion of studies and the selection of the most appropriate sensor hardware for integrated systems.</p>		
Milestone 1.3.1.1	<i>Description & Achievement date:</i> Test strategy for MEMS-INS sensor technologies	Dec 2004	✓
Output 1.3.2	<p><i>Description:</i> An integrated GPS+INS development platform.</p> <p><i>Delivery Targets:</i> by December 2004 for development of microprocessor-based platform that can integrate INS and GPS sensor technologies, by December 2005 for synchronisation of all sensor inputs (ready for data processing).</p>		
Milestone 1.3.2.1	<i>Description & Achievement date:</i> Microprocessor-based platform	Dec 2004	✓
Output 1.3.3	<p>Integrated software systems for real-time GPS+INS positioning and attitude determination... critical review of integrated sensor navigation algorithm options</p>		
		Dec 2004	✓

Milestone 1.3.3.1	Critical review of optimal estimation filters for GPS+INS integration	Dec 2004	✓
Output 1.3.4	An integrated, low-cost, portable GPS+INS positioning and attitude determination system for automated mapping applications. <i>Delivery Targets:</i> June 2005 after commencement of project for design of physical package (including power, comms & sensor interface sub-systems), by December 2006 for full implementation of integrated positioning/attitude determination system.		
Milestone 1.3.4.1	Detailed design of hardware package (though selection of appropriate MEMS technology awaits Output 3.2)	Jun 2005	✓
Outcome 2.1	The development and implementation of advanced methodologies, procedures and computational processes and systems for automated information extraction from metric imaging sensors.		
Output 2.1.1	Development of improved models and techniques for sensor calibration and object feature positioning from digital imagery (space borne, airborne and terrestrial) and laser scanning (airborne and terrestrial). <i>Delivery Targets:</i> New models, software systems and procedures for sensor calibration, July 2005		
Milestone 2.1.1.1	Review development options for automated sensor calibration and carry out design phase for new models and processes for digital imaging sensors,	Jul 2004	✓
Milestone 2.1.1.2	Sensor calibration developments for airborne LIDAR systems and terrestrial laser scanners,	Dec 2004	✓
Output 2.1.2	New techniques and computational tools for automated object feature reconstruction and modelling from imagery and laser scanning. <i>Delivery Targets:</i> New software systems and tools for technology transfer to industry, December 2006		
Milestone 2.1.2.1	Develop new image matching formulations and techniques for multi-image geometry and stereo high-resolution satellite imagery,	Jul 2005	✓
Outcome 2.2	Advanced modelling, analysis and systems development tools to provide new capabilities and wider applications of integrated imaging, ranging and positioning technologies for spatial information product generation.		
Output 2.2.1	<i>Description:</i> New models and computational systems to support both data fusion and enhanced capabilities associated with the integration of multi-source data, with focus upon imaging and laser scanning systems. <i>Delivery Targets:</i> New algorithms and software for enhanced capability of imaging and ranging systems, July 2005		
Milestone 2.2.1.1	<i>Description & Achievement date:</i> Development of geometric and radiometric processing algorithms to extend the capability of laser scanners as imaging systems,	Jul 2004	✓
Milestone 2.2.1.2	<i>Description & Achievement date:</i> Fusion models for terrestrial imaging and laser scanning systems,	Dec 2004	<i>Delayed - Dec 2005</i>
Milestone 2.2.1.3	<i>Description & Achievement date:</i> Experimental validation of enhanced imaging and laser scanning systems for spatial and spectral applications,	Jul 2005	<i>Delayed - Jul 2006</i>
Outcome 3.1	Design Concepts for Virtual Australia The Outcome from Project 3.1 will draw on the research and results of other programs and projects in the CRCSI to ensure that Australian SDIs support the Virtual Australia concept. The project will investigate <ul style="list-style-type: none"> • user needs analysis and market identification at local, state, national and regional levels for spatial data • the legal, regulatory and institutional issues and limitations concerned with the use, access and delivery of spatial data • benchmarking and comparative analysis of the SDI hierarchy, and • strategic SDI design for Virtual Australia. Project 3.1 - This project will enable government and industry to develop a strategic design for Virtual Australia based on spatial data infrastructure principles. [Note – at the Governing Board's request this project was approached as a one year exercise to scope further work.]		
Output 3.1.1	<i>Description:</i> User needs analysis and market identification at local, state, national and regional levels for spatial data <i>Delivery Target:</i> 2006		

Milestone 3.1.1.1	Description & Achievement date: Development of user needs and market identification strategy, questionnaires and process	2004	✓
Output 3.1.2	<i>Description: The legal, regulatory and institutional issues and limitations concerned with the use, access and delivery of spatial data</i> <i>Delivery Target: 2006</i>		
Milestone 3.1.2.1	Description & Achievement date: Review current legal, regulatory and institutional issues and limitations concerned with the use, access and delivery of spatial data	2005	✓
Outcome 3.2	Data integration, modeling and standards framework to support the seamless compilation of spatial datasets for the <i>Virtual Australia</i> concept		
Output 3.2.1	Development of data integration models for geocoding and interoperability <i>Delivery Targets: New data integration framework, models and procedures, December 2006</i>		
Milestone 3.2.1.1	Review spatial data integration issues and evaluate alternatives and solutions,	Dec 2004, ongoing	✓
Outcome 3.3	The outcome from Project 3.3 (Access to spatial data) will be the investigation of the scientific and technical aspects of access to and delivery of spatial data by a range of communication technologies and issues concerned with spatial data discovery in support of the Virtual Australia concept. The project will investigate: <ul style="list-style-type: none"> distributed www and WAP services modeling including the development of clearer links between SIS design and tools for SI access improved spatial data/information discovery using existing search engines the next generation of search engine tools to strengthen the spatial dimension in www searches delivery of location based services to multiple mobile devices 		
Output 3.3.1	Distributed www and WAP services modeling including the development of clearer links between SIS design and tools for SI access <i>Delivery Target: 2006</i>		
Milestone 3.3.1.1	Description & Achievement date: Review current developments in distributed www and WAP services modeling	2004	<i>Project moved beyond this technology</i>
Output 3.3.2	Description: Improved spatial data/information discovery using existing search engines <i>Delivery Target: 2006</i>		
Milestone 3.3.2.1	Description & Achievement date: Review current search engine design and identify limitations from a spatial perspective	2005	<i>Work now undertaken in separate project</i>
Outcome 4.1	Near real-time satellite image processing and distribution of MODIS data. The objective is to develop and implement algorithms and software necessary to systematically acquire, process and calibrate Direct Broadcast (DB) Moderate Resolution Imaging Sensor (MODIS) data in order to generate standardized Level 2 products of selected Australian land parameters and conditions, including fire detection, burn area mapping, flooding extent and vegetation change associated with land clearing and agricultural cropping. MODIS is a sensor carried on board NASA Terra and Aqua satellites with a DB facility capable of being received in Alice Springs, Hobart, Perth and Adelaide. However, algorithms for automating near real-time atmospheric corrections and the BRDF normalization for wide field of view sensor geometry need to be validated within the Australian context before calibrated Level 2 products involving measures of reflectance and temperature can be derived.		
Output 4.1.1	Development, validation and implementation of algorithms for atmospheric correction, BRDF normalization and aerosol optical depth determination from DB MODIS data acquired over the Australian continent. <i>Delivery Targets: 24 months from commencement of project to calibration and validation of algorithms suitable for Australian conditions.</i>		
Milestone 4.1.1.1	Implementation and testing of interim algorithms for atmospheric corrections and BRDF normalization,	Jan 2005	✓
Milestone 4.1.1.2	Research of an operational method for aerosol optical depth determination from MODIS spectral data,	Jul 2005	✓
	Multi-sensor, multi-scale image and terrain systems for environmental and natural resource analysis.		

Outcome 4.2	<p>The new generation of high resolution microwave and optical remote sensing systems provide enhanced capabilities for the geophysical and geochemical detection and discrimination of earth surface materials. Multi-polarimetric and interferometric (InSar) radar provide three dimensional reconstructions with the capacity to generate precise digital elevation models (DEM) of the earth's surface and detect ground surface deformations and displacements. Optical wavelength beam splitting techniques generate multi-channel (Hyperspectral) image data that can be used for feature characterisation.</p> <p>The objectives of this research are to test, validate and implement multi-sensor image processing techniques for deriving high resolution topographic baseline datasets with the capability of measuring sub-centimeter ground deformations and displacements and to produce hyperspectral based value added products for the mapping and monitoring of soil degradation and salinity.</p>		
Output 4.2.1	<p>Establish reliable methods of elevation model generation and levels of accuracy associated with DEM's generated from ERS, Radarsat, Envisat and SRTM datasets.</p> <p><i>Delivery Targets:</i> Jul 2005</p>		
Milestone 4.2.1.1	Description & Achievement date: Evaluate interferometric SAR DEM generation using sensor systems outlined in 2.1	Jan 2005	✓
Outcome 4.3	<p><i>Description:</i> Agriculture, land cover classification, natural resource monitoring and assessment.</p> <p>This project aims to develop operational procedures that allow the routine mapping and monitoring of agricultural resources so that timely assessments of status and condition can be derived to enable informed management decisions to be made at the farm and paddock level of operation. Such procedures will build towards the development of operational systems to track progress towards the goal of delivering economically and environmentally responsible agricultural systems. The primary objective is to develop methods for linking crop and pasture performance to land condition. This involves evaluating the potential of new space-borne sensor data (eg., MODIS, ASTER, Landsat ETM, SPOT-Vegetation and Ikonos) for providing accurate and reliable quantitative biomass information for temperate and Mediterranean pasture systems and cropping environments.</p>		
Output 4.3.1	<p>Evaluate new space-borne sensor data and devise methods and procedures for the detection and mapping of crop/pasture rotations that match current land practices. <i>Delivery Targets:</i> Technology assessment and methods for improved land utilization at farm level, 24 months from commencement of project.</p>		
Milestone 4.3.1.1	Review models of land utilization applicable for decision making at farm level,	Jul 2005	✓
Outcome 5.1	<p>To create user-oriented toolkits for modelling spatially explicit complex systems. This will allow users to build spatially explicit models of processes or activities using the generic toolkits using data derived from the SDI.</p>		
Output 5.1.1	<p>a hybrid 2 and 3D cellular automata spatial modeling and intelligent mobile agent system with a web-based (Java) interface running on PCs, distributed computer networks and massively parallel architectures.</p> <p><i>Delivery Targets:</i> June 2009</p>		
Milestone 5.1.1.1	A package for creating generalised cellular automata models (CAMs) from GIS datasets with novel methods for determining effective update rules.	Dec 2004	<i>Change of project scope – n/a</i>
Outcome 5.2	<p>Establish operational procedures for SDI interface via collaborative virtual environments. The advanced visualisation techniques will improve communication of data and model outcomes and provide common access to decision support tools from diverse locations.</p>		
Output 5.2.1	<p>Create system design for development of collaborative virtual environments to support spatial decision-making. Jun 2004</p>		
Milestone 5.2.1.1	Review development options including: processes for 3D model generation from SDI data, real-time interface to 3D models, options for multiple interface points and user representation.	Mar 2004	✓
Milestone 5.2.1.2	Systems design stand-alone prototype.	Sep 2004	✓
Output 5.2.2	<p>Three dimensional model generator (automated) from GIS/SDI data, with potential for integration of other 3D data from ancillary sources : Dec 2005</p>		
Milestone 5.2.2.1	Automated procedures for working from SDI based contour to other elevation data (including IFSAR and similar) in TIN or grid based terrain models and	Mar 2005	✓

	georeferencing of available surface imagery. Ensure system can work over a wide range of requested scales and levels of detail.		
Milestone 5.2.2.2	Automated procedures for working from SDI based land cover, cadastre, utility and other infrastructure data to 3D surface based objects.	Jun 2005	✓
Output 5.2.3	Adoption and integration with above procedure of scientific visualization toolkit/software (including options for 3D geological modeling) Dec 2005		
Milestone 5.2.3.1	Definition of scientific visualization process requirements and evaluation of software options	Mar 2004	✓
Milestone 5.2.3.2	Development of scientific visualization tool box in common environment with development under 2.2.	Mar 2005	✓
Outcome 5.3	To provide procedures and tools for communicating information uncertainty which improve the way users evaluate the suitability of spatial datasets for inclusion in their decision-making processes.		
Output 5.3.1	Technical specifications proposed for the development environment Jun 2004		
Milestone 5.3.1.1	Identify case study data (e.g. online metadata of Geoscience Australia's corporate spatial library – or of another CRC partner)	Jun 2004	✓
Output 5.3.2	Visualisation framework (assigning the visualisations to the case study data) Jun 2004		
Milestone 5.3.2.1	Identify visualisation tasks suited to the case study datasets.	Jun 2004	✓
Output 5.3.3	Working prototype of simple online uncertainty visualisations. Sep 2005		
Milestone 5.3.3.1	Conduct questionnaire of users of the case study data to determine the types of tasks or processes users perform when evaluating the case study datasets online.	Sep 2004	<i>Delayed - Sep 2005</i>
Milestone 5.3.3.2	Design and develop an online uncertainty viewing tool.	Mar 2005	<i>Delayed Mar 2006</i>
Milestone 5.3.3.3	Identify the limitations in current data and metadata online structures that inhibit uncertainty visualisations.	Jun 2005	✓

8 Education and Training

The Education Program provides educational and training opportunities to people who are, or may become, employed by industries using SI. It also provides a framework of support for the research students involved in CRCSI activities.

The CRCSI will

- educate existing and emerging scientists and engineers about the advantages of SI applications
- increase awareness and promote an understanding of the many SI applications
- ensure meaningful relationships with other relevant stakeholders

As principles of operation, we will look internationally for inputs to these activities and to our customers; we will look to those areas where we can make a difference as a CRC; and we will embrace current technologies and delivery methods of educational outcomes appropriate to the customers' needs and situations.



The CRCSI established an Education Reference Group under the Chair of Sue Moffat (CSU). Members are Clive Fraser (Chair, CRCSI Research & Education Advisory Committee); Mike Ridout (CRCSI Education Program Coordinator); Mike Stewart (Higher education leader, CUT) and Geoff Taylor (Short courses leader, UNSW). This operational Group meets as required to drive forward the various education initiatives.

Great progress was made during the year. A significant initiative was the first industry wide **national survey of industry training needs**. All ASIBA and SSI members received the survey. Results have informed all CRCSI education activities and will be widely distributed to relevant groups such as ASIBA and SSI and ANZLIC. The survey will be repeated regularly to continually inform the CRCSI short course program and future investments.

The **Postgraduate Courses** program led by Mike Stewart got underway with two on-line Masters units being developed, with a strong

national approach, one at Curtin and one at UNSW.

The **Short Courses** program led by Geoff Taylor has established a base at UNSW, and is looking to present courses across Australia in particular to satisfy the needs expressed in the survey and to roll out learning from the CRCSI projects. Links are being developed with NICTA and other training providers so as to supply them when appropriate with CRCSI expertise.



The **inaugural CRCSI conference** was held in Melbourne, with very good feedback from the two days' events. It was combined with the official launch of the CRC. Feedback sheets have shaped the 2005 event which will incorporate an international conference. The 2004 conference outcomes included a report to the board on research initiatives; significant networking and new research and business opportunities across the board. As one director of the Board said "this is a real landmark for our CRC."

More full and top-up **CRCSI Scholarships** were awarded, bringing the quota to 19 PhD, 5 Masters and 1 Honours. Participants are encouraged to bring their own staff into higher degrees by coursework research. This saw one enrolment from government and two from industry (43pl). Honours scholarships and summer schools, amongst other activities, are being trialled, with two honours students during the year. In addition a "placement scheme" has been developed for trial next year in response to industry demand.



The **support framework** for CRCSI scholars is being continually developed. As well as the industry placements (for mutual benefit), supportive training to prepare students for employment has commenced with a number of students having courses on commercialisation and on communications. Associate supervisors from the user community are being strongly encouraged for

students. The CRCSI will support attendance by students at its 2005 conference, which will be adjacent the Spatial Sciences Institute 2005 Conference. Informal meetings have been held with students in the three major geographic locations, and the conference will have a 'students only' day of various activities.

8.1 Progress against Contractual Milestones / Targets

Description of all milestones	CommAg date	Achievement date / forecast	
CommAg Outcome 7.1 Enhanced human resource pool for industry and the community			
Output 7.1.1 <i>Description:</i> constant stream of well-trained researchers (Masters and PhD level), with an industry focus. <i>Delivery Targets:</i> MSc within Year 3, PhDs within Year 4 onwards June 2004 – ongoing			
Milestone 7.1.1.1 Establish MSc and PhD and other Post Grad courses across Australia, & strive for full web delivery. These will be applicable to some undergraduate courses as well.		2004 – and work ongoing on new and online units	✓
Milestone 7.1.1.2 Establish scholarship scheme –full; top-up; honours; etc	Nov 03	Full and top-up PhD, Masters in place. Honours in trial. Work Placement & Vacation Awards for trial next year.	✓
Milestone 7.1.1.3 Establish industry partner programs and input to student work as appropriate	June 2004	Assoc Supervisors encouraged (but not mandatory). Work placement scheme will also tackle this next year.	✓
Output 7.1.2 <i>Description:</i> provide, in conjunction with industry partners and primarily members of the SME consortium, customised intensive technology training courses focused at the operational level <i>Delivery Targets:</i> 3 courses in 2004, doubling each year thereafter June 2004			
Milestone 7.1.2.1 Establish mechanism for facilitating short courses and public fora under the CRCSI banner		Achieved early 2005	✓
Milestone 7.1.2.2 Institute Visiting Research Fellow Scheme to attract international experts to the CRCSI for say 3 month periods	Sep 2004	Achieved late July 2004 but within CEO Discretionary Fund with broader mandate to support international links and person exchange.	✓
Outcome 7.2 Industry wide appreciation of the role that SI (and hence the CRC-SI) plays, as a platform technology for use in varied applications			
Output 7.2.1 National recognition as the place to go for Spatial Information issues Milestone <i>At least one</i>			
Milestone 7.2.1.1 Convene international conference in Australia		Inaugural international event to be held in Sep 2005	✓
Milestone 7.2.1.2 Recognition by relevant stakeholders as a prime driver in achieving the Action Agenda objectives	Ongoing	Evidence: • Training needs analysis • Industry workshops to be convened 05-06	✓

CRCSI inaugural Annual Conference

The 2004 CRCSI Conference brought together researchers, collaborators, shareholders, other sponsors and related stakeholders to critically evaluate progress and make plans for future investments.

The inaugural conference was held in Melbourne in November 2004 following the official launch of the CRC. Both events were very successful. 160 attended the launch, and 110 the conference - about third each from academia, government and 43pl.



Mr Gary Nairn, Parliamentary Secretary to the Prime Minister and representing The Hon. Minister Brendan Nelson, officially launched the CRC to the select audience, described as "a real who's who of the industry."



During the Conference each Project Leader spoke for 15 minutes followed by 15 minutes of robust discussion. Many organisations displayed corporate banners

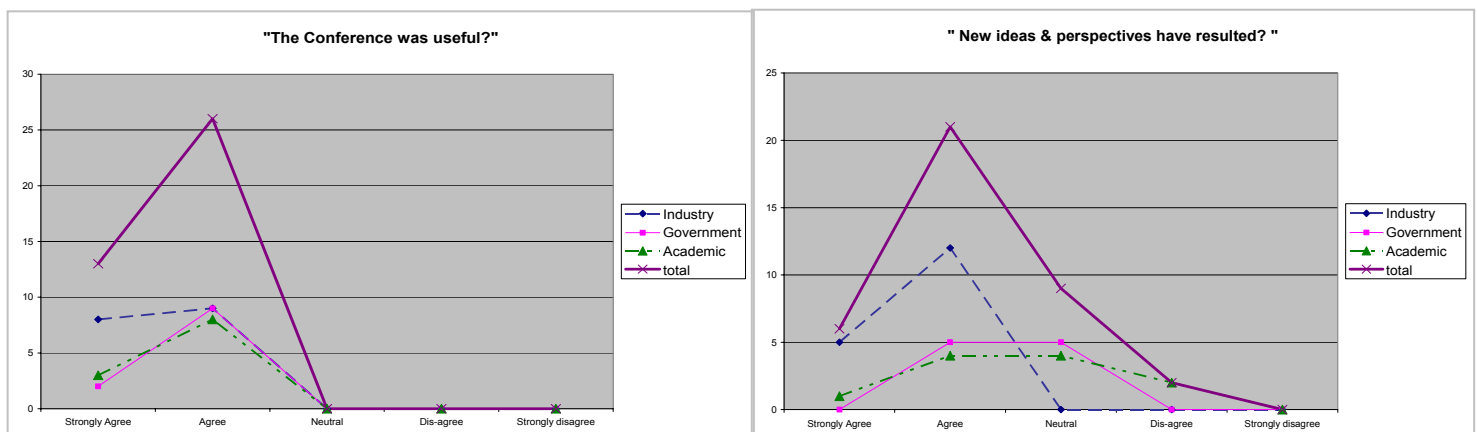
and promotional materials, and every project a poster.



Evaluation form responses were very positive about the networking opportunities and the ability to get a grasp first hand of all of the activities across the CRC.

Nine of the 43pl member companies reported that they would pursue engagement in new projects and or CRC activities in which they were not previously engaged.

A report was prepared from the conference presentations and debates. This went to the Governing Board and the recommendations considered before wider release.



9 Collaboration

CRCSI has many participants across Australia. There is also a great diversity in organisation type and size. Respective organisational cultures differ, and are a potential source of friction and misunderstanding, amongst various government agency structures; small service companies and manufacturers; R&D based enterprises and universities. Fostering a CRCSI culture is important to the Governing Board and management. CRCSI is above all a collaborative enterprise and this is practised in various ways, as described in the following sections.

Internal

The CRCSI has achieved great progress in developing collaborative linkages within the CRC. The CRCSI is vertically integrated in that leading edge customers are engaged with technology and service providers. In addition many of the customers are also suppliers of the data and infrastructure used by the market in devising new products.

Cooperation amongst geographically spread activities and entities is being assisted through regular telephone and other conferences, efficient email exchange, and coordination of physical meetings by the Board and the executive to allow some time for local site visits and personal interaction. In addition, the substantial level of activity and participants in WA has been recognised and a senior management position appointed in Perth. The website has become increasingly important to connect participants with CRCSI activities and events.

A comprehensive Communications Strategy was adopted by the Board during the year which has a central role in fostering collaboration. This is further discussed at the section on Communication Strategy.

External

Cooperative arrangements with other CRCs will be actively sought: some 30 CRCs are thought to have strong interests in and applications of spatial information. Initial contact will be made with those of obvious relevance, such as the CRC for Bushfires, predictive mineral discovery CRC, CRC for Sensor Signal and Information Processing and the Australian Biosecurity CRC.

An MOU to explore joint research projects with Bushfires CRC was signed at the CRCSI booth at the CRCA conference. A workshop was held in June 05 to explore common interests with the e-Water CRC.

International

The CRCSI plan in this area is to emphasise quality of link over quantity. It is recognised that considerable resources have to be devoted by each party to make such collaborations work. Apart from the usual project and personally based links, the following international links are being explored by the CRCSI.

- GEOIDE Network based in the University of Laval in Quebec, Canada (analogous to a CRC, funded as a Canadian 'Networks of Centres of Excellence' (<http://www.geoide.ulaval.ca>) - *strategic link of CRC-wide benefit*
- Chinese University of Hong Kong – a memorandum of understanding has been signed to explore the monitoring of ground surface movement in the Chinese mining industry. - *project specific link to maximise benefit*

National

Strong Links have been established with key stakeholder groups, notably ASIBA; SSI and ANZLIC. Mechanisms include board invitations, joint board meetings, membership, committee representation, and invited presentations, shared web links, and collaborations on important initiatives such as the national CRCSI training needs analysis.

10 Specified Personnel

Title and Name	Role in CRC	Contributing Organisation	2003-04 time %
Peter Woodgate	Chief Executive Officer	CRCSI	100
Graeme Kernich	Business Manager	CRCSI	100
Michael Ridout	Communications Director	CRCSI	100
Chris Rizos	Program Manager 1	University of NSW	48
Clive Fraser	Research Director	CRCSI & University of Melbourne	88
Ian Williamson	Program Manager 3	University of Melbourne	5
Tony Milne	Program Manager 4	University of NSW	38
Ian Bishop	Program Manager 5	University of Melbourne	30
Jack de Lange	Chair, Industry Advisory & Commercialisation Committee	Australian Spatial Information Business Association & 43pl	8



11 Publications and Patents

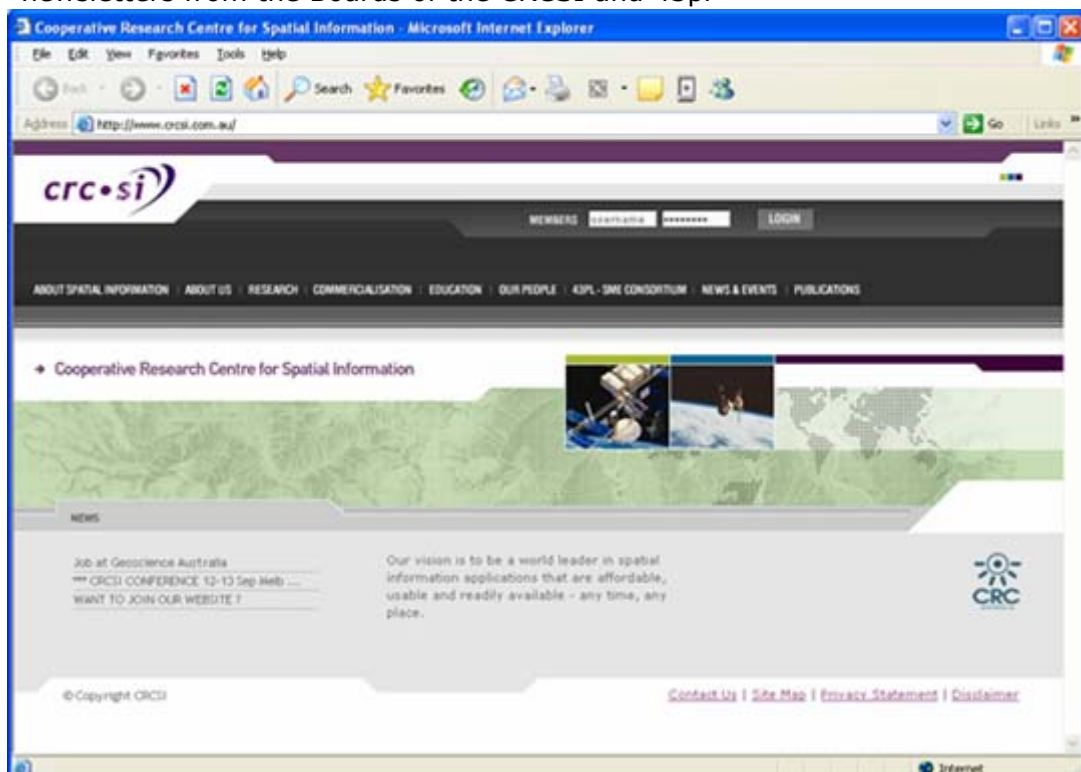
Category	Authors	Title	Bibliographic detail	Date
Book chapters	Winter, S.; Tomko, M.	Translating the Web Semantics of Georeferences	In: Taniar, D.; Wenny Rahayu, J. (Eds.), Web Semantics and Ontology, Idea Group Publishing, Hershey, Pennsylvania, USA.	Accepted 2005
	Klippel, A., Knuf, L., Hommel, B., & Freksa, C.	Perceptually Induced Distortions in Cognitive Maps	In C. Freksa, M. Knauff & B. Krieg-Brueckner (Eds.), Spatial Cognition IV. Reasoning, Action, and Interaction: International Conference Spatial Cognition 2004, Frauenchiemsee, Germany, October 11-13, 2004, Revised Selected Papers (Lecture Notes in Computer Science, Volume 3343, pp. 204-213).Berlin: Springer.(2005)..	2005
	Richter, K.-F., & Klippel, A.	A model for context-specific route directions	In C. Freksa, M. Knauff & B. Krieg-Brueckner (Eds.), Spatial Cognition IV. Reasoning, Action, and Interaction: International Conference Spatial Cognition 2004, Frauenchiemsee, Germany, October 11-13, 2004, Revised Selected Papers (Vol. Lecture Notes in Computer Science, Volume 3343, pp. 58-78). Berlin: Springer.	2005
Refereed journals	Hung Kyu Lee, Steve Hewitson, Jack Wang	Web-based resources on GPS/INS integration	GPS Solutions, Publisher: Springer-Verlag Heidelberg ISSN: 1080-5370 (Paper) 1521-1886 (Online)	5 August, 2004
	Poon, J., Fraser, C.S., Zhang, C., Zhang, L. Gruen, A.	Quality assessment of digital surface models generated from ikonos imagery	Photogrammetric Record 110 162 - 171	Published
Published conference papers	Abbas Rajabifard, Andrew Binns and Ian Williamson	Development of Virtual Australia utilising an SDI enabled platform	Published GSDI 8 and FIG Week Conference, Cairo-Egypt,	April 2005
	Abbas Rajabifard, Andrew Binns and Ian Williamson	Use of SDIs as an enabling framework in the construction and delivery of a Virtual Australia	Published GSDI 8 and FIG Week Conference, Cairo-Egypt,	April 2005
	Fuller, S., A. Kealy, P. Collier	Real-time quality assessment for CORS networks	Proceedings of GNSS 2004 Conference, Sydney, Dec 2004	Published
	Fuller, S., M. Hale, A. Kealy and P. Collier	Continuous monitoring of the GPSnet	DSE Technical Support Newsletter Issue 16, March 2005	Published
	Hutchinson, M and B Veenendaal	The Move from Geocoding to Geolocating	URISA GIS in Addressing Conference, Austin, Texas	August 2004
	Klippel, A., Dewey, D., Knauff, M., Richter, K.-F., Montello, D. R., Freksa, C.,Loeliger, E.-A.	Direction Concepts in Wayfinding Assistance	Klippel, A., Dewey, D., Knauff, M., Richter, K.-F., Montello, D. R., Freksa, C., et al. Direction Concepts in Wayfinding Assistance. In <i>Workshop on Artificial Intelligence in Mobile Systems 2004</i>	Published

			(UbiComp 2004). Pp 1-8SFB 378 memo 84	
	Klippel, A. Lee, P.U. Fabrikant, S. Montello, D.R. Bateman, J.	<i>The Cognitive Conceptual Approach as a Leitmotif for Map Design.</i>	AAAI 2005 Spring Symposium on "Reasoning with Mental and External Diagrams: Computational Modeling and Spatial Assistance", Stanford University, California, March 21-23, 2005.	March 21-23, 2005
	Klippel, A., & Montello, D. R.	On the Robustness of Mental Conceptualizations or the Scrutiny of Direction Concepts.	Klippel, A., & Montello, D. R. (submitted). On the Robustness of Mental Conceptualizations or the Scrutiny of Direction Concepts. submitted to GIScience 2004, (extended abstracts)	October 23 2004
	Klippel, A., Knuf, L., Hommel, B., & Freksa, C.	Perceptually Induced Distortions in Cognitive Maps.	Klippel, A., Knuf, L., Hommel, B., & Freksa, C. (submitted). Perceptually Induced Distortions in Cognitive Maps. submitted to <i>Spatial Cognition Conference 2004</i> .	October 23 2004
	Klippel, A., Lee, P. U., Fabrikant, S. I., Montello, D. R., & Bateman, J.	The Cognitive Conceptual Approach as a Leitmotif for Map Design	In Reasoning with Mental and External Diagrams: Computational Modeling and Spatial Assistance. Papers from the AAAI 2005 Spring Symposium. March 21-23, Stanford, California. (pp. 90-95). Menlo Park, CA: AAAI Press.	2005
	Lee, P.U.Klippel, A.	Dynamic aspects of spatial information in air traffic controller displays.	AAAI 2005 Spring Symposium on "Reasoning with Mental and External Diagrams: Computational Modeling and Spatial Assistance", Stanford University, California, March 21-23, 2005.	March 21-23, 2005
	Tenbrink, T., & Klippel, A.	Achieving reference via contrast in route descriptions and spatial object identification	Paper presented at the 21st Scandinavian Conference of Linguistics, NTNU, Trondheim, June 1-4, 2005 (abstract)	June 2005.
	Tomko, M.	Case Study - Assessing Spatial Distribution of Web Resources for Navigation Services	In: Claramunt, C.; Boujou, A.; Kwon, Y.J. (Eds.), 4th International Workshop on Web and Wireless Geographical Information Systems W2GIS 2004, Goyang, Korea, pp. 90-104.	Nov 26-27, 2004
	Poon, J., Fraser, C.S., Zhang, C., Zhang, L. Gruen, A.	Accuracy evaluation for terrain modelling from IKONOS stereo imagery	ISPRS Hannover Workshop 2005 - High- Resolution Earth Imaging for Geospatial Information	Published
	Stock, C., Bishop, I.D. and O'Connor, A.	Generating Virtual Environments by Linking Spatial Data Processing with a Gaming Engine, for Real-time Visualization and Participation	MLA 05 Proc. Trends in real time landscape visualisation and participation. Anhalt University of Applied Sci 2005 pp 324-329	2005
	Willneff, J., Poon, J. and Fraser, C.S.	Single-Image High-Resolution Satellite data for 3D information extraction	ISPRS Hannover Workshop 2005 - High- Resolution Earth Imaging for Geospatial Information	2005
	Winter, S., & Tomko, M.	Shifting the Focus in Mobile Maps	Winter, S.; Tomko, M., 2004: Shifting the Focus in Mobile Maps. In: Morita, T. (Ed.), Joint Workshop on Ubiquitous, Pervasive and Internet Mapping UPIMap2004, Tokyo.	2004
	Zhang, C., Fraser, C.	Automated image registration for change detection	ISPRS Hannover Workshop 2005 - High- Resolution Earth Imaging for Geospatial Information	2005

12 Communication Strategy

A comprehensive Communications Strategy was adopted by the Board during the year. CRCSI communication strategies include

- Annual workshops in each state to bring all participants views into strategic planning, and to encourage understanding across sectors. Specific workshops are also held with participants and with sectors
- Annual Conference of participants for wide-ranging technical discussion and personal interaction
- Annual "satisfaction survey" to maintain and understand the engagement of parties
- Regular correspondence and newsletters which include summaries of board minutes immediately following Board meetings
- Project involvement is sought and encouraged for all participants, and projects must have representatives from each area of participants – govt, corporate and academic. Project Management Groups of wide and diverse membership meet quarterly to discuss project progress and ramifications and potential applications. Dissemination of project progress reports through a closed web system allows appropriate information flows and encourage organisational interaction
- Communications Director appointed in June 2004 to drive and resource these strategies, and to nurture relationships amongst 43pl SME consortium
- Research Director with wide remit to draw players together through program and project seminars for instance
- Board representative seats – for instance two SME representatives sit on the Governing Board. Representatives on research and industry advisory committees – for instance an SME representative chairs the Industry Advisory & Commercialisation Committee, and both committees have members from each sector in the CRC
- co-location of R&D and management personnel and activities in the CRCSI offices
- reliance on a strong web platform for project and other communications. The website is averaging 6 thousand visits per month
- newsletters from the Boards of the CRCSI and 43pl



Strategies for Developing SME Links

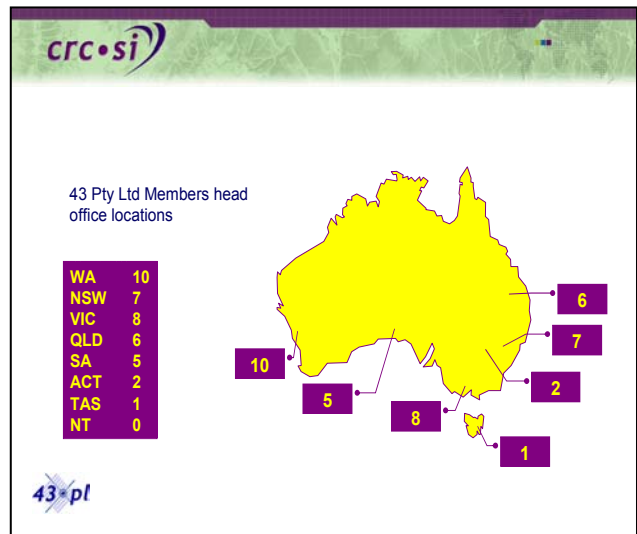
The CRCSI has a unique structure for its SME consortium: members purchase units in a unit trust through which each can participate in the CRC with appropriate flexibility. A resourced set of strategies to engage with these companies has been devised and implemented in through the Communications Director position. New members of 43pl are encouraged and 5 companies have sought to join. Two of the current members have merged.

The industry primarily consists of small firms. In surveying services, the average number of persons employed per enterprise is 4.8 (according to IBIS data); in the remote sensing area, the number is 5 (according to a PWC report). The former Consulting Surveyors Australia organization has estimated that around 70% of its member firms have 20 or fewer employees. Similarly, the PWC report found that around 90% of firms in that sector of the industry had 20 or fewer employees. A survey in 2001 by CTG Consulting included a number of larger firms in the industry but there is still very few employing over 100 staff.

The Australian SI industry has many SMEs. From the outset it was recognised that there was a need for SMEs to be integrated. ASIBA played a strong role in the formation of a unique CRC structure to achieve this. A representative company 43pl has been established as a trust manager: this company is a core participant; companies wishing to participate in the CRC buy units annually (as their cash contribution through to the CRC). A beneficial interest in the trust assets held by 43pl and hence of CRCSI joint venture is held by each in

proportion to their contribution amount each year. The structure provides limited liability and ease of entrance and exit, two important factors to the SME.

The CRCSI provides finance,

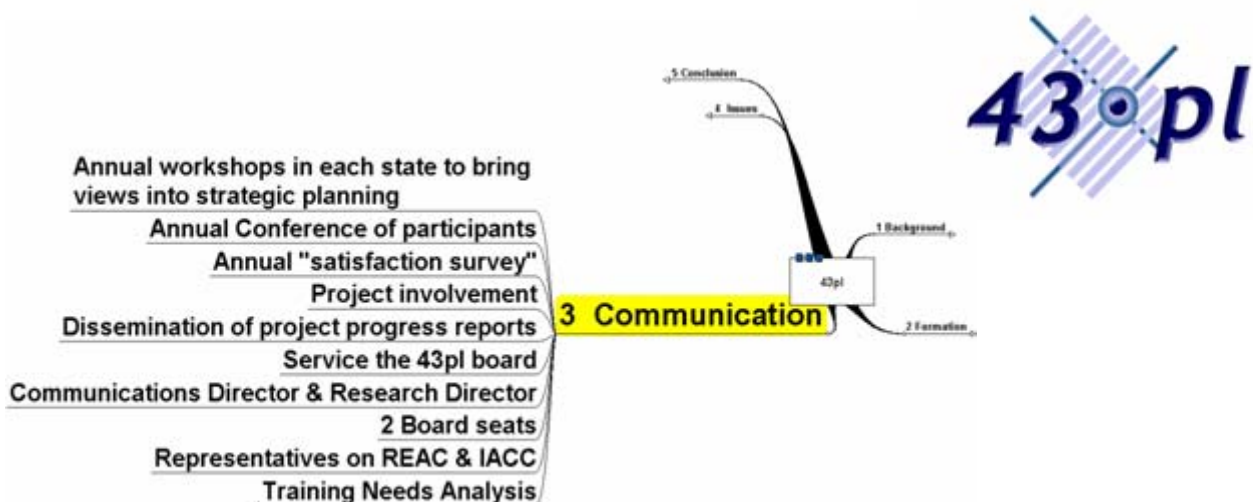


administration and communications functions to the company and its board of directors. The consortium is a major platform for the CRCSI to achieve industrial development which is a core outcome of the CRCSI and enunciated in the Strategic Plan.

The 43pl value proposition includes

- Access to R&D initiatives and IP
- Neutral ground to meet clients and suppliers
- Growing the business (technical, professional development)
- Meaningful networking into government & academia
- Market development; kudos

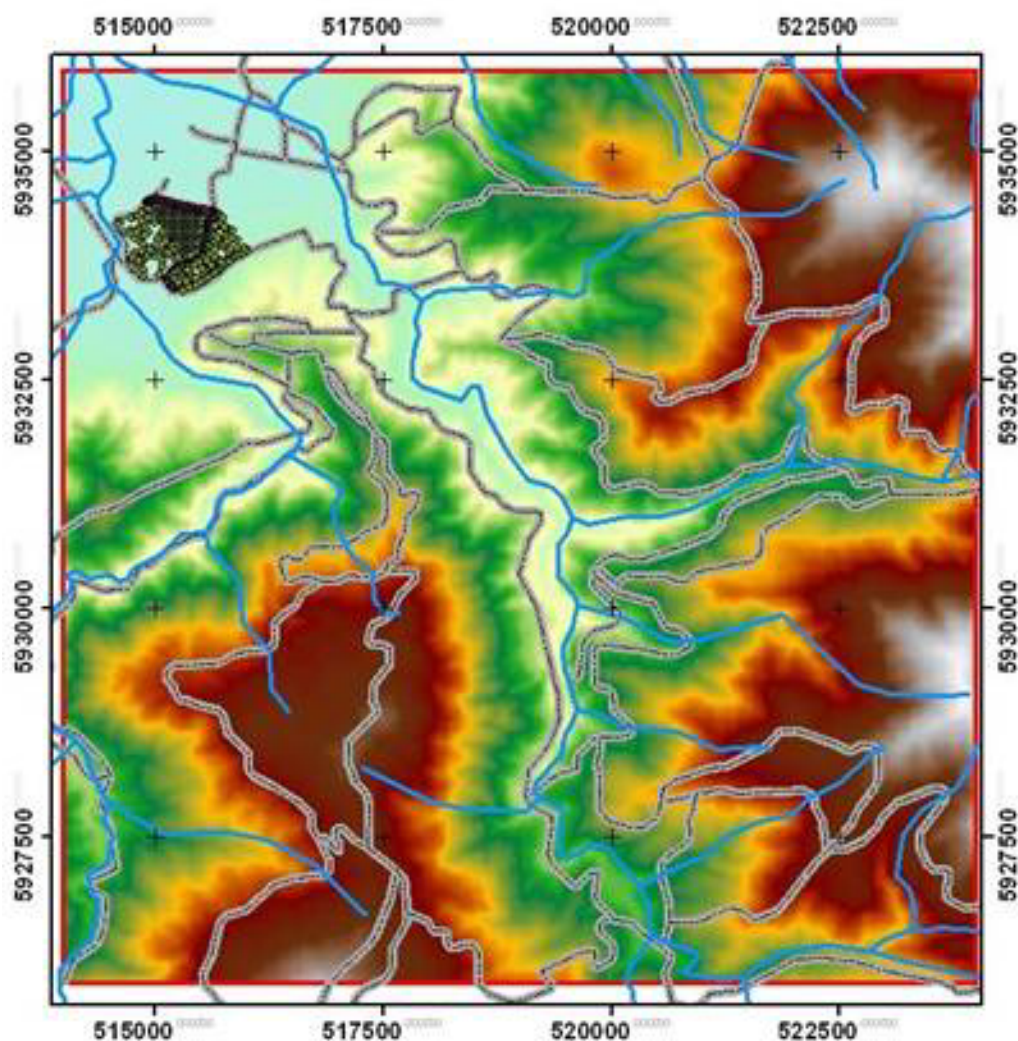
"43pl gives us an unprecedented opportunity to bring the small corporates and researchers together in a rapidly growing industry" *Mike Ridout, Communications Director*



13 Grants and Awards

Research Grants					
Researcher	Parent Orgn	Project Title	Source	Period	\$
Relationship to CRC research activities					

Awards prizes, medals, and election to Academies	
Recipient	Description
Dr Phil Collier	Faculty of Engineering, The University of Melbourne, Teaching Excellence Award 2004
Michael Hsing-Chung	IEEE Geoscience Remote Sensing Society – Student Sponsorship travel award to IGARSS2004 in Alaska, to participate in the Student Prize Competition.
Michael Hsing-Chung	First prize in the IGARSS2004 in Alaska Student Prize Competition.
Matthew Hutchinson	US Geospatial Intelligence Foundation Scholarship - This year, the Foundation granted four scholarships, all to current doctoral students who “demonstrated academic and professional excellence in the geospatial intelligence tradecraft.” Matt was the only non US winner.



14 Performance Measures

As part of its strategic planning the CRCSI produced a new set of performance indicators that covered and in some cases extended those within the Commonwealth Agreement. The First Year Review considered and approved the changes, and formal adoption of the new set of indicators has been sought.

The performance of the CRCSI will be measured by the following six indicators by 30 June 2010. A seventh will be developed specific to educational activities.

- 1 **The CRCSI participants will obtain significant tangible and intangible benefits as a result of their participation.** This will be measured annually through a comprehensive survey of stakeholders. The survey should show that 75% of respondents meet this measure in the first year, with the proportion increasing in each subsequent year. Participants can determine their own definition of 'direct and significant tangible and intangible benefit.'
- 2 **The CRCSI will generate at least \$5.3 million of new revenue in the first seven years.** This revenue will be in addition to the shareholder, supporting partner and Commonwealth funds committed in the founding contracts.
- 3 **The CRCSI will ensure that at least one stakeholder from each of the industry, government and education sectors is involved in each CRC project, with at least two of the sectors making a major contribution.** A 'major contribution' is defined as over 20% of an effective full-time person per annum.
- 4 **The average annual turnover in revenue of 43pl members will increase more than the industry average.** The industry average will be drawn from independent survey data.
- 5 **25 PhD and Masters candidates in progress or completed.**
- 6 **75% of projects will be rated as "world class" by independent review.** The independent panel will include at least one international person and 'user' experts. World class will be defined by comparison with the best known examples of similar work overseas, functionality of project outputs, quality of research papers, and number and quality of international connections and collaborations, etc.

Indicator	03-04 Actual (Target)	04-05 Actual (Target)	05-06 Actual (Target)
1 Satisfaction	No survey (Not applicable)	✓ (>75%)	(>75%)
2 Revenue	75 (50)	146 ¹ (200)	(450)
3 Collaboration	11 out of 11 projects (100%)	14 out of 18 projects (78%)	(100%)
4 43pl growth	n/a (growth > industry norm)	Benchmarked FYs 03 & 04 (growth > industry norm)	(growth > industry norm)
5 25 higher degree candidates	12 doctorates 0 Masters	16 doctorates 4 Masters	
6 World class research	Not applicable in Years 1 and 2		Review in Sep 05

¹ Some \$40,000 flowed direct to participants rather than through CRCSI because of SISL arrangements not yet in place to handle contracts on behalf of the CRCSI.

Appendix 1 - Glossary and Acronyms

43pl	43 Pty Ltd, a company representing the CRCSI's national SME consortium
ACC	Audit & Compliance Committee
ANZLIC	Australia and New Zealand Land Information Council
ASIBA	Australian Spatial Information Business Association
ASIERA	Australian Spatial Information Education and Research Association
CORS	Continuously Operating Reference Station
CRC	Cooperative Research Centre
DEM	Digital Elevation Model
DInSAR	differential InSAR
GB	Governing Board
GIS	Geographical Information Systems
GPS	Global Positioning Satellites
ICC	Research & Education Committee
INS	Inertial Navigation Systems
InSAR	Interferometric Synthetic Aperture Radar
PSInSAR	permanent scattered InSAR
REC	Industry & Commercialisation Committee
SDI	Spatial Data Infrastructure
SISL	Spatial Information Systems Ltd
SSI	Spatial Sciences Institute



Appendix 2 – Executive and Meetings Attended

CRCSI Governing Board	Meetings attended	Meetings held in term of appointment
Em Prof Bill Charters	4	4
Peter Woodgate	4	4
Les Field (alternate - J Walsh)	0 (1)	1
Mary O'Kane	3	4
Roland Slee	3	4
Bill Richards	4	4
Tony Burns	4	4
Neil Williams	1	1
Grahame Searle (alternate - D Hartley)	3 (1)	4
Warwick Watkins	4	4
Bruce Thompson	3	3
Colin Sutherland	3	3
Jannie van Deventer (alternates - I Williamson, G. Hutchison)	2 (1,1)	4
Audit and Compliance Committee		
Mary O'Kane	3	3
Warwick Watkins	3	3
Bruce Thompson	2	2
Neil Williams	1	1
Research and Education Advisory Committee		
Clive Fraser	1	1
Peter Woodgate	1	1
Peter Loughrey	1	1
Roland Slee	1	1
Colin Sutherland	1	1
Graeme Wright	1	1
Industry Advisory and Commercialisation Committee		
Jack de Lange	1	1
Tony Burns	1	1
Hun Gan	1	1
Grahame Searle	1	1
SISL Board		
Bill Charters	1	1
Peter Woodgate	1	1
Mary O'Kane	1	1
Roland Slee	1	1

