FRONTIERSI

YEAR IN SUMMARY
2018–19

FRONTIER SI >

ACKNOWLEDGMENTS

FrontierSI would like to make the following acknowledgments:

- Māori as tangata whenua and Treaty of Waitangi partners in Aotearoa New Zealand.

- Australian Aboriginal and Torres Strait Islander peoples as the traditional custodians of the land across Australia where our services are located. We also pay our respects to ancestors and Elders, past and present.

- Image contributions by the broader FrontierSI team and the spatial information research community.

Australian Government
Department of Industry and Science

Business
Cooperative Research
Centres Programme

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CEO'S MESSAGE

It has been a rewarding 12-months as we completed our transition from the Cooperative Research Centre for Spatial Information (CRCSI) to FrontierSI, delivered significant major projects, constituted a new Board, developed a new Strategy, and established mechanisms to allow us to work even more closely with our partners.

In the past 12 months we have:

✓ **30 partners signed up.** We have maintained the strength of our Core and Support Partner base with government agencies and universities and we have also signed a very strong and engaged group of 18 industry partners.
(To see who these partners are visit: **frontiersi.com.au/our-partners**).

✓ **Refreshed the Board and its committees and set the strategic direction and business priorities for the next 3 years.** With the appointment of new Chair, Dr Gillian Sparkes in December 2018 completing the FrontierSI Board formation process, early 2019 has seen the development and approval of a new Strategic Plan and more recently of the 2019-2022 Business Plan and Budget.

✓ **Developed a new strategy.** The new strategy positions us as the organisation of choice to lead, formulate, broker and deliver collaborative solutions with government, industry and universities. We will focus on high impact collaborative user led initiatives, using our partners capabilities and scale.

✓ **Continued to deliver significant project outcomes through the completion of continuing projects.** The successful completion and delivery of high profile, high impact projects such as the SBAS Test-bed Demonstrator and Cancer Atlas projects are but two examples of FrontierSI's ability to enable research and innovation collaborations which deliver high impact solutions for our partners, clients and broader community. Both projects began as CRCSI initiated projects and we are now building on that foundational capability through new FrontierSI projects. We look forward to reporting on the outcomes of these and other exciting opportunities being pursued during 2019-20.

✓ **Launched the FrontierSI brand.** 2018-19 has seen completion of key rebranding activities, including the launch of a new website (**frontiersi.com.au**) and culminating in our official launch at the FrontierSI Conference in April. This one-day event attracted over 150 delegates and provided a wonderful forum to officially wrap up and celebrate our achievements as CRCSI and look toward our future as FrontierSI.

✓ **Finalised our research priorities with partners and initiated 22 new projects in FrontierSI with a solid pipeline of future opportunities.**

✓ **Exceeded our 2018-19 income target ($6.9M v $6.5M) and maintained operational expenditure at < 25% of total spend.**

✓ **Realigned our staffing and organisational structure and processes to meet business and partner needs** and recruited some really talented staff. We have established mutual partnership expectations through our partner engagement process, which supports a comprehensive approach to engagement and will, over time, build an evidence-based platform for continuous improvement. We have articulated our values, behaviours and purpose.

> **We will be well recognised for the industry value we have created, our contributions to major national initiatives in positioning and geodesy, and for our groundwork in the development of the digital twin landscape."**
>
> G. Kernich, CEO

The global growth in geoservices provides us with a great opportunity to be the leaders in the spatial intelligence area.

Over the last year, the Satellite Based Augmentation System (SBAS) and Digital Earth Australia have drawn significant focus to public infrastructure. While implementation of these initiatives has primarily been within the government sector, both private and university sectors have welcomed the increased certainty and long-term nature of these major investments.

FrontierSI has set itself a target to grow as a self-sustaining organisation from revenues of $6.5M in 2018-19 to $12.0M in 2021-22, and at the same time generate surpluses for re-investment in research and innovation.

FrontierSI would not exist without our partners. The model for ongoing sustainability of FrontierSI is predicated on solving partner challenges and we draw on the expertise of our university and industry partners to provide the complex and varied skills required to solve identified problems. Growing demand for resources will be met by increasingly sourcing capability from our university and industry partner base, and where specialist capability is needed beyond these partners, via external providers. Scaling for growth is reliant on maintaining a highly skilled staff base in FrontierSI which has the necessary expertise to provide solutions to identified problems and then competently match the university and industry capabilities to address them.

With the continued support of our partners it's been a great period for us with a continuing wave of projects and collaborative opportunities which have come our way. We are grateful to have committed partners, and the number of large initiatives before us is greater than ever. The impact of spatial information on our daily lives is more pervasive than ever. It has now truly moved well beyond the traditional spatial industries.

The need for connections between (and within) industry, government and universities has never been more acute with all sectors seeking ways to connect to improve the way they do business. The ability to combine multidisciplinary approaches to applied research, industry engagement and innovation, together with sourcing the right expertise, and being easy to do business with, is critical. With all this before us, we intend to remain as the preferred spatial research organisation for our partners to competently tackle the large and complex spatial challenges faced in Australia and New Zealand.

By 2022 our success in achieving our strategic objectives will be demonstrated through our sustainability, satisfied partners and deep partnerships established with target organisations such as the SmartSat CRC.

Current trends in spatial technology development and the demand for real-time data means that FrontierSI is well positioned to pursue our planned growth strategy. Governments are increasingly focused on better service delivery to the community, however keeping pace with technological and business process changes has become increasingly difficult. We have exciting challenges ahead, and we should take this opportunity to encourage the spatial sector, academia, research and government to continue its leadership role. We will be well recognised for the industry value we have created, our contributions to major national initiatives in positioning and geodesy, and for our groundwork in the development of the digital twin landscape.

I commend this summary of our 2018-19 activities to you.

Graeme.

Graeme Kernich, Chief Executive Officer

Everything happens somewhere, solutions happen here.

VISION, MISSION AND PURPOSE

Vision

We will be the spatial organisation of choice to lead, formulate, broker and deliver collaborative solutions with government, industry and universities.

Mission

Through our partnerships and collaborative model, our spatial expertise will accelerate industry and economic growth, provide better government services and lead to improved environmental and social well-being.

Our mantra is to make our partners better at what they do. Our value lies in our ability to harness the spatial expertise of our university and industry partners to solve complex problems.

Purpose

FrontierSI is a not-for-profit company that delivers major benefits to governments, industry, academia and the community in Australia and New Zealand. We provide the connection point and collaborative model for people to work together on shared challenges. We apply our deep spatial expertise to broker solutions that solve long term strategic problems.

Values

We value **collaboration**, **future focus**, **agility**, **integrity**, and **communication**.

We are solutions driven, and achieve high quality outcomes through **collaboration**, being open minded and embracing inclusion, working together as a team internally, and with our partners and clients.

We are **future-focused**, looking at "what's next": from tapping into the most promising technologies, to new application areas to ensure we deliver.

We respond to our partner needs with **agility**, being flexible and deploying teams and effort as needed, to adapt to our rapidly changing environment.

We work with **integrity**, we do what we say, we are professional and respectful of others.

We **communicate** and share information effectively, we listen first, seek to understand other perspectives and simplify complex concepts into understandable stories.

DID YOU KNOW?

For 16 years we have played a key role in addressing many of the fundamental technical challenges associated with the realisation of a dynamic datum. Our research has armed geodetic agencies with a world-leading dynamic adjustment capability, has explored the inclusion of non-traditional observation types to aid the development of crustal deformation/plate motion models and has contributed to identifying technical, institutional and legislative challenges to the adoption of time-dependent coordinates.
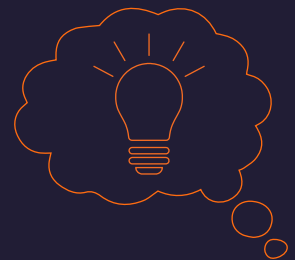
STRATEGIC PLAN 2019–2022

With the successful transition out of the CRC program and rebirth as FrontierSI, the newly formed Board's focus in 2018-19 was to set the strategic framework for FrontierSI to grow and consolidate a position as a self-sustaining organisation within the next 3 years. And at the same time generate surpluses for reinvestment in research and innovation.

The strategy for growth has three components:

1 **Retain our current partners and grow our project portfolio activity with them.** Our partners already turn to FrontierSI for guidance, vision and leadership in emerging technologies and cross jurisdictional challenges.

2 **Broaden the current portfolio to new government agencies through our partner base.** We need to define and address the emerging needs of all levels of government, with an initial focus on current partners as champions and to reach further government agencies.

3 **New initiatives which comprise new industries, offerings or a combination.** The aim is to actively develop roadmaps/strategies to address emerging challenges, as cases for further FrontierSI investment and partner capability development.

STRATEGIC OBJECTIVE	GOAL	PRIORITIES TO JUNE 2020
HIGH IMPACT	Broker high impact spatial solutions to complex problems	• Positioning and Geodesy • Spatial infrastructures and data analytics • Connect space and spatial • Foster development of the Digital Twin by laying the groundwork for focus in 2020
DRIVE OUTCOMES	Drive the adoption of spatial outcomes by and for our partners	• Facilitate the roll-out and usage of SBAS • Explore the potential to scale up the adoption of 'internet of things' applications • Accelerate the adoption of earth observation and mapping solutions
SUSTAINABLE FUTURE	Ensure a sustainable partner base through a strong reputation of identifying and solving complex spatial challenges	• Ensure people, systems, and processes to effectively manage partners and clients • Retain existing partners • Foster partnerships for new business opportunities • Establish a role and presence in the space agenda
COLLABORATION & INNOVATION	Multi-sectoral problem-solving with a creative and collaborative approach	• Ensure staff and partners embrace the Strategy • Drive a creative and collaborative approach for continuous improvement • Strengthen congruence between strategy, capability and culture • Ensure alignment of structure, resourcing and strategy

OUR CAPABILITY REQUIREMENTS	Collaboration with Government, Industry and Universities	Leadership & Innovation	Ease of Doing Business	Sound Governance & Talent Management	Communications & Outreach

DID YOU KNOW?

Past spatial infrastructures (SI) research has focused on developing technical solutions to problems that inhibit access to spatial information and the creation of spatial information products and services. Our research has included improved semantic search, supply chain automation, data federation and the development of a user-defined vocabulary for describing data quality and fitness-for-use. Research teams, with support from the private sector, have focused on the creation of proof of concept tools to make research outcomes accessible to partners.
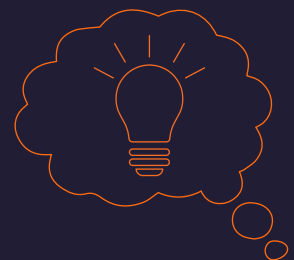
RESEARCH FOCUS & INNOVATION

FrontierSI leads our partners through the research and development process, minimising the risks while maximising the benefits of innovation. Together we ask the right questions, deliver excellent projects and collaborate for success.

We work in three core areas:

Positioning and Applied Geodesy – with the aim of improving location;

Spatial Infrastructures – focusing on increasing data accessibility and improving service delivery;

Rapid Spatial Analytics – with the goal of generating answers through automation, and deliver applied solutions across a range of industries, with extensive prior experience in Health, the Built Environment, Agriculture and Defence.

DRIVERS · RESEARCH & ADVICE · OUTCOMES · SOLUTIONS

EVERYTHING HAPPENS SOMEWHERE · SOLUTIONS HAPPEN HERE

FrontierSI provides a connection point and collaborative model for our partners to access, develop and apply spatial research development and innovation project outcomes into impactful solutions. Put simply, at our core we act as a broker, however our partnership offers significantly more, as we provide our partners with the research services, expertise and technology to improve operations and implement innovative solutions.

FrontierSI provides:

Project Facilitation: Responsively facilitating the formulation and delivery of complex projects which require collaboration between organisations. This draws upon our ability to connect drivers and insights from different organisations, extensive networks internationally and our expertise in delivering multi sectoral and multi-partner projects. This includes our ability to create, manage and monitor quality outsourcing and subcontracting services which

enhance solution delivery. Through our outsourcing capabilities, FrontierSI offers efficient and effective access to a highly specialised and expert resource base. The scalability through our networks vastly enhances our ability to deliver the required solutions and business outcomes.

Collaborative Applied Research: We have 16 years experience in creating and managing collaborative teams of academic, private sector and government professionals to solve challenging innovation and R&D spatial problems of varying scales. We help to breakdown organisational, jurisdictional, and technology silos to deliver results and realise value for all project stakeholders. We have staff accredited in a variety of project management approaches to ensure that the right approach is used for each problem. Often these are large scale, complex, multi-jurisdictional initiatives. Our projects range from deep technical research through to proof- of-concepts and demonstrators.

Advisory Services: Through our inhouse expertise as well as industry and university partnerships, we provide independent and trusted expert advice in spatial industry strategy, business strategy, data and spatial infrastructures strategy, innovation programs, technology due diligence, industry and technology trends, new markets assessment and economic analysis. We offer software development capabilities and technical Geographic Information System (GIS) services.

Industry Engagement and Outreach: We conduct workshops, reviews and industry consultations across both technology and end user markets to uncover new strategic insights and directions for our partners. We have co-organised national and international business networking events and business exchanges. These extensive outreach efforts raise awareness of new technologies and their potential benefits, leading to the funding of new large-scale initiatives. Our global linkages and networks beyond ANZ connect our partners to leading global research and innovation.

Technology Development: We bring ideas to life, straddle the divide between cutting edge research and commercially scalable software to bring our partners ideas to market. We help our industry and government partners navigate the constantly changing digital environment by rapidly prototyping new ideas to explore feasibility and strategic fit. We join forces with our partners to provide an innovative, competitive edge in project bids. We play at the leading edge of technology, providing expertise in design, development, prototyping, and testing.

Professional Training: We provide training, capacity building, up-skilling and professional development courses directly and through our partners. Through our research we deliver postgraduate and postdoctoral education and training.

REFINED AND IMPROVED REMOTE MONITORING OF UTILITY ASSETS

900 PUBLICATIONS

$1.07 BILLION TOTAL ESTIMATED BENEFIT 2010–24

PREVENTATIVE HEALTH AND EARLY DISEASE DETECTION TOOLS

SUSTAINABLE URBAN DEVELOPMENT SOFTWARE TO INCREASE PLANNING EFFICIENCY AND LIVEABILITY

80 PHD AND MASTERS COMPLETIONS INCLUDING 3 COMPLETIONS IN 2018-19

BETTER LICENSING REGIMES FOR DATA SUPPLY CHAINS

MULTIPLE AWARDS WITH PARTNERS NATIONALLY AND INTERNATIONALLY

120 PARTNERS FROM GOVERNMENT AGENCIES AND DEPARTMENTS, INSTITUTES, UNIVERSITIES AND THE PRIVATE SECTOR

PROGRESSED VISION OF PRECISE GNSS POSITIONING TO NON-EXPERTS ANYTIME, ANYWHERE

IMPROVED MAPPING METHODOLOGIES AND IMPLEMENTED QUALITY ASSURANCE SOFTWARE

200 PROJECTS

ENRICHED GOVERNMENT DATA MANAGEMENT AND SERVICES

FOR EVERY DOLLAR INVESTED IN THE CRCSI, THERE WILL BE A **$3.13 RETURN** TO THE AUSTRALIAN AND NEW ZEALAND ECONOMIES BY 2024

500 INDIVIDUALS ACROSS 100 ORGANISATIONS COLLABORATING ANNUALLY

4 COMPANIES CREATED

MORE COLLABORATIVE GOVERNMENT, UNIVERSITY AND INDUSTRY INTERACTIONS

A MORE COORDINATED AND LARGER SPATIAL INDUSTRY

Earth image courtesy of NASA.

SIGNIFICANT OUTCOMES

Transition

2018-19 saw the successful completion of the transition activities from CRCSI to FrontierSI including acceptance of the final reporting submission to the Department of Industry, Innovation and Science and culminating in a one day conference to celebrate the legacy of CRCSI and to launch FrontierSI.

CRCSI directly supported more than **80 PhD and Masters students**. While these candidates have come from many different countries, **90 per cent** have chosen to find employment in Australia or New Zealand, making a lasting contribution to these two nations and the spatial industry.

The focus of the CRCSI was to develop a collaborative research environment that could build the teams and access the expertise needed to tackle the big, cross-sectoral spatial research challenges that underpin infrastructure development in today and tomorrow's digital economies. The CRCSI built effective collaborations among some 500 specialists drawn from over 120 partnering organisations.

The CRCSI delivered over $1.07 billion in benefits arising directly from its research and development (R&D) outputs. This represents a direct benefits ratio of 3.13 to 1, meaning for every $1 invested in CRCSI activities, $3.13 in benefits were derived.

> *The vital part CRCSI played in the National Positioning Infrastructure program created a lasting impact for the Australian public across a range of sectors including agriculture, autonomous vehicles and precision navigation. Their fundamental contribution will directly support an estimated $70b of economic activity in sunrise industries."*
>
> Dr Heather Smith PSM Secretary,
> Department of Industry,
> Innovation and Science

Notable FrontierSI Projects

Satellite Based Augmentation System Test-Bed-(SBAS)

The 18-month trial of the high accuracy satellite positioning technology successfully demonstrated the benefits of implementing an operational SBAS across Australia and New Zealand.

SBAS augments and corrects the positioning signals already transmitted to Australia by constellations of global satellites, known as Global Navigation Satellite Systems, such as the United States' Global Positioning System (GPS). It improves the accuracy of positioning data from metres down to centimetres and makes it available across Australia and New Zealand's lands and seas.

The Trial assessed the economic, social and environmental benefits of improved positioning technologies and demonstrated tangible benefits across a range of industry sectors. It found significant economic benefits with expected value of $7.6 billion for Australia and New Zealand, and $6.2 billion for Australia alone over 30 years.

The Report highlights how future safety, productivity, efficiency and environmental benefits to industry will flow from wider coverage, enhanced accuracy down to decimetre, signal integrity and reduced commercial costs and infrastructure investment.

It also details the benefits across ten industry sectors in Australia and New Zealand. In the agricultural sector, for example, a sector that has historically been of great economic importance for New Zealand and Australia, there is an anticipated economic benefit

of AUD$2.2billion in Australia and NZ$1.5B in New Zealand over 30 years with the implementation of SBAS. While space-based positioning has been used in agriculture for over 25 years, the need for greater precision is growing, with anticipated benefits across horticulture, livestock and broadacre farming, and forestry.

FrontierSI played a crucial role in the success of SBAS industry engagement, leading and coordinating 27 industry test bed projects, run across all Australian states and New Zealand, in different industries with different test regimes, OH&S procedures and a mix of uninitiated through to expert users. The projects outcomes all tied into the Economic benefits analysis conducted by Ernst & Young. The FrontierSI project team interacted with hundreds of people across government, universities and industry over the 2 year life of the project, on all facets of positioning.

The Australian Government allocated $160.9 million in the 2018-19 Federal Budget to support the development of an operational SBAS over four years. FrontierSI will continue to play a role, having entered a 2 year project agreement with Geoscience Australia commencing in April 2019. In May 2019, the New Zealand Government committed to funding SBAS in partnership with Australia. FrontierSI will provide underpinning technical support to the user community and manufacturers and will identify existing challenges in industry and breakdown the existing barriers to increase the adoption of SBAS prior to the system becoming fully operational.

Digital Earth Australia

To ensure that Digital Earth Australia ('DEA') generated value for Australian businesses, FrontierSI undertook extensive industry consultation nationally in order to help DEA best provide impact to Australian businesses. This resulted in the delivery of the DEA Industry Strategy in February 2019 (**www.frontiersi.com.au/opportunities/dea**).

A critical part of this strategy was a business incubation program to accelerate adoption, known as DEA Labs.

> *Programs like Digital Earth Australia, coming out of our science organisations, continue to deliver on the government's ongoing investment in the digital economy and space-enabled industries."*
>
> Minister for Resources and Northern Australia, Senator the Hon Matt Canavan

Over the last 8 years FrontierSI has worked with DEA and is now coordinating $50,000 seed funding grants for Australian businesses to develop pilot projects that will leverage Geoscience Australia's DEA technology.

DEA is a key piece of public data infrastructure which uses satellite data to detect physical changes across Australia in unprecedented detail. It offers stable, standardised data from which it can innovate to produce new products and services and be competitive in global markets.

Funding grants have been awarded and pilot projects initiated in late 2018-19 with Australian companies and FrontierSI partners, DataFarming and NGIS, along with AgTech company CiboLabs. They will be using DEA data to automatically map paddock boundaries and capture many other features including drains, dams, vegetation and infrastructure. FrontierSI will manage the pilot projects, including collection of technical and communication feedback, providing technical support and capturing key lessons learnt for future programs.

Industry Innovation Programs

DEA LABS
DEA Labs, a FrontierSI initiative, is a targeted incubator program for the private sector which aims to help Australian businesses use satellite data and DEA technologies to solve real-world problems through collaboration, and the provision of funding and support. It brings together end-users and the private sector to innovate and solve challenging real-world problems.

AGO LABS
Coordinated through FrontierSI, the Australian Geospatial-Intelligence Organisation (AGO) Analytics Lab Program (AGO Labs) program's primary focus is to address AGO capability challenges through a small number of short-term industry projects, with a focus on machine learning and analytics for producing automated imagery analysis, including automated object classification.

Cancer Atlas

An estimated 138,000 Australians will be diagnosed with cancer annually. But some people are more likely to be diagnosed or even die than others because of their lifestyle, behaviour and genetics. The Australian Cancer Atlas, released in September 2018, shows national patterns in cancer incidence and survival rates based on where people live for 20 of the most common cancers in Australia – such as lung, breast and bowel cancer. It lets us make sense of complex data more easily. In turn, this helps health agencies, policy makers and researchers digest the data to understand and see previously indistinguishable patterns. It will provide a better understanding of geographic disparities and health requirements. There are many flow-on effects from being able to visualise data on a map, including avenues for new research and providing evidence for future policy decisions.

The atlas combines spatial analysis tools, geostatistics and small area estimate modelling to create a powerful tool for the presentation and analysis of cancer patterns in Australia. Having a spatial comparison and analysis of cancer patterns helps inform decision-making at local, state and federal levels.

The team has developed a robust, accessible and easy to use tool that presents a spatial view of cancer indicators and provides a model for exploratory data analysis. The online atlas will enable unique insights into the location-based patterns of cancer outcomes across Australia and will build momentum in the research efforts to understand why variations exist, potentially leading to earlier interventions to reduce the observed inequalities.

This project was a collaboration between FrontierSI, with research partners Cancer Council Queensland, Queensland University of Technology, and the Australian Institute of Health and Welfare.

The launch of the atlas received significant media coverage. The project team continues to explore opportunities to implement the atlas in other contexts and jurisdictions. One such opportunity is a project which commenced with the New Zealand Ministry of Health in early 2019, and aims to utilise the methodology and expertise developed under the Australian Cancer Atlas, for application in a New Zealand Setting.

DID YOU KNOW?

Autonomous vehicles, consumer robotics, machine automation and drone-based parcel delivery are just some technologies that explicitly rely on a knowledge of where. Consumers, and businesses alike, will increasingly depend on instant, 3D, fit-for-purpose location information, with certified accuracy and integrity. Robust, reliable, ubiquitous positioning is becoming a fundamental element to our spatially dependent world. This future will require us to exploit the benefits of global and regional navigation satellite systems.
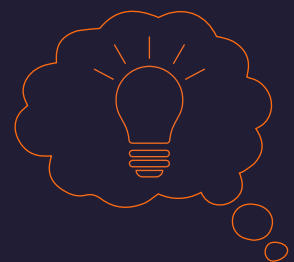
Virtual Reef Diver at Science Week 2018

We were delighted to see one of our important environmental projects become the 2018 ABC Science Week national project in Australia.

The Monitoring Through Many Eyes projects began in 2015 with FrontierSI partners Queensland University of Technology (QUT) and the Queensland Department of Natural Resources, Mining and Energy, as well as the ARC Centre of Excellence for Mathematical and Statistical Frontiers) and the Australian Institute of Marine Science.

The project used citizen science to understand and monitor the Great Barrier Reef. For 2018 National Science Week and the International Year of the Reef, the ABC joined the team and invited people to dive through their computer screens into the Reef by taking part in Virtual Reef Diver – the ABC's online citizen science project. The team developed a spatial data mapping and modelling platform to help people classify thousands of underwater images of the Reef.

The platform was used to ingest new spatial data describing coral cover, fit spatial models to those data, and generate maps of coral cover with associated uncertainty estimates throughout the whole of the Great Barrier Reef.

Virtual Reef Diver

As featured on ABC Science Week.

ABC

The Virtual Reef Diver project represents a new approach to monitoring and managing the Great Barrier Reef. The 'Monitoring Through Many Eyes' projects began in 2015 with FrontierSI partners Queensland University of Technology (QUT) and the Queensland Department of Natural Resources, Mining and Energy, together with ACEMS (the ARC Centre of Excellence for Mathematical and Statistical Frontiers) and the Australian Institute of Marine Science. The project uses citizen science to understand and monitor the Great Barrier Reef. For National Science Week and the International Year of the Reef, the ABC brought their forces to join the team and invited every Australian to dive through their computer screens into the Reef by taking part in Virtual Reef Diver (www.virtualreef.org.au).

Digital Twins & the National Spatial Data Infrastructure (NSDI) Initiative

In Australia, FrontierS has been involved in the National Spatial Data Infrastructure (NSDI) initiative which supports co-design between multiple state and territory jurisdictions, including delivering shared capability and services.

A national digital twin, including cadastral reform, has been identified as a priority activity for NSDI collaboration by the Australia and New Zealand Land Information Council (ANZLIC) and FrontierSI has been identified as an organisation that could play a role to assist in implementation.

The NSDI initiative provides a collaboration mechanism for national harmonisation of the specifications for a digital twin with the goal to supporting a federated digital twin model.

FrontierSI is well placed to make contributions in four main areas in relation to Digital Twins based on current and recent project activities as well as partner expertise: assisting with improved data supply chains (FSDF) including driving standards (including quality assurance), resolving geodetic issues related to cadastral and other data sets, supporting and interlinking cross-jurisdictional and cross-sectorial collaboration with respect to digital twins.

Additionally, FrontierSI has capability in developing and implementing governance frameworks across different stakeholders, associations and business organisations.

Successful Bids

Value Australia

The current labour-intensive approach to land and property value assessment results in expensive, slow and dated, or point in time, property valuations.

Value Australia is an innovative new $8.5M collaborative project which aims to address these challenges, and is supported through the Federal Government Cooperative Research Centre Project (CRC-P) grants.

Integrating research, significant data assets and using state-of-the-art analytics and artificial intelligence, this project aims to deliver secure digital valuation models and tools covering a broad range of land and property types across Australia and overseas. The result aims to be an efficient and accurate land and property valuation product.

> *Value Australia will assist in making data-driven decisions, such as being able to explore rezoning options, determining the economic benefits of a development proposal, or even the location of important infrastructure, like new metro or light rail stations."*
>
> Prof. Chris Pettit, UNSW

Value Australia builds on two years of pilot work across metropolitan Sydney and Brisbane through the award-winning RAISE project which developed a range of Automated Valuations Models. Value Australia will develop on this base to produce a national suite of data and software products over the next three years. Pilot work has also allowed users to rapidly test the impact of new infrastructure development to determine the potential land valuation changes of this infrastructure within minutes. Multiple scenarios can be rapidly created and compared, further-allowing decision makers to validate consulting reports.

The Value Australia project team, managed by FrontierSI is an ideal collaborative mix between government, industry and academia. Including FrontierSI, partner organisations UNSW and Omnilink, along with Commonwealth Bank of Australia, State Government (Office of the NSW Valuer General) and Liverpool City Council.

SmartSat CRC

The SmartSat CRC was announced on 15 April 2019 in Adelaide by the Minister for Industry, Technology and Science, Karen Andrews, with the launch attended by the South Australian Premier, Steven Marshall. The $245m SmartSat CRC will be Australia's largest ever nationally coordinated ecosystem of research and industry collaboration in space technologies and will attract a significant amount of Earth observation (EO) based R&D.

The SmartSat CRC will be a vital part of the fledgling space industry in Australia, bringing together government, industry and academia to work on the big R&D challenges, and FrontierSI played a critical role through the bid and interview stages in helping this bid be successfully funded. FrontierSI's role will be to look at the research through a broader lens and help create further demand for Earth observation data and analytics across agriculture, mining, logistics and environmental management of natural disasters, such as fire and floods.

As a core partner, FrontierSI will leverage its research program related to EO analytics and reinforce our position as a key connection between industry and research for EO analytics. We intend to take the lead role in coordinating and delivering the EO analytics research program. It will allow us to grow our brokering role and address priorities of connecting space and spatial and driving the use of Earth observation data. We will participate in joint projects which align with the FrontierSI research plan and strategy and benefit our partners, as well as core management and industry engagement activities that align to our expertise gained through the CRC program so far.

> *The SmartSat CRC is a collaborative research effort that will provide enhanced connectivity, navigation and monitoring capability by solving major satellite system and advanced communications challenges. It will catapult Australia as a leader in niche areas of intelligent satellite systems, advanced communications and earth observation driven data analytics.*

SBAS: www.frontiersi.com.au/project/satellite-based-augmentation-system-test-bed

Digital Earth Australia: www.frontiersi.com.au/project/digital-earth-australia

Cancer Atlas: https://atlas.cancer.org.au

SmartSat CRC: www.smartsatcrc.com

Virtual Reef Diver: www.virtualreef.org.au

Awards

Dr Kathryn Salm
2018 Asia Pacific Award for Women's Leadership

Chosen from a very strong list of nominated women leaders, Dr Kathryn Salm exemplified this category by leading by example in a range of senior positions in various organisations. Prior to joining FrontierSI, Kathryn was National Geospatial Capability Leader at LINZ, dedicating herself to the development of New Zealand's national geospatial capability, liaising with key stakeholders across industry government, and the research and education sectors.

Kathryn was considered a clear role model for other aspiring women who remarked on the indelible and profound contribution she has made to the spatial profession. Kathryn's work on spatial certification could have far-reaching, positive development impacts on our industry as a whole. She's also a member of the NZ Women in Spatial Committee, where her engagement is impacting on women's growth within their workplace diversity and through career progression.

The Asia-Pacific Spatial Excellence Awards (APSEA) celebrate the achievements of top spatial information enterprises and individuals and showcase the finest projects and most significant performance of professionals that the Surveying and Spatial Industry has to offer. Projects and individuals attaining recognition at this premier series of events are deemed to be truly outstanding achievers in their field.

I have always been passionate about space. The opportunity to work on the SBAS test-bed, working with over 100 organisations to trial and have them understand the gains more precise positioning can bring to their organisations has been an exceptional experience."

Julia Mitchell

### Julia Mitchell
Inaugural Ray Stalker Memorial Award

On Monday 25 February 2018 at the Australian International Aerospace Congress dinner, Julia Mitchell became the inaugural **Ray Stalker Memorial Award** winner.

The award is just one of several accolades Julia has recently received. Julia also spent a week in Brussels at the **EU-Australia Leadership Forum**, where she was selected as an emerging leader.

The Raymond John Stalker Award for Outstanding Contributions to the Australian Aerospace Industry is an award jointly hosted by the Australian Youth Aerospace Association and the Royal Aeronautical Society. The award is designed to recognise exceptional young professionals in the aerospace industry for their outstanding achievements and leadership.

DID YOU KNOW?

If we want to monitor our environment, be it crowding, fires, floods, air quality or traffic, we need reliable information on where and when things are happening. New sensor technologies make knowing what is happening as well as where it is happening much easier to monitor. But pulling this data together to inform and execute actions in real time is more difficult. Our Rapid Spatial Analytics program turns these rich data sets, and the location information linking them, into usable knowledge and actionable decisions. We are already discovering ways to connect and integrate data sets, making it easier to generate meaningful information, collaborate and inform decision-making.
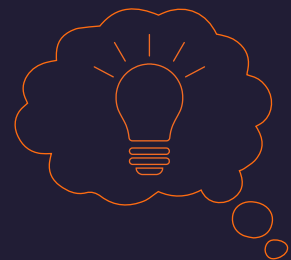
PROJECT DELIVERY

In 2018-19, FrontierSI led, formulated, brokered and delivered solutions with government, industry and university partners within a portfolio of 49 projects with cumulative funding in excess of $13M. 21 Projects were completed, 22 new projects commenced and FrontierSI began 2019-20 with an active project portfolio of 28 projects.

FrontierSI exists to solve partner challenges and our portfolio reflects the deep level of engagement we have with each organisation within our Core and Support Partner network. Our projects involved engagement with 124 project partners across 60 organisations, with each of our Core and Support Partners involved in multiple initiatives.

Positioning

Autonomous vehicles, consumer robotics, machine automation and drone-based parcel delivery are just some technologies that explicitly rely on a knowledge of where. Consumers, and businesses alike, will increasingly depend on instant, 3D, fit-for-purpose location information, with certified accuracy and integrity. Robust, reliable, ubiquitous positioning is becoming a fundamental element to our spatially dependent world. The future requires us to exploit the benefits of global and regional navigation satellite systems (GNSS).

Working with our partners, we play a lead role in providing Australia and New Zealand with precise position information — anywhere, anytime. Our positioning program conducts user-driven research to expand the capability, usability and functionality of multi-system, multi-sensor positioning infrastructure to realise our vision of "GNSS...and beyond."

Expected outcomes

- New approaches for seamless, 3D positioning in any environment
- New models for multi-sensor, multi-system integration
- Dependable measures for quality assuring real-time positioning
- Prototype integrated positioning systems
- More resilient positioning infrastructure
- Enhanced sovereign positioning capability

POSITIONING & APPLIED GEODESY ALIGNMENT WITH PARTNER AND STAKEHOLDER STRATEGIES & INITIATIVES

Australian Government 2018 National Positioning Infrastructure Capability funding

ANZLIC'S Collaboration Framework: Positioning is a Priority

Australian Government 2018 SBAS funding

New Zealand Government 2019 SBAS funding

2026 Agenda

Jurisdiction based initiatives (Cadastre QLD Transformation, Vic Digital Cadastre Modernisation, DFSI)

Geocentric Datum of Australia 2020 (GDA2020)

Cadastre 2034

International Committee on Survey & Mapping Elevation & Depth Strategy

Applied Geodesy

Global Navigation Satellite Systems (GNSS) have catapulted the esoteric science of geodesy into the mainstream. Today, it's not just geodesists who need to apply geodetic principles to solve complex problems. Anyone using GNSS to navigate and locate themselves implicitly depends on the underlying science of geodesy. Otherwise, they cannot ensure satellite-derived information aligns seamlessly, accurately and reliably to their environment. Nor can they be certain such data supports what they need, be it surveying, providing direction and position or calculating boundaries for property.

Our Applied Geodesy activities develop practical and dependable solutions to the underpinning and often invisible problems of geodesy. We are aiming to shield non-expert users from complex geodetic issues while simultaneously providing a rigorous and reliable geodetic infrastructure to realise our vision of "Geodesy for everybody."

POSITIONING & APPLIED GEODESY PROJECTS

Project Title	Progress	Partners
SBAS Specialist Research Technical Support	Commenced	Geoscience Australia (GA)
Ongoing Development of the Multi GNSS Analysis Centre Software	Ongoing	GA
Ensuring access to precise position by improving geodetic data interchange standards	Commenced	GA, Curtin University (Curtin), Department of Environment, Land, Water and Planning, Vic (DELWP Vic)
Improving access to precise positioning information by utilising modern data transmission protocols	Commenced	GA, Queensland University of Technology (QUT)
Ionospheric modelling to support ambiguity resolution for PPP-RTK	Completed	GA, Bureau of Meteorology, Curtin, Land Information New Zealand (LINZ), Position Partners, Think Spatial
Establishment of a Regional Satellite Based Augmentation System Testbed	Ongoing	GA, LINZ
Integrity Monitoring for the Multi-GNSS Analysis Centre Software	Ongoing	GA, University of New South Wales (UNSW), RMIT University (RMIT), LINZ
Next generation vertical datums for Australia and New Zealand	Completed	GA, LINZ, Curtin, Landgate, DELWP Vic, Department of Customer Service, Spatial Services NSW (DCS NSW), Department of Planning, Transport & Infrastructure, Tas (DPTI Tas)
Validation and Verification of ACS Forward Modelling, Advisory role on ACS development	Completed	GA, Australian National University

Rapid Spatial Analytics

If we want to monitor our environment, be it crowding, fires, floods, air quality or traffic, we need reliable information on where and when events occur. New sensor technologies make knowing what is happening as well as where it is happening much easier to monitor. But pulling this data together to inform and execute actions in real time is more difficult.

Our Rapid Spatial Analytics work will ask how can we turn these rich data sets, and the location information linking them, into usable knowledge and actionable decisions? How can we monitor crowding at train stations or on city streets during emergencies? How can information be used proactively to improve business outcomes? How can we fly drones over forests to return real-time tree counts, biomass estimates and invasive species information?

With our partners we have been developing innovative ways to take advantage of the big data and sensor revolution. The opportunity to use rapid spatial analytics emerges in a range of challenging application areas, including environmental, indoor, health and urban applications.

ALIGNMENT WITH PARTNER AND STAKEHOLDER STRATEGIES & INITIATIVES

Digital Earth Australia

ANZLIC Collaborative Framework

2026 Agenda

Key Defence Programs 799 – Sea2400 – DEF100

SmartSat CRC

Jurisdiction based initiatives

International Committee of Survey and Mapping Elevation & Depth Strategy

RAPID SPATIAL ANALYTICS PROJECTS

Project Title	Progress	Partners
VicMap Machine Learning	Commenced	DELWP Vic
NSW Riverlines Toolkit Demonstrator	Commenced & Completed	DCS NSW
AGO Labs	Commenced	Australian Geospatial-Intelligence Organisation, Department of Defence (AGO), Urbis, Maxar, Geospatial Intelligence, Ozius
Designing a Proof-of-Concept to Monitor Water Meters in Non-Urban Queensland	Commenced & Completed	Department of Natural Resources, Mines & Energy, QLD (QDNRME)
AusSeabed Quality Assurance Tool	Commenced	GA
Cadastre of Known Accuracy	Commenced	DCS NSW, Symbolix
Enhancing NSW Building Footprints Using Machine Learning	Commenced & Completed	DCS NSW, RMIT
QA4UAV Tool	Ongoing	DCS NSW, DELWP Vic, Minerals Research Institute of Western Australia
Proof of Concept for Defining Volumetric Parcels From Digitised Paper Plans	Commenced & Completed	QDNRME, ThinkSpatial, Position++
Support Services for the Hosting and Maintenance of the BNHCRC Online Project Management System	Commenced	Bushfire and Natural Hazards CRC Limited (BNHCRC)
DEA Industry Strategy and DEA Labs	Ongoing	GA, NGIS, Data Farming, Cibo Labs
Foster an Open Source Community for the Open Data Cube	Ongoing	GA, AMA, NASA, Symbios
Change Detection System from High Resolution Satellite Images	Ongoing	QDNRME, Dept of Environment and Science QLD, QUT, University of Queensland
Port Phillip and Western Port Bathymetric LiDAR Trial	Completed	DELWP Vic, Port of Melbourne, Melbourne Water, Fugro
An Automated Workflow to Develop Requirements and Quality Assure Multibeam Bathymetric Surveys	Completed	GA
Improving the usability for QA4LiDAR	Completed	DELWP Vic
Space Science Degree Business Case	Commenced & Completed	RMIT
Copernicus Data Hub Training Materials	Commenced	GA

Spatial Infrastructures

Access to data is rapidly changing the way we live and how we get things done. To keep pace, consumers and users need access to the right data at the right time, without needing expert knowledge. Spatial infrastructures are how we achieve this goal for our location information, empowering users and informing decision making. We believe "anyone, anywhere should be able to use location information as easily and reliably as switching on a light."

To achieve this goal will require an enormous collaborative, cross-sectoral effort. The governments of Australia and New Zealand face significant challenges in the provision and maintenance of spatial infrastructures. The era of stand-alone, jurisdictional solutions is no longer economically viable nor technically sustainable. Meeting the future needs of users requires collaboration and cooperation on the design and delivery of a shared infrastructure solution and the adoption of common standards and procedures.

ALIGNMENT WITH PARTNER AND STAKEHOLDER STRATEGIES & INITIATIVES

ANZLIC Collaboration Framework

Jurisdictional initiatives

2026 Agenda

Cadastre 2034

SPATIAL INFRASTRUCTURES PROJECTS

Project Title	Progress	Partners
Foundation Spatial Data Infrastructure (FSDI) Privacy Assessment for NSW Spatial Services	Commenced & Completed	DCS NSW, Elefant
Curtin University Professor Position Support	Completed	Curtin
University of Canterbury Professor Position Support	Ongoing	University of Canterbury (UC), LINZ
Geospatial Vision for Saudi Arabia	Completed	General Commission of Survey, Saudi Arabia, Spatial Vision, Dr Nik & Associates, Cofluence, Whereabouts
Malaysia Geospatial Plan	Completed	Dr Nik & Associates

SOLUTIONS

Project Title	Progress	Partners
Agriculture		
Monitoring Through Many Eyes: Virtual Reef Diver	Completed	QUT, QDNRME, ABC
Environmental		
Measuring and Monitoring Vegetation Health Impact through Earth Observation	Commenced	GA, Curtin, Roy Hill, BHP Billiton Minerals, NGIS, GHD, Department of Water and Environment Regulation WA, Western Australia Biodiversity Science Institute
Defence		
3D Point Clouds for Geospatial Intelligence Operations	Completed	AGO
Health		
Patient Coordination System Requirements	Commenced & Completed	WA Country Health Service, NGIS
Real-time environmental sensors to improve health in the Sensing City	Completed	UC, Curtin, WA Department of Health (WADoH), Canterbury District Health Board, Future Position X, LINZ, Sensing City
Australian Cancer Atlas	Completed	Australian Institute of Health and Welfare, QUT, Cancer Council QLD
Cliniface Stage 3 – Integrating, Enhancing and Scaling 3D-FAST for local and international impact	Ongoing	Curtin, WA DoH, University of Sydney, Linear Clinical Research
Provision of Spatial Cancer Models for New Zealand	Commenced	QUT, Cancer Council Queensland, New Zealand Ministry of Health
Utilisation of Earth Observation data to determine smoke exposure during prescribed burns and correlation of these exposed areas to health outcomes	Commenced	Curtin, NGIS, WA DoH, Bureau of Meteorology, WA Department of Biodiversity, Conservation and Attractions
Urban Development		
Learning Predictive Models for Urban Artificial Intelligence	Commenced	UNSW, Urban Development Institute of Australia, NSW
Value Australia	Commenced	UNSW, Commonwealth Bank of Australia, Liverpool City Council, NSW Govt Valuer Generals Office
Blockchain for Property Development Phase 1 and 2	Commenced & Completed	DCS NSW, Business Aspect, Civic Ledger
Developing and implementing the Greening the Greyfields frameworks and tools across Australia and New Zealand	Completed	DELWP Vic, UC, Swinburne University, Maroondah City Council
Smart Cities and Suburbs Program	Completed	Maroondah City Council, Knox City Council, Swinburne University
Integrated city planning using the RAISE toolkit	Ongoing	QUT, UNSW, Omnilink, NSW Govt Valuer Generals Office, Blacktown City Council, Parramatta City Council, Brisbane City Council, Landcom, Australian Property Monitors
Smart Information Services for Land Use Planning	Ongoing	DCS NSW, VPAC

Utilisation and Commercialisation

The effective management and utilisation of IP is fundamental to achieving the objectives set out in FrontierSI's Strategic Plan.

The management of IP is guided by the following practices:

- Facilitation of rapid uptake (and capability) by end-user participants and stakeholders for national benefit.

- Innovative use of IP including all FrontierSI Core Partners having a licence to use IP for internal research purposes.

- Endeavouring to make prior decisions about the commercial potential of investments in IP from research. Where an impact maximising an outcome of public good is sought or where there was no commercial uptake (and no national security or privacy issues) then the IP will be placed into the public domain.

- Operating an end-user uptake pathway with an emphasis on partnering SMEs and government organisations, supported by research providers. Appropriate consideration was also given to the needs of corporate participants.

A summary of 2018-19 commercialisation and utilisation activity and impact in relation to select intellectual property items held by FrontierSI follows:

Farm-Map 4D provides property managers with an easy to use cloud based, mapping solution for infrastructure, natural features and land type mapping, developed water and pasture efficiency, long term safe carrying capacity calculation, development planning, and time series imagery and data for assessing and monitoring of property infrastructure, land resources and ground cover.

Initially developed through a series of projects coordinated through CRCSI, the Hub provides tools to analyse and report changes in ground cover (e.g. the percent of bare ground) for any period over the last 30 years. Users can generate statistics for an individual paddock or their whole property and "benchmark" or compare their paddocks or property to the surrounding neighbors' or to specific area of interest. Incorporated as Farm-Map Analytics Pty Ltd in July 2017 with investment from CRCSI and AAM Group, at the end of its first year of operationsFarmMap4D were supporting more than 500 family and corporate producers managing 5-10 percent of Australia's cattle herd.

FrontierSI relinquished its shareholding in Farm-Map Analytics in March 2019 to a consortium of investors with the expertise and resourcing to take the platform to its next stage of development.
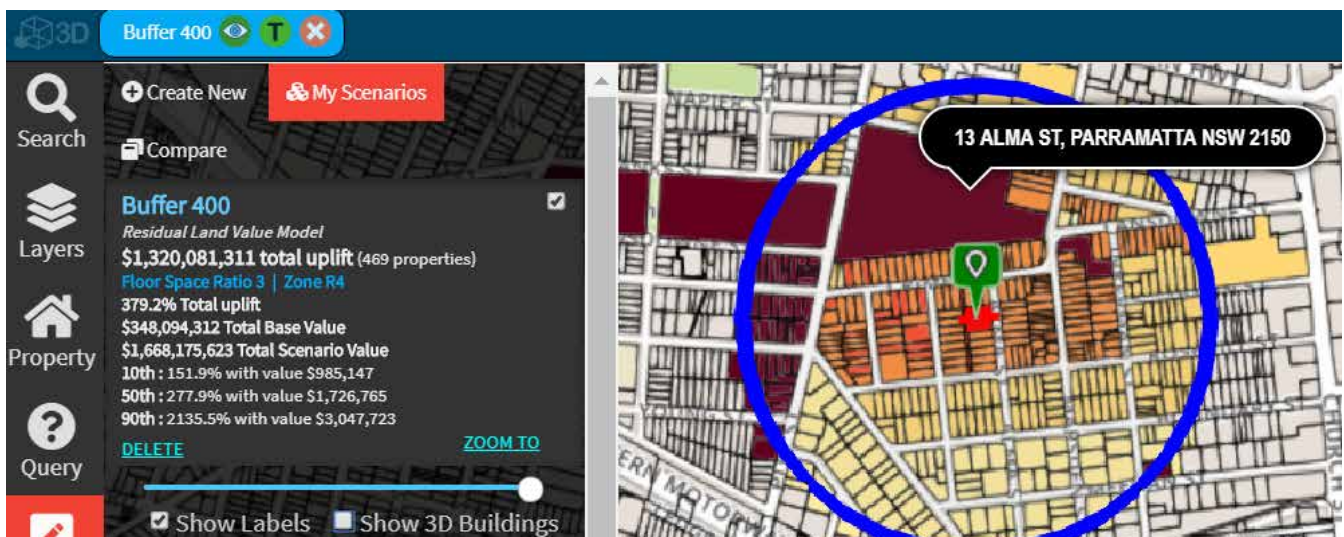
RAISE

Rapid Analytics Interactive Scenario Explorer (RAISE) is an award-winning, cloud based interactive geo-visualisation toolkit, built for accessing automated land valuation models as well as more complex land value uplift models. It is a spatial data query and analysis tool that enables users to quickly estimate and visualise property values. FrontierSI (via CRCSI) funded the research for RAISE via a project through the UNSW City Futures Research Centre and in partnership with QUT, DCS NSW, OmniLink and Australian Property Monitors (Domain Group). In late 2018-19 FrontierSI issued an EOI to its partner base seeking investment in the commercialisation of the RAISE toolkit, and/or the operational support of existing deployments of the tool. A licensing option will be pursued with the successful applicant in 2019-20.

QA4LiDAR

QA4LiDAR was the first in FrontierSI's trademarked QA4 suite of quality assurance tools. The developments of QA4Mobile (mobile LiDAR) and QA4UAV (aerial imagery) have followed and are in earlier stages of development. Initially developed through CRCSI project funding in 2012 and with several upgrades since, QA4LiDAR is a unique platform which provides an end-to-end workflow to simplify, standardise and automate the quality assurance process for airborne topographic and bathymetric LiDAR data. Its implementation consists of two main components, an online portal and a desktop application.

It currently has nearly 30 active users across 8 organisations within government and the private sector. It has been used in over 155 projects in Victoria, New South Wales and Queensland with over 166TB of data quality assured since December 2017. DELWP (Vic) now mandate the use of QA4LiDAR for the QA of all LiDAR data before delivery.

Through an EOI issued to our partner base in mid-2019, FrontierSI is seeking investment in the commercialisation and/or technology transfer of QA4LiDAR.

Hazwatch Indji Watch

Indji Watch web-based hazard monitoring tool was initially developed through a CRCSI project initiative and commercialised through start-up company Iintegrate Systems Pty Ltd of which CRCSI was a founding investor. The system brings together a range of third party information into a single user interface to help reduce risks in bushfire management, renewable and utilities operations. Indji Watch increases the level preparedness of its users and allows them to react more proactively in the face of all natural hazards threatening their business operations. Since its inception, the tool has been expanded and tailored specifically for renewable energy farms, an emerging market,in Australia, Europe and the United States. FrontierSI sold our minor shareholding in Iintegrate in mid-2019.

PARTNERSHIPS

FrontierSI would not exist without our partners who contribute funding which supports FrontierSI in its ability to fund its base operations and support collaborative research projects, and receive preferential rights in relation to services, service costings and partnership benefits in return.

The model for ongoing sustainability is predicated on solving partner challenges. FrontierSI draws on the expertise of its university and industry (research and innovation provider) partners to provide the complex and varied skills required to solve identified problems.

Through this model we view our partner base as either partners that utilise our research and innovation services (predominantly government) or partners that provide those services (predominantly university and industry).

As a collaborative organisation we believe in growing the skills and capabilities of our university and industry partners, which contributes to the growth of specialist spatial skills for use by the economies of ANZ. Taking action on this belief, FrontierSI will continue its support and contribution tor development of the New Zealand Spatial Hub in 2019-20. The hub has a purpose to initiate and support cross-sectorial geospatial projects and initiatives that provide beneficial outcomes for the wider geospatial industry and for New Zealand. FrontierSI is confident the hub can provide greater opportunities for Trans-Tasman partnerships and initiatives.

It was our partner base who provide the impetus for our centre to continue through FrontierSI, and we are proud and grateful to have maintained 28 of our partners through the transition. 2018-19 also saw the addition of two new industry partnerships with Data Farming and Orbica, bringing our total partner number to 30.

Key relationships have been forged with all of Australia's leading spatial peak bodies; ANZLIC (Australia New Zealand Land Information Council) representing the government interests, SIBAGITA (Spatial Industries Business Association and Geospatial Information Technology Association) representing the private sector interests and SSSI (Surveying and Spatial Sciences Institute) representing the spatial profession.

Formal connections are also maintained with associated industry bodies and organisations, both domestically and internationally, where there is strategic alignment and benefit to be derived for FrontierSI and our partners, including Open Geospatial Consortium (OGC), European Association of Remote Sensing Companies (EARSC) or the Space Industry Association of Australia.

Core Partners

NSW Government | Spatial Services

Australian Government — Geoscience Australia

University of Canterbury — Te Whare Wānanga o Waitaha — Christchurch New Zealand

QUT

Queensland Government

Australian Government — Department of Defence

Curtin University

RMIT University

Support Partners

Victoria State Government — Environment: Land, Water and Planning

Land Information New Zealand — Toitū te whenua

Government of Western Australia — Department of Health

UNSW Australia

Program Partner

Landgate

Industry Support Partners

Fugro

Data Farming

InsightGIS — Seeing is Achieving

Photomapping

e-Spatial

Spatial Vision

Alexander Symonds — Surveying Consultants

symbolix

Mercury Project Solutions

GHD

Orbica — Location. Data. Connectivity.

think spatial

ngis — people partnership success

OMNILINK — Linking People and Information

Position Partners — Shaping New Dimensions

AAM

PSMA Australia Limited

STAKEHOLDER ENGAGEMENT /COMMUNICATIONS

In 2018-19 we successfully rebranded to FrontierSI and have since repositioned the new brand to capitalise on our strong reputation in the spatial industry following 15 years of operations as a Cooperative Research Centre.

Our new brand combines our history and core skills in Spatial Information and blends that with the future and the new challenges we will embrace – 'our new frontiers.' We will extend our strong brand presence to increase the value and use of spatial information in applicable industry sectors through several channels.

Partner & Stakeholder Promotion

Monthly newsletters are disseminated to our partner and stakeholder network and news as well as project updates are promoted through our newly launched website. In addition, we utilise several digital channels to promote our activity including social media (Twitter, LinkedIn) and undertake systematic analysis of our website users to drive lead generation. We remain highly visible at targeted industry conferences and forums.

External & Potential Markets Promotion

We also undertake some activity to promote to organisations outside our network through mainstream media releases, industry journals, white papers and technical reports as well as presence at growth sector conferences. We are mindful that we will need to strengthen these activities in 2019-20 following our transition year.

Partner Engagement

FrontierSI is committed to two-way open communication that involves listening to our partners, involving our partners and advancing with our partners. Having clear expectations keeps the ongoing work understandable, rewarding and focused. Developing these relationships provides the basis upon which real collaboration and progress can occur. Accordingly, FrontierSI have implemented a formal partner engagement process, including documented partner Engagement Plans plan with all core and support partners. These plans assist us and our partners to clearly articulate and manage those expectations and better direct time and resources for a more fruitful partnership.

Marketing & Communications

While 2018-19 saw an emphasis on solidifying FrontierSI brand implementation activities, 2019-20 will see the development and implementation of a new external FrontierSI content marketing and communications strategy. This will position FrontierSI as thought leaders in the spatial information and allied industries.

We have had past success through state-based forums which primarily focused on our partner organisations, and we will look to broaden our audience at these events to create opportunities for wider networking with growth industries.

MGA, FrontierSI and Locate19 Conferences

In the past 12 months we co-hosted the Multi-GNSS Asia Conference (MGA) 23-25 October 2018 Melbourne with RMIT, which saw 250 delegates from across Australia, south-east Asia, USA, Africa, Europe and Canada attend. Many of our government, industry and university partners also attended. We also held a FrontierSI conference with 150 attendees and had a strong presence at Locate19 with almost 30 presentations related to FrontierSI activities.

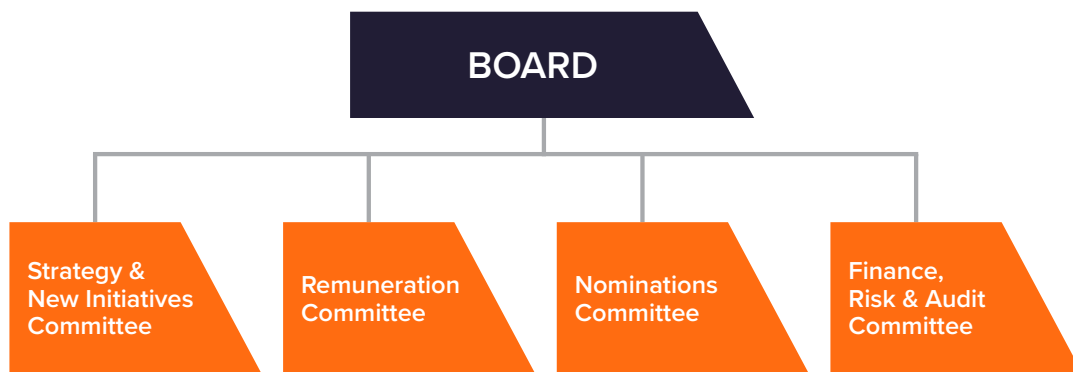# GOVERNANCE AND MANAGEMENT

Governance

Spatial Information Systems Research Limited (SISR), trading as FrontierSI is structured as an unlisted public company limited by guarantee. SISR has status as a not-for-profit charitable organisation under Subdivision 50-B of the *Income Tax Assessment Act 1998* and section 123E of the *Fringe Benefits Tax Assessment Act 1986*.

FrontierSI's partners contribute to organisational governance through participation in a nominations and appointment process of the eight-member skills-based Board who is responsible for governance and operations of FrontierSI. The Board is comprised of a mix of independent and representative members including an independent Chair and a Managing Director in the CEO.

The transition to FrontierSI included a Board refresh in 2018-19. Three new directors were appointed from 1 July 2018 and Dr Gillian Sparkes was appointed as FrontierSI Chair from 1 December 2018. Two outgoing directors deserve particular acknowledgment: Prof Mary

O'Kane, who resigned as Chair in November 2018 after 15 years of service to CRCSI and leading FrontierSI in its formative months of operations, and Mr Steve Jacoby who resigned from the Board in February 2019 after leading QDNRME's particiaption in CRCSI since 2003 and whose role as Chair of the FrontierSI Steering Committee was pivotal in securing a strong partner base and setting the structural foundations of FrontierSI.

In early 2019 the new Board completed a centre Governance review and as an outcome have adopted a Board and Committee structure which is designed to fulfil the business imperatives to closely monitor solvency and sustainability over the next 3 years while strategies are worked through and implemented for longer term viability. A further review outcome was the appointment of an additional Board director (noting the original 7-member structure) with a strong financial background and skills to supplement the existing skills of current directors.

BOARD

- Strategy & New Initiatives Committee
- Remuneration Committee
- Nominations Committee
- Finance, Risk & Audit Committee

Management Structure

FrontierSI has formally adopted a functional structure divided into three key areas:

- Operations (finance, governance, communications, administration)
- Business Development/Partner Relations
- Research and Innovation

Success is dependent on a culture which encourages cross functional collaboration and a partner focus. FrontierSI is also heavily reliant on strong partner relationships for its ongoing project activities. The majority of our **28 strong team** are based at FrontierSI's head office co-located within Data61

in Melbourne's Docklands precinct. The Business Development team are geographically dispersed to be near key partners in Western Australia, NSW/ACT and New Zealand, and several technical and managerial staff are co-located with partner project teams in ACT, NSW and Perth.

Success in FrontierSI's operating environment requires a team of highly skilled staff with core technical capabilities and a willingness to challenge themselves and the organisation to continually improve. The trialling of agile project delivery methodology, and project information sharing activities is critical to the development of the learning culture.

FrontierSI's four-member executive team bring a mix of operational skills, high quality qualifications, industry experience and new thinking to the leadership of the organisation. The executive team are supported by a management team with a broad range of technical skills and experience, pertinent to and commensurate with the roles they fulfil.

Clockwise from bottom left: Graeme Kernich (Chief Executive Officer), Nathan Quadros (Chief Commercial Officer), Phil Delaney (Chief Innovation and Delivery Officer), Melanie Plumb (Chief Operating Officer)

Board of Directors

GILLIAN SPARKES
CHAIR (Independent)

Dr Gillian Sparkes FAICD is the board Chair and Victoria's Commissioner for Environmental Sustainability. She is leading reforms in environmental monitoring, assessment and reporting in Victoria, including advocating better use of spatial information, data analytics and citizen science. She is a Director of the Country Fire Authority, Industry Capability Network Vic, the Royal Children's Hospital Foundation and is Chair of the Western Port Integrated Water Management Forum, and a Member of the MSDI (Monash) Advisory Council. Dr Sparkes has been instrumental in key improvements in how the Victorian Government pursues its digital transformation agenda for better environmental outcomes.

CHRIS THOMAS
DEPUTY CHAIR (Independent)

Chris specialises in digital re-engineering, technology and venture capital investment. Chris first became a director of a listed technology company in 1987 and is a non-executive director of Servco Australia, which operates automotive dealerships throughout Australia. Chris is also a member of the Victorian Council of the Australian Institute of Company Directors.

Chris is a graduate of The University of Adelaide and holds a Master's in Management (Technology) from The University of Melbourne.

GRAEME KERNICH
CEO

Graeme has been CEO of FrontierSI since July 2018. Graeme previously served as CEO and Deputy CEO for the Cooperative Research Centre for Spatial Information, where he was responsible for operations, including finance, compliance, legals, corporate governance, business development and commercialisation. His prior experience includes technology transfer, including negotiation of commercial agreements, commercial and route-to-market strategies, intellectual property management, licencing and project planning.

PAUL FARRELL
(Industry Partner Representative)

Paul Farrell is the CEO of NGIS Australia. He has worked with the business for 24 years in a variety of locations and helped formed significant partnerships with players such as Google, Esri and Microsoft.

Paul is involved in many boards, including Frontier SI, Pointerra and the WA Regional Development Trust. He is a co-founder of the APSEA Awards and SSSI Young Spatial Professionals, a past National Chairman of SIBA (Spatial Industry Business Association) and was previously a board member for AIIA (Australian Information Industry Association).

ABIGAIL GOLDBERG
(Independent)

In 2018 Abigail completed the full term as a Commissioner at the NSW Independent Planning Commission. She now Chairs the Independent Hearing Assessment Panels for both the City of Ryde and Willoughby Council and is an alternate Chair for the panel for the City of Sydney. She is also an alternate member for the NSW Joint Regional Planning Panels. Abigail is in addition a Gateway Reviewer for the NSW Treasury, Infrastructure NSW, Schools Infrastructure NSW and the EPA NSW.

Abigail is Executive Chair of GoldbergBlaise, a boutique consultancy providing advice to the infrastructure, planning, housing, tourism and transport sectors. She has held a number of executive positions, including CEO, Metro Transport Sydney (light rail and monorail company) and General Manager, South Sydney Development Corporation.

WENDY LAWSON
(University Partner Representative)

Professor Wendy Lawson is the Pro Vice Chancellor of Science at the University of Canterbury. She is a glaciologist with a passion for field work and has more than 30 years of experience of remote fieldwork in polar and alpine environments, including in Greenland, Svalbard, Alaska and Arctic Norway – as well as Antarctica. Also renowned for her commitment to the geospatial industry, in 2017 she received international recognition for this aspect of her work, winning the prestigious Professional of the Year Award at the annual Asia Pacific Spatial Excellence Awards in Sydney.

MICHELLE MCLEAN
(Independent)

Michelle is an experienced non-executive board director and business advisor, and holds directorships of a number of private entities. She is the Deputy Chairman of the Country Fire Authority (CFA) a volunteer and community-based fire and emergency services organisation. She also chairs the CFA Finance, Risk and Audit committee. From 1995 to 2018 Michelle was Managing Partner/CEO of Cornwall Stodart (Lawyers). Throughout this period, Michelle also spent several years on various boards and committees.

BRUCE THOMPSON
(Government Partner Representative)

Bruce Thompson is Executive Director Spatial Services in the government of NSW. He is responsible for the State's geodetic and positioning infrastructure and for its spatial and mapping functions.

Bruce has more than 30 years' experience in the spatial sector, primarily in the Queensland, Victoria and New South Wales governments. He is the Chair of the Australia New Zealand Land Information Council (ANZLIC) and a Director of PSMA Australia, Australia's national spatial data provider.

FINANCE SUMMARY

FrontierSI delivered a favourable result to budget in 2018-19, ending the year with an operating deficit of $2.3M against a budgeted deficit of $7.3M.

Contributing to FrontierSI's 2018-19 operating deficit was $2.0M of expenditure on projects committed to and with income derived and recognised within CRCSI, maintenance of investment funds while a new strategic pathway was developed, and some delays in current project expenditure. With an ongoing focus on

sustainability, FrontierSI is targeting operating surpluses of 10%, 15% and 18% respectively over the next three years.

2018-19 Financial Year Highlights:

✓ Total Income target of $6.5M exceeded by $0.4M.

✓ > than 75% of total expenditure spent on projects.

✓ $4.4M of funds in reserve at 30 June 2019.

## 2018-19 Income

Research Project Income	$4.9M
Subscription Income	$1.7M
Other Income	$0.2M
Total Income	**$6.9M**
Budget	*$6.5M*

Legend: Research Project Income (72%), Subscription Income (25%), Other Income (3%)
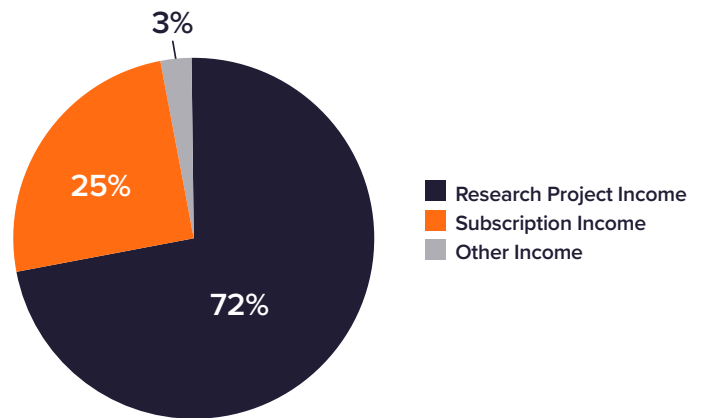
2018-19 Expenditure

Research Projects	$7.0M
Operating Costs	$2.0M
Other Expenditure	$0.2M
Total Expenditure	**$9.2M**
Budget	*$13.8M*

Legend: Research Projects (76%), Operating Costs (24%), Other Items
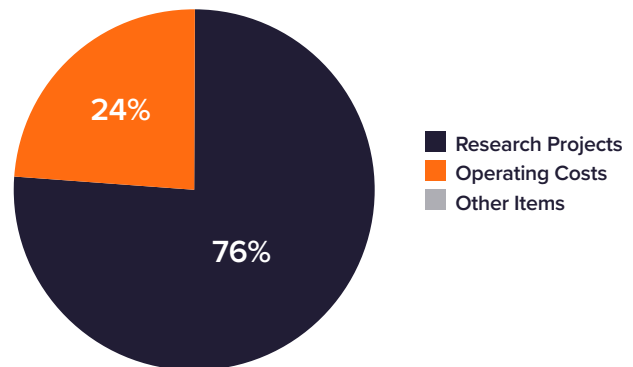
2018-19 Program Allocation

Program	Expenditure 2018-19
Positioning & Geodesy	$3.4M
Spatial Analytics	$1.9M
Spatial Infrastructures	$1.7M
Total Expenditure	**$7.0M**

Legend: Positioning (48%), Spatial Analytics (27%), Spatial Infrastructures (25%)
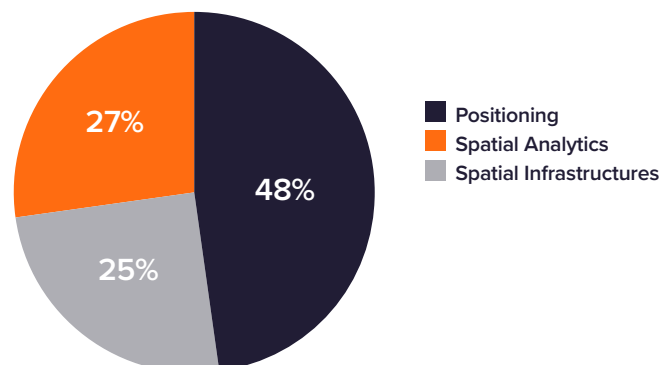
WE EXIST TO
BRING THE BEST
PEOPLE TOGETHER
TO SOLVE THE
MOST COMPLEX
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