Annual Report 2015–16

Australia's innovation catalyst

100 YRS
OF INNOVATION

CSIRO

CELEBRATING A CENTENARY OF INNOVATION

2016 marks 100 years since the establishment of the Advisory Council of Science and Industry, a precursor to CSIRO.

COVER: CSIRO's Australia Telescope Compact Array (ATCA) radio telescope near Narrabri, NSW. Using the ATCA, coupled with an innovative radio survey technique, an Australian team of astronomers led by CSIRO made breakthrough observations of invisible structures in the thin gas lying between the stars in our galaxy. The research was published in *Science* in January 2016. Further observations will be able to more precisely determine the geometry of these structures, and bring us another step closer to answering the fundamental questions about how galaxies evolve and form. See page 50 for further information. Credit: Emil Lenc.

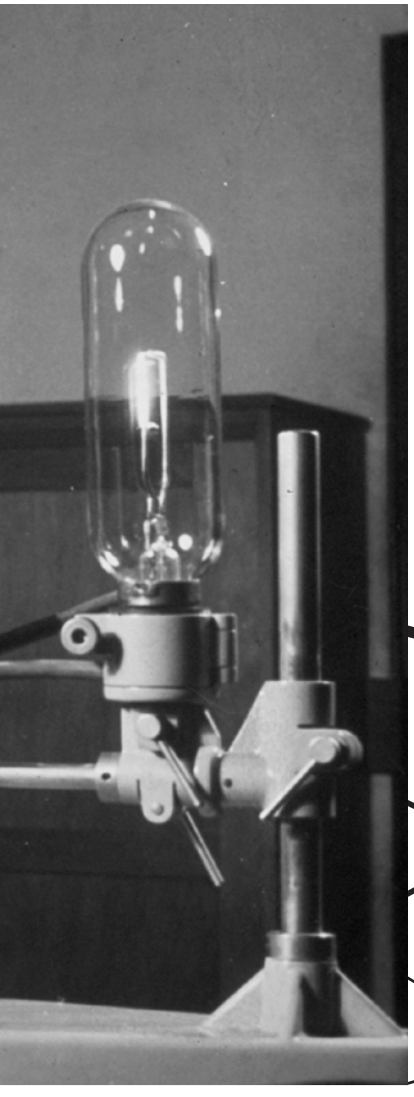
CSIRO

We do the extraordinary every day. We innovate for tomorrow and help improve today – for our customers, all Australians and the world.

Our innovations contribute billions of dollars to the Australian economy every year. As the largest patent holder in the nation, our vast wealth of intellectual property has led to more than 150 spin-off companies.

With more than 5,000 experts and a burning desire to get things done, we are Australia's catalyst for innovation.

We imagine, we collaborate, we innovate.



Our mission

Create benefit for Australia through impactful science and innovation.

Our vision

Australia's innovation catalyst, collaborating to boost Australia's innovation performance.

This report covers the financial year that ended 30 June 2016. It is also available at: www.csiro.au/annualreport2016.

www.csiro.au

CSIRO Head Office
Limestone Avenue, Campbell ACT 2601
PO Box 225, Dickson ACT 2602, Australia
T (02) 6276 6000 • **ABN** 41 687 119 230

8 September 2016

The Hon Greg Hunt MP
Minister for Industry, Innovation and Science
Parliament House
CANBERRA ACT 2600

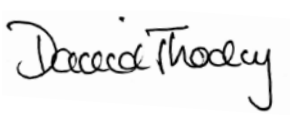
We have pleasure in submitting to you, for presentation to Parliament, the sixty-eighth Annual Report of the Commonwealth Scientific and Industrial Research Organisation (CSIRO) for the year ending 30 June 2016. This report has been prepared in accordance with the requirements of the *Science and Industry Research Act 1949* and in accordance with section 46 of the *Public Governance, Performance and Accountability Act 2013* (PGPA Act) and the *Public Governance, Performance and Accountability Amendment (Corporate Commonwealth Entity Annual Reporting) Rule 2016*.

The report was endorsed for presentation to you at the meeting of the CSIRO Board members on 8 September 2016.

The report includes an appendix comprising a report from the Chief Executive of CSIRO, as trustee of the Science and Industry Endowment Fund (the Fund), established under the *Science and Industry Endowment Act 1926*, on the operations of the Fund together with a report by the Auditor-General on the accounts of the Fund.

The Corporate Commonwealth Annual Reporting Rule requires CSIRO to report any significant activities and changes that affected the organisation or structure. During the annual reporting period, CSIRO integrated NICTA and Digital Productivity activities as Data61, which took effect from 1 July 2016. Also during this period, CSIRO reorganised its Food and Nutrition Business Unit, merging its Bioproducts and Food Programs into an expanded Agriculture and Food Business Unit, and merging the Nutrition and Health Program with the Biosecurity Business Unit to form the Health and Biosecurity Business Unit.

We commend the Organisation's achievements to you.



Mr David Thodey
Chairman of the CSIRO Board

Dr Larry Marshall
Chief Executive of the CSIRO

Contents

CSIRO operates Australia's only laboratory that evaluates the performance of fire detection systems and smoke alarms. An alarm sounder is tested in our anechoic chamber.

Part 1
Overview

Foreword

By the Chairman

It is with great honour and anticipation for the year ahead that I write this foreword. The last year, my first as Chair of CSIRO, has been an overwhelming welcome to the science of CSIRO with innovation at its very heart. I have been delighted to learn of the excellent science and inroads that CSIRO is making into the future of technology, through innovation and collaboration.

Upon appointment of my position as Chair, I would like to acknowledge the contribution that our previous Chair, Simon McKeon, made to his role on the Board. Simon completed his service to CSIRO in 2015, and was a remarkable ambassador for CSIRO, who helped to steer us through the release of our CSIRO Strategy 2020.

I was drawn to the culture of excellence at CSIRO that supports the creation of breakthrough technology and scientific knowledge. Everything CSIRO does is focused on creating measurable economic, environmental and social impact that betters our world and Australia's place in it. I have been impressed by how we seamlessly collaborate with other research institutions and partner with companies that are best placed to take new technologies to market and deliver positive impact to Australia.

The last year has been one of growth and change as we commenced implementation of the Strategy 2020. The strategy was developed in concurrence with the Minister's Statement of Expectation that highlights the need to accelerate the pace of innovation through science and technology.

The Strategy 2020 aims for us to be at the centre of business, government and the community, creating new products and services and potentially whole industries. We are working to create unique value through innovation and collaboration – our beneficiaries are the Australian people and our core customers are the Australian government, industry and international organisations that invest in innovation and technology.

Our strategy focuses on collaboration across the innovation system. CSIRO already partners with 39 universities in Australia, and together we meet the science and research needs facing our nation. The strategy sets out to identify CSIRO's role in tackling Australia's innovation challenge. What makes CSIRO suitable for this role is our breadth of research, our ability to collaborate and to integrate capability so that we can deliver solutions. I believe we have some of the best minds, science, technology and infrastructure, with a proven trackrecord.

While traditional industries will continue to play an important role in our future, we have a significant opportunity to help shape the foundations of Australia's future industries. To enable this, CSIRO has undertaken a number of changes over the last year. We have merged our Digital Productivity business with National ICT Australia, forming Data61. Data61 will bring its expertise in data-centric research and development to help guide us through technological change and digital disruption and realise the many opportunities ahead.

We have also launched the first AcceleratiON program: a program to provide a path for the best ideas in CSIRO to be identified and accelerated. The ON program is focused on improving Australia's innovation performance by helping our research teams build their entrepreneurial competencies and collaborate more with industry and the broader innovation system to understand and address global challenges. This structured, full-time program has allowed research teams to validate and develop high potential innovative ventures in partnership with experienced mentors and industry-specific experts.

I am pleased to note that in the year ahead CSIRO has been entrusted by the National Innovation and Science Agenda to run a National Accelerator and Innovation Fund to commercialise early stage innovations from CSIRO, universities and other publicly funded research bodies. I look forward to reporting on the progress of this in next year's annual report.

The safety of our staff is paramount and though much of our work in cutting-edge research and development is inherently risky – our goal is to achieve zero harm by managing, reducing and removing risk to ourselves and our environment in everything we do.

We continue to strengthen performance in gender equity and diversity. Our Diversity and Inclusion vision reflects our growing diversity and our inclusive culture to support the excellence of our science, increasing our impact for the nation and our future vibrancy.

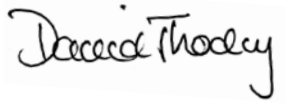
Over the last year we took part in the Science in Australia Gender Equity (SAGE) program, focused on equity and diversity evaluation and accreditation. The program specifically addresses Gender Equity in Science, Technology, Engineering and Mathematics (STEM), which along with our Indigenous Engagement Plan, forms an important part of our broader Diversity and Inclusion Strategy at CSIRO. We're proud to be an inaugural member of this initiative tackling gender equality in STEM head on. By participating in this program, we are committing to a long term partnership with the Australian Academy of Science and the SAGE Program.

We are at a point in history where the rate of technological change is unprecedented. Innovation is touching all areas of our lives and changing the face of industries, businesses and societies. Science is imperative in this technological transition to create solutions that drive this change. CSIRO is well positioned to accelerate the volume and velocity of impact from science and technology, delivering real solutions for Australia and the world.

We have made tremendous progress laying the ground work to implement the Strategy 2020, as challenging and exciting as it has been, the year ahead will be even more so as we continue to implement the goals we've set for our future.

None of us can achieve this alone, and as Chairman I know that we will be effective only by working together. Our people have a great depth of talent and opportunity, and I am honoured to work alongside them at CSIRO to deliver lasting impact for the nation.

I would like to thank the Board, the management team and all CSIRO staff for their dedication, commitment and inspiration over the last twelve months.



David Thodey
Chairman of the CSIRO Board

Chief Executive's report

One hundred years ago our nation changed forever when Prime Minister Billy Hughes established the Advisory Council of Science and Industry. Over the past century, the council evolved to become the CSIRO we know today, but deeply tied to his vision delivered in a parliamentary speech in 1916: '*Science will lead the manufacturer into green pastures by solving for him problems that seemed to him insoluble.*' Over time, the obstacles facing our nation have evolved, but our mission to overcome those obstacles has held. Our Strategy 2020 embraces excellent science to solve Australia's challenges, to make life better for all Australians. We invent with science, we solve by innovation.

I am proud to be part of CSIRO, especially this year when we celebrate the truly remarkable 100 year milestone of government investment in science. CSIRO has delivered great benefits to Australia and the world over the years, but just as we stand on the shoulders of our great forebears – building on the scientific advances of the past and forming new collaborations around the world – so too our contribution will be greater into the future. As technology takes science into every corner of our lives, now more than ever we have an opportunity to channel that science into the tools and techniques to tackle today's challenges and to plan for what's next.

This year we've mobilised our organisation to tackle these problems. We're harnessing digital opportunities with the unification of our Digital Productivity team with NICTA to form the digital powerhouse Data61, helping Australia navigate digital disruption and particularly job re-creation. We've invested in STEM education to help. We're driving Australia's only national deep-science and tech accelerator with the ON Program, collaborating across the research sector to realise value from our inventions and ignite the spirit of customer-first entrepreneurialism. We've created our new OneHealth-focused Health and Biosecurity business unit, to keep Australia healthy. We're protecting jobs and security by contributing to the new Cybersecurity Growth Centre. We're dedicating a significant amount of our resources to the threats of environmental disruption, and helping industry and environment to become partners. Our incisive forecasting and modelling are mapping the future with reports like the *Australian National Outlook*, *Australia 2030* and *Tomorrow's Digitally Enabled Workforce*. We're working with business, industry, government and the community to respond to today's disruptions and be sure we're ready to face tomorrow's.

Over the last year, we've made some tough decisions to reposition our expertise and enable new investment in emerging areas of scientific research, building a more sustainable CSIRO for the future. The greatest strength of our Strategy 2020 is that it was developed through our unique OurCSIRO crowd platform that gave voice to every one of our staff and affiliates. Our people are our greatest asset, a formidable brains trust passionate about the power of excellent science to change lives. We will continue finding new ways to fully enable, support and empower their creativity, risk taking and innovation.

FUTURE SCIENCE

In November 2015, we were honoured to be entrusted with a number of core elements in the Australian Government's National Innovation and Science Agenda. So far this year, nearly 20 innovations with the potential to disrupt industries and solve major challenges have been through the ON Program. The next round will see new heights of collaboration across the research sector, translating more of our bright ideas into impact. The CSIRO Innovation Fund will invest in the development of science-driven innovation, carrying invention from the lab bench into real world prototypes and then into the hands of new startups and existing SMEs. The newly formed digital powerhouse Data61 has been given a mandate to drive Australia's digitisation, from protecting against cyberattack to realising the potential of our new big data future.

Our Strategy 2020 committed to increasing our investment in breakthrough science to be $52 million per year in Future Science Platforms by 2020. In 2016–17, we are investing $17 million in these six new Future Science Platforms. These six areas represent an investment that has the potential to help overcome profound challenges for Australia. Some will draw on digital technologies to make strides forward for health and environment, some use our precision science to transform biological systems, and others focus on our deep knowledge of resources and manufacturing to create more sustainable industries.

COLLABORATION IS THE KEY

We must collaborate to innovate. We're strengthening the bridge connecting research, industry, government and the community, and we are focused on supporting the national innovation system to improve its performance. Collaborative approaches ensure we can tackle big challenges together and shift Australia towards open innovation for the nation, powering our future prosperity and sustainability.

Internationally, we accelerate engagement between Australia and the global innovation system to create positive economic, environmental and social impact. Not only does Australia benefit from working alongside the world's best and brightest, but as global citizens we contribute to life-changing solutions such as improved agricultural productivity in Indonesia and more

sustainable water management in Cambodia. Some of these relationships open up new markets and access, like our agreement with the Chinese Academy of Sciences, which enables greater connectivity with industry in the greater Pearl River Delta Economic Zone.

As we reflect on a big year for the organisation and chart the course for a busy and exciting year ahead, I would like to thank Simon McKeon, who served as Chairman until 2015 and welcome our new Chairman David Thodey. I would also like to thank my fellow Board members and our staff who work tirelessly for the delivery of CSIRO goals and achievements. I am lucky to work amongst a remarkable group of people, who make the national benefit delivered by CSIRO a priority in their busy lives. Together we will be able to realise the great promises and successes that will add to our proud track record. I invite you to read more about CSIRO's accomplishments and milestones in this annual report for 2015–2016.

Dr Larry Marshall
Chief Executive of the CSIRO

Highlights of 2015–16

SCIENCE IMPACT AND EXCELLENCE

A **3D-PRINTED STERNUM** was successfully implanted into a cancer patient. (pg 40)

The **ATLANTIC SALMON BREEDING PROGRAM** was assessed to have a net present value of approximately $169 million, with $79 million attributable to CSIRO. (pg 17)

Our **LAB-AT-RIG® TECHNOLOGY** is being commercialised, saving the minerals industry millions of dollars in exploration costs. (pg 41)

We delivered to the Papua New Guinea (PNG) Government the **DIGITISED BIODIVERSITY DATA OF PNG**, including hundreds of thousands of plant and animal specimens, to help them make informed management decisions for sustainable land use and development. (pg 59)

Our data analytics for the **VICTORIAN GOVERNMENT'S POWERLINE BUSHFIRE SAFETY PROGRAM** reduced the relative risk of bushfires started by powerlines by almost 16 per cent in 2015. (pg 35)

We discovered **LENSES OF INTERSTELLAR GAS IN OUR GALAXY**, and observations are bringing us closer to determining their exact geometry and answering the fundamental questions about how galaxies form and evolve. (pg 50)

Our research publications are cited **68 PER CENT MORE** often than the global average. (pg 24)

We built the optics that enabled the **DETECTION OF GRAVITY WAVES**.

The **AUSTRALIAN ANIMAL HEALTH LABORATORY** (AAHL) has been designated an International Reference Laboratory for the World Organisation for Animal Health. (pg 47)

We developed a new **MULTIPURPOSE FABRIC** with researchers from Queensland University of Technology and RMIT University, which is effective at mopping up crude oil from the surface of both fresh and salt water. (pg 19)

SUSTAINABILITY

- We discovered that we could reduce carbon emissions by approximately nine kilotonnes of carbon dioxide equivalent (CO_2-e) per year by conducting a feasibility study for on-site renewable generation, showing we could install at least five megawatts of photovoltaic (PV) cells across CSIRO sites. PV capacity is already installed across sites in New South Wales and Western Australia, with large-scale, on-site generation planned under the CSIRO Carbon Emission Reduction Strategy. (pg 79)
- Our energy consumption (electricity and gas) decreased by two per cent compared with 2014–15 and has reduced by eight per cent over the last five years. (pg 78)

PEOPLE AND CULTURE

- Our Recordable Injury Frequency Rate dropped by 30 per cent this year. (pg 76)
- We provided 7,621 development days through our learning and development curriculum, a 45 per cent increase on last year. (pg 82)
- 99 of our staff (1.8 per cent) identify as Aboriginal or Torres Strait Islander peoples, up from 22 people (0.3 per cent) five years ago. (pg 83)

ENGAGEMENT AND CONNECTIONS

- We signed a collaborative research agreement with the Chinese Academy of Sciences (CAS), which allows CSIRO and CAS to manage and conduct future projects in a broad range of science areas. (pg 20)
- We had 1,972 Scientists and Mathematicians in School (SMiS) partnerships in 1,300 schools. Thirty-two per cent of those partnerships were in rural and regional schools, and 52 partnerships in schools with more than 25 per cent Aboriginal or Torres Strait Islander students. (pg 26)
- We worked with more than 1,800 private industry customers, including 500 major Australian companies, more than 1,200 Australian small-to-medium enterprises (SMEs), and a large number of overseas corporations. We facilitated research services for more than 140 SMEs, and facilitated 74 Innovation Connections research project grants. (pg 30)
- Our first ever children's book, *Phasmid: Saving the Lord Howe Island Stick Insect*, was shortlisted for the Children's Book Council of Australia Book of the Year Award. (pg 29)

FINANCIAL PERFORMANCE

In 2015–16, CSIRO delivered a deficit from ongoing operations of $56.6 million. Our total revenue of $1,214 million included appropriation from government of $750.3 million and $463.7 million in revenue generated from other sources.

TABLE 1.1: CSIRO'S FINANCIAL PERFORMANCE BY SOURCE OF REVENUE, $M

REVENUE SOURCE	2011–12	2012–13	2013–14	2014–15	2015–16
Co-investment, consulting and services					
Australian private sector	74.2	70.1	78.5	69.4	80.1
Australian governments	201.8	190.3	179.3	181.1	147.8
Rural industry research and development (R&D) corporations	35.0	38.4	50.2	38.1	31.7
Cooperative Research Centres	30.0	16.9	14.7	9.5	10.0
Overseas entities and international	77.5	84.3	84.7	81.4	99.3
Work in progress/deferred revenue	–7.6	25.1	–13.0	–6.1	–4.0
Total co-investment, consulting and services	**410.9**	**425.1**	**394.4**	**373.4**	**364.9**
Intellectual property (IP) – royalty and licence revenues	278.5	37.5	29.1	60.8	59.7
Total research and services revenue	**689.4**	**462.6**	**423.5**	**434.2**	**424.6**
Other external revenue	61.3	44.1	43.2	44.6	37.9
Gain/(loss) on sale of assets	0.4	0.0	-	0.0	1.2
Other fair value gains and reversals	-	5.5	-	6.7	-
Total external revenue	**751.1**	**512.2**	**466.7**	**485.5**	**463.7**
Revenue from government	724.9	733.8	778.2	745.3	750.3
Total revenue	**1,476.0**	**1,246.0**	**1,244.9**	**1,230.8**	**1,214.0**
Less expenses	1,275.5	1,267.5	1,270.6	1,245.3	1,270.6
Operating result	**200.5**	**–21.5**	**–25.7**	**–14.5**	**–56.6**

Our locations and global achievements

We seek to solve problems that matter to Australia and the world, and generate positive impact for today and tomorrow. Here are some examples of our international impacts.

EUROPE

1,051 20

CSIRO, with Australian and European partners, celebrated the completion of the €8.7 million AU2EU project. The project successfully developed and demonstrated the world's first truly integrated authentication and authorisation framework, which enables trusted, secure collaborations across organisational boundaries and governmental jurisdictions.

NORTH AMERICA

868 20

We began joint spacecraft-tracking projects with NASA in 1962, and we now manage one of the three tracking stations around the world that make up NASA's Deep Space Network. In July 2015, this was the prime tracking station for the closest encounter between the New Horizons spacecraft and Pluto, taking detailed measurements and images of the dwarf planet and its moons for the first time.

LATIN AMERICA

157 5

CSIRO Chile signed a collaboration agreement with Minnovex, a trading association of mining service provider companies, to boost technological development in Chile.

SOUTH ASIA

118 9

CSIRO has been working closely with the Bangladesh Council of Scientific and Industrial Research (BCSIR), on a number of opportunities to develop new industries in Bangladesh, including mineral sands, e-waste recycling and solar energy. In August 2015, CSIRO and BCSIR signed an MOU to support this collaboration.

JOINT PUBLICATIONS

MEMORANDUM OF UNDERSTANDING

AFRICA

185 3

Our Africa Food Security Initiative has brought technical bioscience know-how to private sector millers in Kenya, allowing them to introduce Kenya's first aflatoxin-free maize, reaching about 10 million consumers across Kenya in 2016.

EAST ASIA

634 55

CSIRO developed and demonstrated an industrial-scale, smart iron blast furnace technology known as dry slag granulation. By signing an agreement on this research with Beijing Equipment Research and Design Corporation in 2015, we opened the way for savings in water, energy and greenhouse gas emissions. We are also very proud to have celebrated the 40th anniversary of our deep collaboration and connection with the Chinese Academy of Sciences.

SOUTH-EAST ASIA

159 10

We have improved market access and livelihoods for hundreds of Indonesian farmers in 2015–16 through work within our Applied Research and Innovation System in Agriculture (ARISA) program in Indonesia. The program has involved Indonesian farmers in projects using agricultural innovation.

PACIFIC

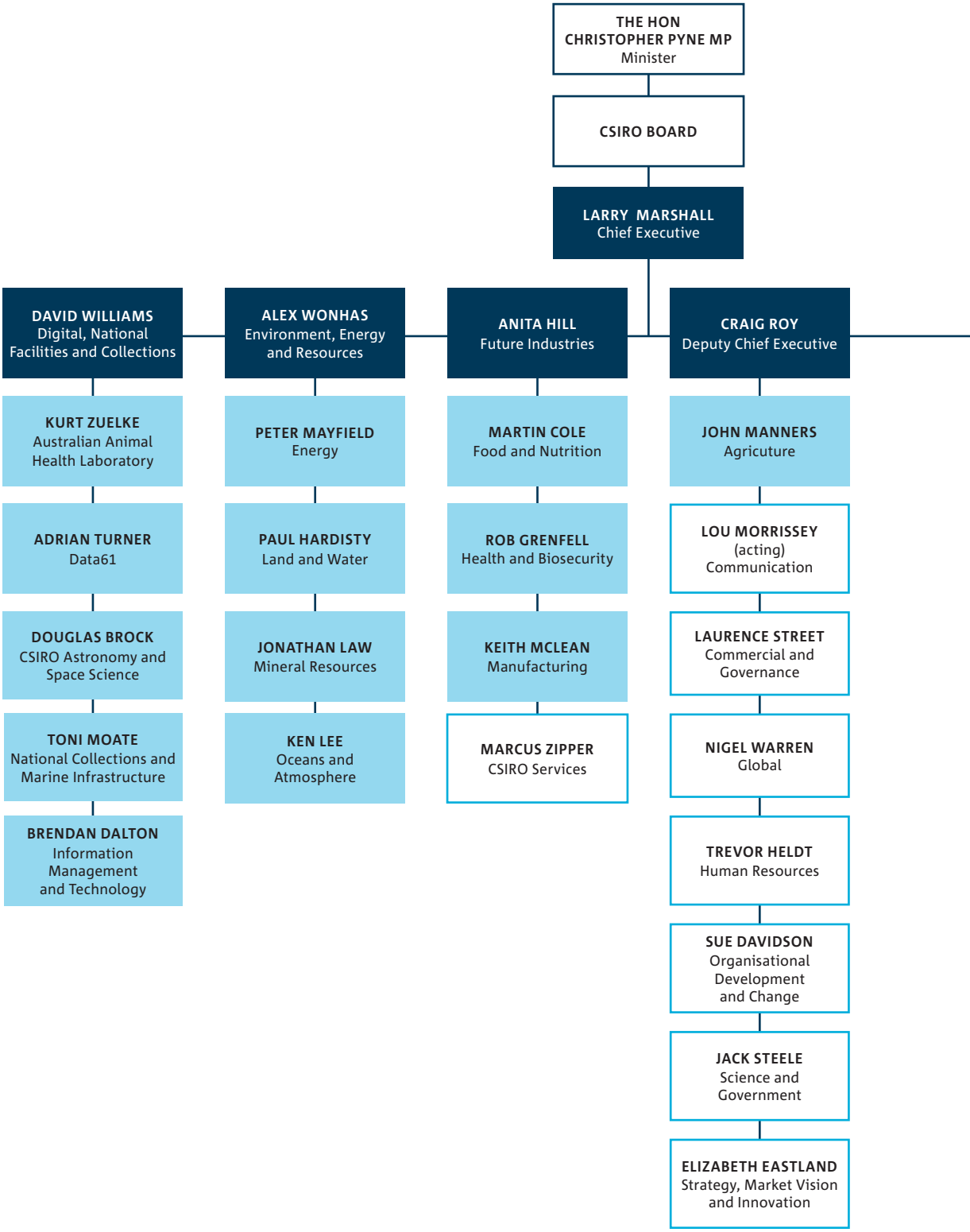
161 7

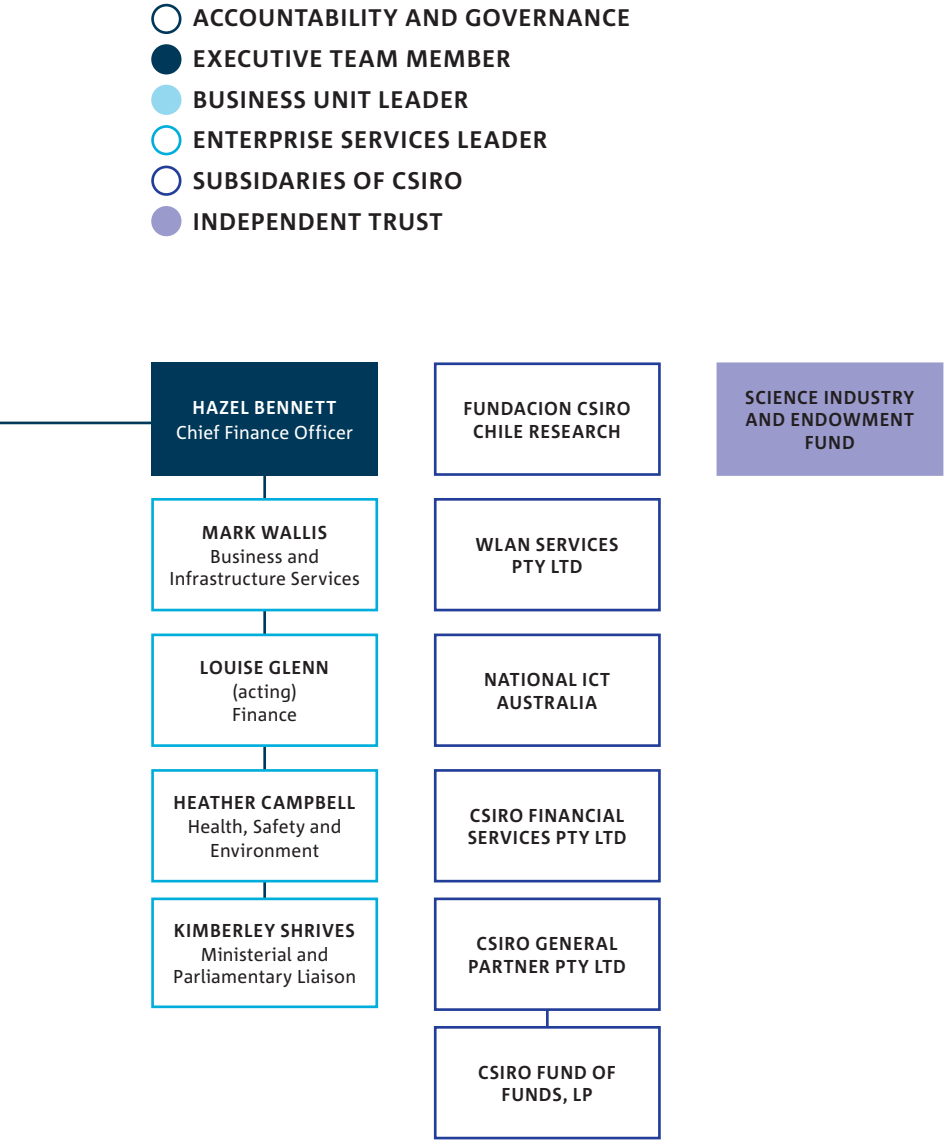
CSIRO and Australian partners have delivered an Australian Aid program called Enhancing Pacific Ocean Governance. With regional partners, we have provided national- and regional-level information systems, training and scientific support. This support is being used to develop local marine spatial planning, and inform international negotiating strategies for the Pacific countries and the Australian government in the current United Nations negotiations on managing biodiversity in areas beyond national jurisdiction.

A full list of CSIRO locations is available on page 159.

Our organisational structure

AS AT 30 JUNE 2016




ACCOUNTABILITY AND GOVERNANCE
EXECUTIVE TEAM MEMBER
BUSINESS UNIT LEADER
ENTERPRISE SERVICES LEADER
SUBSIDARIES OF CSIRO
INDEPENDENT TRUST
HAZEL BENNETT
Chief Finance Officer
MARK WALLIS
Business and Infrastructure Services
LOUISE GLENN
(acting)
Finance
HEATHER CAMPBELL
Health, Safety and Environment
KIMBERLEY SHRIVES
Ministerial and Parliamentary Liaison
FUNDACION CSIRO CHILE RESEARCH
WLAN SERVICES PTY LTD
NATIONAL ICT AUSTRALIA
CSIRO FINANCIAL SERVICES PTY LTD
CSIRO GENERAL PARTNER PTY LTD
CSIRO FUND OF FUNDS, LP
SCIENCE INDUSTRY AND ENDOWMENT FUND

Ulysses butterflies. The Australian National Insect Collection (ANIC) is the world's largest collection of Australian insects and related groups such as mites, spiders, nematodes and centipedes, housing over 12 million specimens. ANIC is recognised nationally and internationally as a resource for understanding biodiversity and managing biosecurity.

Part 2
Annual performance statements

Introductory statement

We, the CSIRO Board, as the accountable authority of CSIRO, present the 2015–16 annual performance statements as required under s39(1)(a) of the *Public Governance, Performance and Accountability Act 2013* (PGPA Act). These annual performance statements are based on properly maintained records, and accurately present CSIRO's performance in accordance with s39(2) of the PGPA Act.

Purpose

CSIRO is an Australian Government statutory authority within the Industry and Science Portfolio, operating under the provisions of the *Science and Industry Research Act 1949* (SIR Act). Our primary purpose is defined through the functions we undertake for the benefit of Australia, as set down in the Act.

Our primary purpose is to conduct scientific research and provide services to address the problems facing industry and the nation. CSIRO is charged with hosting the national research infrastructure on behalf of the scientific community to assist with delivering research. CSIRO must also assist in the uptake and use of scientific results to achieve national objectives and responsibilities.

Additionally, CSIRO is tasked to act as an effective catalyst within the innovation system, with a focus on:

- connecting individuals, associations and industry across the world around scientific research
- contributing to the development of the next generation of scientists
- providing opportunities and financial support for partnerships and mentoring
- disseminating knowledge.

Results

CSIRO continues to play an important role in Australia's national innovation system. Consistent with our responsibilities outlined in the SIR Act, we aim to deliver innovative solutions for industry, society and the environment, and to see our science used to make a positive impact for the future of Australia and humanity.

Fundamental to this outcome is our focus on:

- connecting and collaborating across the innovation system to help Australia gain access to global knowledge
- managing research capabilities and facilities that are critical for the nation to use opportunities and respond to challenges
- promoting and supporting the science sector by supervising postgraduate students, conducting science education programs for school students and teachers, and raising community awareness of our activities and science
- acting as a trusted advisor to the nation.

The activities and achievements outlined in this section of our annual report provide evidence of our performance against our Corporate Plan 2015–16[1] and the Portfolio Budget Statements 2015–16[2]. In addition to this report to Parliament, we also monitor our performance throughout the year by providing:

- regular reports to the CSIRO Executive Team and Board to assist with their decision-making and governance responsibilities
- detailed planning and review processes operating at a range of levels, including Business Units, functional areas and individuals.

1 CSIRO's Corporate Plan is available at: www.csiro.au/~/media/About/Files/CSIROCorporatePlan2015-16-PDF.pdf
2 CSIRO's Portfolio Budget Statement is available at: www.csiro.au/en/About/Our-impact/Reporting-our-impact/Performance-reviews/Portfolio-budget-statement

PERFORMANCE AGAINST OUR STRATEGY

TABLE 2.1: PERFORMANCE SUMMARY AGAINST OUR STRATEGY OBJECTIVES

CRITERIA SOURCE: CORPORATE PLAN 2015–16	
PERFORMANCE CRITERION	**RESULT AGAINST PERFORMANCE CRITERION**
Evidence of progress towards, and delivery of, impact objectives based on mixed-method evaluation, including external review outcomes, independently validated impact studies, verifiable evidence of uptake and adoption, and periodical whole-of-CSIRO impact assessments	CSIRO conducted eight externally validated impact assessments, in Manufacturing, Agriculture, and Oceans and Atmosphere, demonstrating significant economic, environmental and social impacts. Net present values (NPVs) totalled approximately $1 billion. A comprehensive assessment of impact is also conducted in Business Unit Reviews. Although reviews were deferred in 2015–16, due to organisational change effects, four reviews are scheduled in 2017.
Maintain our customer satisfaction using our Customer Willingness to Recommend net promoter score, maintaining a result above 8	Starting in 2015–16, CSIRO adopted the industry benchmark Net Promoter Score (NPS) methodology to assess customer satisfaction, as the existing 'Customer Willingness to Recommend' score was found to be a less effective and reliable measure to report. The NPS for 2015–16 is +11, a favourable result.
Increase the number of active technology licences from our research over base year 2014–15	The total number of active licences recorded as at 30 June 2016 was 347, which is an increase of 25% or 71 active licences more than the previous year.
Increase external revenue, particularly from industry and international sources, as a per cent of total expenditure from 38% to 45% by 2019–20	The external revenue result for 2015–16 is 36.4% of total expenditure. A review of the forward trajectory is recommended to ensure alignment with approved budget and strategic priorities.
Increase internal and external collaboration through the assessment of staff mobility across Business Units and our external engagement with industry and other stakeholders	External collaboration is trending upwards by approximately 2%, based on 3–5 year rolling averages, with increased rates of supervision of higher degree students by CSIRO researchers and rates of co-publication with external partners, while inclusion of external capability in CSIRO projects through sub-contracting has reduced slightly. Internal mobility and collaboration is stable, with 11% of full-time equivalent (FTE) of staff capacity deployed outside of their program areas.
Increase the diversity of our leadership cohort, including gender, non-English speaking background, and Aboriginal and Torres Strait Islander people	The representation of women in middle to senior leadership roles across CSIRO has increased from 28% last year to 29% in 2015–16. Engagement of Aboriginal and Torres Strait Islander people has increased from 1.2% to 1.8%, and the percentage of staff of non-English speaking background remains unchanged at 20.6%.
Increase our innovation capacity across all staff cohorts over the base year of 2015–16, as evidenced by results from the CSIRO staff survey	CSIRO did not undertake an all-staff survey in 2015–16 and therefore a measure of our innovation capacity is not available. We undertook an all-staff survey in July 2016, and the result will be reported in CSIRO's annual performance statements for 2016–17. The AcceleratiON Program successfully launched this year and offers insights into the evolution of our culture and activity towards innovation.

CRITERIA SOURCE: CORPORATE PLAN 2015–16	
PERFORMANCE CRITERION	**RESULT AGAINST PERFORMANCE CRITERION**
Increase staff safety via 'Zero Harm' policy of continuous improvement of Recordable Injury Frequency Rate (RIFR) to improve on baseline RIFR of 14.3 per million hours as at 30 June 2015	In 2015–16 we had a RIFR of 10.3 per million hours worked, which represents a drop of 30% compared with our baseline at 30 June 2015.
Increase our investment in future science and technology platforms to 250% of FY2015 budget, including capability development and central competitive funds	In 2015–16, our investment in future science was 88% of the 2014–15 amount. Investment in ResearchPlus programs to attract, support and develop early- and mid-career researchers was maintained. The intention to increase investment in new Future Science Platforms (FSPs) was deferred to allow a comprehensive process for identifying and prioritising the new FSP portfolio with all staff.

ANALYSIS OF PERFORMANCE

CSIRO developed its Strategy 2020 in concurrence with the Minister's Statement of Expectations from 2015. Focusing the strategy upon innovation, impact from excellent science, and working with business to translate research outputs into commercial outcomes directly responds to the Australian Industry Innovation Competitiveness Agenda.

Our achievements this year were delivered in a tough external revenue environment. To support the organisation achieving its longer term strategic objectives, this year Business Units undertook 'Deep Dive' sessions with the Executive Team, an additional planning process linked to our investment decision framework.

We have implemented and communicated our strategy, as well as our investment and disinvestment processes. We have identified areas for improvement in this process and are taking action for the changes needed. Remaining focused on our core purpose, vision and mission has greatly assisted us to demonstrate actions and achievement towards our goals.

In order to maximise funding sources, members of the national innovation system, including CSIRO, must improve their agility by growing sources of revenue from non-government, and specifically international, customers. It is also essential to reduce 'red tape' through continual and coordinated improvements to organisational operating models.

Evidence of economic, social and environmental impacts through demonstrated uptake and adoption of research outputs

The evidence for impacts from CSIRO activities is obtained from a mixed methods approach, including results from Business Unit reviews and impact case studies, which are conducted via independent assessments. CSIRO did not conduct any Business Unit reviews this year due to the organisational focus on the new processes and structures required to support the delivery of the strategic objectives. Reviews will re-commence in 2017, with four reviews scheduled.

This year, eight independent assessments of projects from Agriculture, Manufacturing, and Oceans and Atmosphere were conducted[3]. The analyses were undertaken using the CSIRO impact evaluation methodology[4]. Net present values (NPVs), under a seven per cent real discount rate, totalled approximately $1 billion. Examples demonstrating significant economic, environmental and social impacts are below:

The assessment of the Atlantic salmon breeding program demonstrated economic impacts. Atlantic salmon is the highest valued commercial fishery in Tasmania. To ensure sustainable growth in the industry, CSIRO collaborated with Salmon Enterprises of Tasmania Pty Ltd on a seven-year research and development (R&D) co-investment project to establish a selective breeding program in 2004. Based on conservative assumptions, the NPV of the salmon breeding program is approximately $169 million, with $78 million attributable to CSIRO.

Economic and social impacts are demonstrated through the assessment of CSIRO's cereal rust research, which is part of the Australian Cereal Rust Control Program funded by the Grains Research and Development Corporation. Rust diseases are a global threat that can only be countered by the development of rust-resistant varieties. At present, 60 per cent of about 100 wheat cultivars grown in Australia have resistance genes that are tagged by CSIRO-developed markers. The improved capacity of growers to prevent rust epidemics is likely to contribute to greater stability in production and, at a national level, a higher level of food security.

The conservative estimate of the NPV of CSIRO's rust research for the wheat industry is $382 million – $290 million of that is attributable to CSIRO.

Economic and environmental impacts derived from CSIRO research are also illustrated in the assessment of the eReefs project. The eReefs information platform is a marine modelling system built to inform decisions about managing the Great Barrier Reef. The issues that eReefs can help manage include the quality of water, hydrodynamics conditions for navigating safely or responding to an incident, and the likely occurrence or spread of ecological pests. The eReefs project is a collaboration between the Great Barrier Reef Foundation (whose funders include: BHP Billiton, Mitsubishi, and the Australian and Queensland governments), the Bureau of Meteorology (BOM), CSIRO, the Australian Institute of Marine Science and the Queensland Government. Based on conservative assumptions, the NPV of benefits from the project by 2025–26 is estimated at about $80 million.

Maintain our customer satisfaction

During 2015, CSIRO undertook a review of the current 'Customer Willingness to Recommend' methodology. It was found that the measure was not an effective indicator to report and the Board agreed to shift to the industry benchmark Net Promoter Score (NPS) methodology. The NPS for 2015–16 is +11, a favourable result[5].

The survey results show that customers trust CSIRO and feel that our staff are empathetic, ethical, professional and honest. This is good news, given the changes we have instigated in the year. According to our customers, CSIRO's strengths are empathy, trust, reliability and excellence. The quality of our science is second to none; we are innovative and committed to customer needs.

The survey also identified opportunities for improvement, including maintaining our capability and improving competitiveness, contractual and intellectual property (IP) processes, which are already underway as a specific focus of our Strategy 2020 customer-first initiative.

3 The full reports are published at: www.csiro.au/en/About/Our-impact/Evaluating-our-impact
4 The CSIRO Impact Evaluation Guide is available at: www.csiro.au/en/About/Our-impact/Our-impact-model/Ensuring-we-deliver-impact
5 The survey and analysis were undertaken by a leader in the industry, Insync, who have surveyed 11 other government and industry organisations in the past 14 months. CSIRO's results compare favourably with those of the other organisations.

Increase the number of active technology licences

Active technology licences are used as a key indicator of R&D uptake and adoption by customers and collaborators. The total number of active licences recorded as at 30 June 2016 was 347, which is an increase of 25 per cent, or 71 active licences, more than 2014–15. This includes 125 patent licences, 111 copyright licences, 50 know-how licences and 34 Plant Breeder's Rights. The reported result is an aggregate count of all executed IP licences currently in force, including both revenue- and non-revenue generating agreements and indirect licences. Of these 347 licences, over the last three years, 146 have generated revenue. For details of our IP portfolio, see page 29–30.

Increase external revenue

The total external revenue was in line with the budget, delivering revenue from industry, government and international customers of 36.4 per cent of total expenditure. The moderated emphasis on external earnings does vary noticeably from the aspiration to derive funding for 39 per cent of expenses from external sources this year and represents a focus on sustainability during a year of transition into the new strategic context. A review of the forward trajectory is recommended to ensure alignment with approved budget and strategic priorities.

Increase internal and external collaboration

The external collaboration metric is based on formal publications, project contracts and research student connections. The increase of two per cent from the previous year is anticipated to continue as new initiatives stimulate collaboration by increasing co-supervision of research students and drawing more research capability into CSIRO-led projects from other research agencies. Internal mobility and collaboration, as assessed through staff deployment outside of their program areas, is stable, with 11 per cent FTE deployed outside their program areas.

CSIRO IS AUSTRALIA'S LARGEST PRODUCER OF RESEARCH PUBLICATIONS IN FOOD AND AGRIBUSINESS.

Joint research publications

Our number of collaborative publications has more than doubled since 2006. In 2015, 89 per cent of our publications were collaborations with authors from other institutions, and 64 per cent were produced with authors from other Australian institutions. We have also significantly increased the rate of collaboration with organisations overseas, as measured by the number of joint publications. In 2015, 55 per cent of our scientific publications were co-authored with an international author.

Science alignment with industry sectors

The Industry Growth Centres Initiative is an industry-led approach to focus science and research in key areas with the aim of delivering commercial outcomes. This initiative covers six industry sectors:

- Food and Agribusiness
- Mining Equipment, Technology and Services
- Medical Technologies and Pharmaceuticals
- Oil, Gas and Energy Resources
- Advanced Manufacturing
- Cyber Security.

CSIRO's output in Australian research is as follows, using publications as a metric for output:

Food and agribusiness

In terms of research publications in food and agribusiness, CSIRO is Australia's largest producer and contributes to 16 per cent of Australia's publications output. This sector represents a significant proportion (15 per cent) of CSIRO R&D activities. CSIRO's food and agribusiness research is of outstanding quality and is 88 per cent more cited than the world average. CSIRO is ranked first in Australia for patent output.

Mining equipment, technology and services

CSIRO is Australia's largest producer of research publications in this field, and represents 14 per cent of the country's total output. The sector represents nine per cent of the CSIRO's total output. CSIRO research in this sector is good, and is 36 per cent more cited than the global average. We are ranked third in Australia for patent output.

Medical technologies and pharmaceuticals

This is a minor sector for CSIRO and we are not highly ranked in terms of Australian publication output. CSIRO is ranked third in Australia for patent output, despite this being a minor field for CSIRO and a major one for Australia.

Oil, gas and energy resources

While this sector is a relatively minor area for CSIRO (three per cent), our contribution to Australian output is the largest (13 per cent). Therefore, CSIRO's contribution to this sector is critical. CSIRO's research in this sector is of strong quality and is 52 per cent more cited than the world average. It is ranked first in Australia for patent output.

Advanced manufacturing

CSIRO is the fourth-largest producer of advanced manufacturing research publications in Australia and contributes 10 per cent of the country's output. This sector is a significant proportion (11 per cent) of CSIRO's R&D activities. CSIRO's research quality is good, and is 46 per cent more cited than the world average.

Cyber-security

CSIRO is the seventh-largest producer of cyber security research publications in Australia, contributing six per cent of the country's output. This sector represents four per cent of CSIRO's R&D activities. The organisation's cyber security output is good quality, and is 34 per cent more cited than the world average.

University collaboration

CSIRO partners with universities to ensure the best available research is used to deliver impact in areas of national priority. In 2015–16, CSIRO worked with 39 Australian universities in a range of activities. These universities were partners in 55 per cent of CSIRO's research publications and, in partnership with the universities, CSIRO supervised 801 postgraduate research students. Other highlights are:

We developed a new multipurpose fabric with researchers from Queensland University of Technology and RMIT University. The fabric, which is covered with semi-conducting nanostructures, is able to repel water while, at the same time, attracting oil. Testing showed that it is effective at mopping up crude oil from the surface of both fresh and salt water.

We jointly discovered a molecule that enables bone marrow stem cell collection from the blood within an hour – a process that, with current best practice, normally takes several days. CSIRO scientists worked within the Australian Regenerative Medicine Institute at Monash University on the molecule. The collected donor stem cells can be used to treat leukaemia patients. This research is now being progressed towards clinical trials.

In 2015-16, two teams with participants from four universities participated in the CSIRO accelerator program, AcceleratiON. From July 2016, CSIRO will expand AcceleratiON to all Australian universities and Commonwealth publicly funded research agencies. This will be an opportunity to build deep collaboration between researchers, entrepreneurs, investors, start-ups and established companies.

Industry collaboration

In 2015–16, CSIRO earned approximately $120 million of external revenue through co-investment, consulting and contract research, and testing contracts with Australian and international private sector partners and clients. Examples of notable new contracts include arrangements with Chevron Australia Business Unit and Google Life Sciences.

In 2015–16 we worked with over 1,800 private industry customers, including 500 major Australian companies, more than 1,200 Australian small-to-medium enterprises (SMEs), and a large number of overseas corporations. Major strategic-level engagements include Boeing, Bayer AG, Australian Solar Institute, Cotton Seed Distributors, Australian National Low Emissions Coal Research & Development, BHP Billiton Group and AMIRA International.

Building on the strategic customer program, CSIRO's Business Development planning group initiated a series of 11 customer-focused workshops to identify impact and growth opportunities. Programs focused on both private and public sector entities producing an action plan for their target customer relationship.

International collaboration

In line with CSIRO's Strategy 2020, the pursuit of a global outlook has strongly informed CSIRO's activities in 2015–16. Our connections with international universities and research institutes connect us to the 96 per cent of research that happens outside Australia, and provides access to essential data and expertise. By partnering with SMEs and major international companies we provide opportunities for Australian industry to join global value chains. Our science supports Australian foreign policy and trade agendas, including alleviating poverty and improving market access for Australian exporters and trading partners, particularly in Asia.

As an example, during 2015–16 our ARISA program in Indonesia involved hundreds of Indonesian farmers in projects using agricultural innovation to improve their market access and livelihoods. We are also very proud to have celebrated the 40th anniversary of deep collaboration and connection with the Chinese Academy of Sciences (CAS).

CSIRO works with global partners on issues of importance to Australia and the world. For example, in September 2015, the multimillion dollar Great Australian Bight Deepwater Marine Partnership between Chevron and CSIRO was launched. The partnership aims to answer questions about the geology and ecology of this unique region. In 2015–16 CSIRO also signed a collaborative research agreement with the CAS technology transfer hub in Foshan that allows CSIRO and CAS greater connectivity with industry in Foshan and the greater Pearl River Delta Economic Zone. This agreement will enable CSIRO and CAS to establish a governance structure to manage and conduct future projects in a broad range of science areas.

Cooperative Research Centres

The Cooperative Research Centres (CRC) Programme supports industry-led collaborations between researchers, industry and the community.

Since the programme commenced in 1991, 211 CRCs have been funded by the Australian government, and 33 active CRCs are operating in 2015–16. CSIRO has participated in over 140 CRCs during its lifetime and contributed to 16 during the 2015–16 reporting period. The CRC for Optimising Resource Extraction gained continued funding to 2021. CSIRO's total cash and in-kind contribution to CRCs was $9.1 million for the year.

Increase the diversity of our leadership cohort

The gender representation across CSIRO, regardless of role, remained unchanged at 40 per cent women and 60 per cent men over 2015–16. Overall representation of women in middle to senior leadership roles (science-specific and enterprise-support roles) across CSIRO increased slightly from 28 per cent in 2014–15 to 29 per cent in 2015–16.

The science-specific leadership representation remained unchanged at 21 per cent from the previous year. CSIRO's participation in the Science in Australia Gender Equity (SAGE) program aims to develop initiatives to support the increase of women's representation in leadership within CSIRO and across Science, Technology, Engineering and Mathematics (STEM) more broadly over the coming years. There is additional information on these initiatives on page 83.

Employment of Aboriginal and Torres Strait Islander people has increased from 1.2 per cent to 1.8 per cent this year through the ongoing delivery of initiatives within our Indigenous Engagement Strategy, which is detailed on page 83–84.

The percentage of staff reporting a non-English speaking background remains unchanged at 20.6 per cent. To meet diversity and inclusion objectives, diversity and inclusion reference groups and plans have been established across all Business Units.

WE JOINTLY DISCOVERED A MOLECULE THAT ENABLES BONE MARROW STEM CELL COLLECTION FROM THE BLOOD WITHIN AN HOUR. THE COLLECTED STEM CELLS CAN BE USED TO TREAT LEUKAEMIA.

Innovation capacity

The AcceleratiON Program, launched during 2015-16, is an intensive three-month program for teams of CSIRO staff and external collaborators to develop their ideas into real commercial opportunities. It has been a highlight of evolving our culture and activity towards innovation. This past year, nine teams completed the program. As a testament to its significance, the Australian Government, through the National Innovation and Science Agenda, has funded CSIRO to expand the program to universities and other publicly funded research agencies.

The first staff survey, measuring innovation capacity, was undertaken in July 2016, with the results to be reported in the annual performance statements for 2016–17.

Increase staff safety

In the last 12 months, five fewer staff experienced a lost-time injury than in 2014–15, with a concurrent reduction of our Lost Time Injury Frequency Rate (LTIFR) from 3.7 per million hours worked in 2014–15 to 3.3 in 2015–16.

The Medical Treatment Injury Frequency Rate (MTIFR) has dropped to 7.0 in 2015–16, with an increased focus on preventing musculoskeletal

and low-frequency, but potentially serious injuries. Initiatives have continued to encourage staff to avoid placing themselves at risk and to report body-stressing injuries early before they develop into more disabling injuries. This has resulted in a significant drop of 30 per cent in the rate of recordable injuries, demonstrating the effectiveness of the programs.

The number of incidents reported to Comcare and other safety-related regulators also decreased by more than 20 per cent in 2015–16.

For more information on our health and safety programs see pages 76–77.

Increase our investment in future science and technology platforms

CSIRO's Future Science Platforms (FSPs) are an investment in new interdisciplinary and cross-organisational science. The investment underpins innovation and has the potential to help reinvent and create new industries for Australia. The portfolio of FSPs, along with overall growth of our investment, is a significant focus of our Strategy 2020. Work on an approach and process for identifying and prioritising this new portfolio commenced during the year, including a significant challenge on the OurCSIRO crowdsourcing platform to encourage staff to contribute ideas in support of the proposed FSP candidates.

The comprehensive assessment and engagement process meant investment was deferred to 1 July 2016 for six new FSPs. With the funding decision, we are on track to meet investment targets in future years. Our ongoing investments in attracting, supporting and developing early- and mid-career researchers, supporting international researcher mobility and funding seminars to explore cutting-edge science were maintained as part of a redesigned suite of grants programs for staff.

PERFORMANCE OF PORTFOLIO BUDGET PROGRAMS

CSIRO received approximately 59 per cent of its operating revenue in appropriation funding from the Commonwealth Budget. Our commitment to the parliament and people of Australia, set out in the Portfolio Budget Statements (PBS) 2015–16, is to contribute to the following outcome[6]: *Innovative science and technology solutions to national challenges and opportunities to benefit industry, the environment and the community, through scientific research and capability development, services and advice.*

This is achieved through three Programs:

- Research – National Flagships, Science and Services
- National Research Infrastructure – National Facilities and Collections
- Science and Industry Endowment Fund.

The following sections provide a report against the deliverables and key performance indicators specified for each Program in the PBS. Table 2.2 outlines a summary of our consolidated financial performance by PBS Program.

TABLE 2.2: CSIRO (CONSOLIDATED) FINANCIAL SUMMARY BY PBS PROGRAM 2015–16, $M

	ACTUAL	PBS BUDGET	VARIANCE
Government revenue	750.3	749.7	0.6
External revenue	529.8	462.2	67.7
Total revenue	**1,280.1**	**1,211.8**	**68.3**
Program 1.1 (Research – National Flagships, Science and Services)	1,171.1	1,095.8	75.3
Program 1.2 (National Research Infrastructure – National Facilities and Collections)	161.8	157.5	4.3
Program 1.3 (Science and Industry Endowment Fund)	15.3	23.8	–8.5
Total expenses	**1,348.2**	**1,277.1**	**71.1**

6 The relevant section of the Portfolio Budget Statement can be viewed at: www.industry.gov.au. The outcome is the formal legal statement of the purpose for which funds are appropriated to CSIRO.

Program 1.1:

Research – National Flagships, Science and Services

CSIRO's Research Program activities deliver economic, social and environmental impacts to the nation by providing advice, information and solutions.

CSIRO commits the majority of its resources to this program through large-scale, multidisciplinary research partnerships with Australian universities, publicly funded research institutions, the private sector and selected international organisations. CSIRO also provides technical and advisory services to industry and government. CSIRO Services runs student education programs and provides technical and engineering services, SME support and foresight advisory services.

Our science outreach activities aim to promote the importance of CSIRO science and its application to students, parents, teachers and the Australian community. We support undergraduate, postgraduate and postdoctoral researchers to boost the calibre of researchers working in the Australian community and strengthen Australia's future innovation capacity. We also operate CSIRO Publishing, an independent science and technology publisher which has a global reputation for quality products and services covering a wide range of scientific disciplines.

This year our research program continued to perform well. Table 2.3 provides an overview of the evidence against each performance criterion, followed by a more detailed analysis.

MORE THAN 86 PER CENT OF OUR RESOURCES WERE COMMITTED TO THIS PROGRAM, WITH THE AIM OF ACHIEVING MAJOR, LONG-TERM BENEFITS TO AUSTRALIA.

TABLE 2.3: PERFORMANCE SUMMARY FOR PROGRAM 1.1

CRITERIA SOURCE: CORPORATE PLAN 2015–16; PORTFOLIO BUDGET STATEMENTS 2015–16, PROGRAM 1.1, PG 142	
PERFORMANCE CRITERION	**RESULT AGAINST PERFORMANCE CRITERION**
Maintain or increase the number of refereed publications	The number of refereed publications has increased by 8.5% over the past year. Published journal articles increased from 3,176 to 3,385 between 2014 and 2015. Refereed conference papers also increased, from 518 in 2014 to 595 in 2015.
Maintain or improve science excellence in CSIRO research capabilities and the impact of their research outputs as assessed through a rolling program of rigorous peer review	Our citation impact has continued to improve over the last decade. CSIRO articles cited perform 68% better than the global average for 2015, a considerable increase from 46% for 2014. There are 14 research fields in which we rank in the top 1% globally by total citation count.
Maintain customer satisfaction	Starting in 2015–16, CSIRO adopted the industry benchmark Net Promoter Score (NPS) methodology to assess customer satisfaction, as the existing 'Customer Willingness to Recommend' score was found to be a less effective and reliable measure to report. The NPS for 2015–16 is +11, a favourable result.
Awareness of science by CSIRO stakeholders	90% of Australians are aware of CSIRO, a 1% increase from 2015. This period also saw an improvement in perceptions, with 75% holding a positive view of CSIRO in 2016, compared to 63% in 2015.
Utilisation and success of science outreach programs	Utilisation and success of science outreach programs has continued. The number of school students participating in science education programs has reduced, due to the closure of state-based centres in late 2014, but visitor numbers to our radio astronomy visitor centres have increased, participation in the Scientists and Mathematicians in School (SMiS) program has increased and a new pilot teacher professional learning program commenced in 2016.
Evidence of economic, social and environmental impacts through demonstrated uptake and adoption of research outputs	The total number of active technology licences recorded as at 30 June 2016 was 347, which represents an increase of 25%, or 71 active licences, more than the previous year. 44% of CSIRO's patent portfolio is either subject to a research right, arose as a result of collaborative activity, was used as background IP in a collaboration/evaluation or is subject of a commercial licence.

ANALYSIS OF PERFORMANCE

Since its inception, CSIRO's point of difference has been its mandate to deliver benefits to the nation. Over the past years, CSIRO developed and implemented a framework to allow the organisation to plan, monitor and evaluate its impact. Reporting impact from research has now become a dominant discussion and anticipated inclusion into what will be required from Australian universities, so CSIRO's competitive advantage in this space will be challenged. The research sector's ability to respond to this expectation will grow over time, and significant capacity building will be required.

Our innovation system continues to focus on identifying high-value research and programs with benefits to a wide range of stakeholders to enable the adoption of science and technology. This includes a concentrated effort in linking research to industry, and the pursuit of a next-generation, STEM-qualified labour force remains an emphasis of the Chief Scientist.

High aspirations to scientific excellence from Australia's publicly funded research agencies and universities continue. Empowered creativity, risk-taking and collaborative innovation are seen as leading areas of growth for the nation because they embrace diversity and inclusion, as well as expanding leadership opportunities.

Maintain or increase the number of refereed publications

The number of published, refereed CSIRO journal articles and reviews has been trending upwards over the last five years (see Figure 2.1), with an increase from 3,176 to 3,385 between 2014 and 2015. The number of refereed conference papers has also increased: from 518 in 2014 to 595 in 2015. Overall, the total number of refereed publications has increased by eight per cent over the past year.

Journal articles are the main type of research publications produced by CSIRO, followed by conference papers (see Figure 2.2). In addition, CSIRO produced 695 client reports and 395 technical reports during 2015.

Maintain or improve science excellence in CSIRO research capabilities

Research publication performance is often measured in the scientific community by counting citations: the references from one article to another in its bibliography. When one piece of work cites another, this is taken as recognition of value and academic impact. The more citations an article has received, the more impact it has had on its field.

Citations can be expressed relative to the global average performance, accounting for the age and subject of publications. A result of 1.0 is equal to the global average, 1.2 is 20 per cent more cited and 0.75 is, accordingly, 25 per cent less cited. Overall, our citation impact has continued to improve over the last decade. CSIRO articles cited have performed 68 per cent better than the global average for 2015, a considerable increase from 46 per cent for 2014.

CSIRO produces publications in a range of research fields. Figure 2.3 shows the top 14 fields in which we rank in the top one per cent globally (by total citation count). Fifty-one per cent of our publications are in the four fields for which we are most strongly ranked for citations (that is, in the top 0.1 per cent).

Another robust and established metric is ranking articles by citation count based on percentile performance, compared with all other articles of the same type and in the same subject area. In 2011–15, three per cent of CSIRO publications were in the top one per cent of articles globally, 10.5 per cent in the top five per cent and 18.5 per cent in the top 10 per cent. All three of these levels equalled or improved on percentages from the period 2010–14. These results demonstrate that our share of the very best research output is substantially above average and continues to improve.

FIGURE 2.1: CSIRO PUBLICATION OUTPUT AND CITATION IMPACT BY YEAR, 2011–15

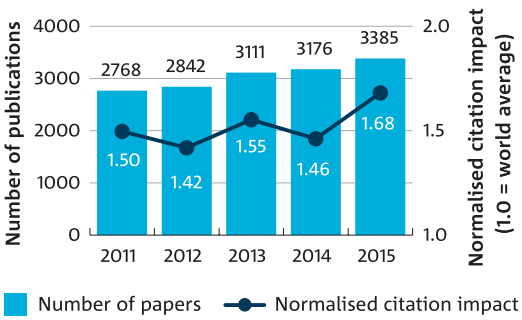


FIGURE 2.2: PERCENTAGE OF CSIRO PUBLICATIONS BY TYPE, 2015

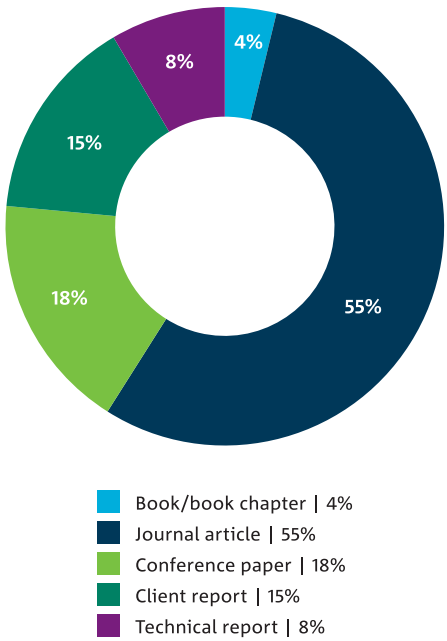


FIGURE 2.3: CSIRO PUBLICATION OUTPUT AND CITATION IMPACT BY RESEARCH FIELD, 2006–15[7]

Maintain customer satisfaction

During 2015, CSIRO undertook a review of the current 'Customer Willingness to Recommend' methodology. It was found that the measure was not an effective indicator to report and the Board agreed to shift to the industry benchmark Net Promoter Score (NPS) methodology. The NPS for 2015–16 is +11, a favourable result.

The survey results show that customers trust CSIRO and feel that our staff are empathetic, ethical, professional and honest. This is good news, given the changes we have instigated in the year. According to our customers, CSIRO's strengths are empathy, trust, reliability and excellence. The quality of our science is second to none; we are innovative and committed to customer needs.

The survey also identified opportunities for improvement, including maintaining our capability and improving competitiveness, contractual and intellectual property (IP) processes, which are already underway as a specific focus of our Strategy 2020 customer-first initiative.

Awareness of science by CSIRO stakeholders

Public awareness of CSIRO slightly improved this year – 90 per cent of Australians are aware of CSIRO, a one per cent increase from 2015. This period also saw an improvement in perceptions of CSIRO, with 75 per cent of people holding a positive view in 2016, compared to 63 per cent in 2015. Respondents stated that their positivity was driven by attitudes that CSIRO is trustworthy, reputable and makes a meaningful contribution.

Last year's survey found that 67 per cent of respondents perceived that CSIRO staff want to make a difference and are innovative. The 2016 survey results showed an increase in perceptions of performance: 76 per cent of respondents agree that staff are innovative and 79 per cent agree that staff are here to make a difference.

During this period, along with individual- to organisational-level efforts to showcase achievements and share our knowledge, we increased our focus on communications and community engagement, to help increase positive perceptions about CSIRO. Two major brand campaigns were delivered – CSIROseven and the experiential Infinity Swing – as well as a stream of customer-focused stories on our breakthroughs, innovations and impact.

7 The four research fields represented by green points are CSIRO's four main fields of research.

In late 2015, CSIRO also commissioned a study with the business community, which found that 97 per cent of respondents understood what we do to some degree, which is above the awareness level of the general public. Nearly three-quarters (71 per cent) of industry stakeholders stated that CSIRO provides innovative solutions to help business and industry. Over half (61 per cent) were not aware their business could work directly with CSIRO – 35 per cent reported CSIRO was not relevant to the operation of their business.

Utilisation and success of science outreach programs

Our science outreach programs, including the Discovery Centre and education programs, aim to promote the importance of CSIRO science and its application. We conduct various education and outreach programs for school students, teachers and the public to inform students, families and teachers of the valuable contribution scientific research makes to the community. We also support undergraduate, postgraduate and postdoctoral researchers to boost the calibre of researchers working in the Australian community and strengthen Australia's future innovation capacity.

CSIRO Education and Outreach has education specialists and facilities in each capital city, and Townsville and Newcastle. In the past year 42,233 primary and secondary students took part in hands-on science education programs. More than 37,337 students took part in community programs.

The Education and Outreach team delivered the SMiS, Sustainable Futures, BHP Billiton STEM Indigenous project, BHP Billiton Science and Engineering Awards, CREativity in Science and Technology (CREST), Indigenous STEM education, and Science Bootcamp programs. A new pilot teacher professional learning program, *Inquire to Discover*, also commenced in 2016; 20 schools have participated to date.

SMiS links scientists and mathematicians with primary and secondary teachers and students. At the end of June 2016 there were 1,972 SMiS partnerships in 1,300 schools including 32 per cent of partnerships in rural and regional schools and 52 partnerships in schools with more than 25 per cent Aboriginal or Torres Strait Islander students.

The BHP Billiton Foundation Indigenous STEM Education program aims to increase participation and achievement of Aboriginal and Torres Strait Islander students in STEM as they progress through primary, secondary and tertiary education, and into employment. In its second year, five of the program elements are up and running and making good progress. Already, 238 teachers and teacher assistants and 3,425 students are taking part in school programs, and 17 students are enrolled in the Bachelor of Science (Extended) at the University of Melbourne.

Sustainable Futures worked with 3,092 students and 342 teachers Australia-wide to help them understand the science behind climate change and reduce their own carbon footprint.

TOP 0.1%
GLOBALLY IN 4 RESEARCH FIELDS

TOP 1%
IN 14 RESEARCH FIELDS

ALMOST
80,000
PRIMARY AND SECONDARY STUDENTS TOOK PART IN HANDS-ON SCIENCE EDUCATION AND COMMUNITY PROGRAMS

WE WORKED WITH
>1,200
SMES

1,959
GRANTED PATENTS, 597 PATENT FAMILIES, 313 TRADEMARK FAMILIES, 117 PLANT BREEDER'S RIGHTS

In 2015, CREST helped over 9,600 school students plan and carry out research projects. Over 60 per cent received awards for their work. Many went on to participate in BHP Billiton's Science and Engineering Awards, which recognise outstanding scientific research and technology projects by school students, and the commitment and expertise of their teachers. Last year, 7,639 students entered these awards (6,555 in science and 1,084 in engineering).

We host the CSIRO Discovery Centre in Canberra, and major visitor centres at the Parkes and Narrabri observatories in NSW and the Canberra Deep Space Communication Complex (CDSCC). These centres are purpose-built to showcase our research in an entertaining way that demystifies and educates people of all ages about research and innovation.

The CSIRO Discovery Centre continues to attract large crowds – its biggest audience is local and interstate school groups comprising 18,477 students during 2015–16. The CSIRO Discovery Centre was closed for part of 2015 due to building renovations, which accounts for the drop in visitor numbers compared to previous years.

Education and outreach programs at the CDSCC attracted 9,082 school students and teachers during 2015–16, 0.7 per cent up on 2014. An additional 347 school students and teachers participated in self-guided visits. Programs covered the broad spectrum of science, technology, engineering and mathematics subjects, with a focus on their uses in space exploration and astronomy. The total number of visitors was 67,378, up 10 per cent on the previous year.

The Parkes radio telescope welcomed 95,212 visitors in 2015–16, almost a 30 per cent increase on 2014–15. Thirty-six schools participated in education and outreach programs, compared with 41 the previous year, reaching approximately 1,183 students, and there were 1,893 visitors from seniors' groups, clubs or specialised interest groups. The PULSE@Parkes program had 280 students, 80 teachers and 30 astronomers and general public in sessions held in New South Wales, Victoria, Queensland, the Australian Capital Territory and Guangzhou (China). We also ran a session for participants at the International Astronomical Union General Assembly in Hawaii.

Public outreach activities at the Australia Telescope Compact Array at Narrabri included a self-guided visitor centre experience serving 11,511 visitors during 2015–16, an increase on the visitor numbers of the previous year. Regular visitors to the observatory include seniors' coach tours and local school groups.

TABLE 2.4: SCIENCE OUTREACH: EDUCATION PROGRAMS

PROGRAM	2011–12	2012–13	2013–14	2014–15	2015–16
CSIRO Science Education Centres (visitors)	374,797	363,099	366,305	154,825	0[8]
CREativity in Science and Technology (CREST) (participants)	8,385	7,767	11,048	10,805	9,600
BHP Billiton Science and Engineering Awards (participants)	3,770	4,065	7,125	8,146	7,639

TABLE 2.5: SCIENCE OUTREACH: VISITOR CENTRES

CENTRE	2011–12	2012–13	2013–14	2014–15	2015–16
CSIRO Discovery Centre (visitors)	108,060	113,000	120,000	33,189	18,477
Parkes radio telescope (visitors)	96,609	92,876	84,698	68,427	95,212
Canberra Deep Space Communication Complex (visitors)	77,350	68,710	67,554	61,051	67,378
Australia Telescope Compact Array, Narrabri (visitors)	-	10,500	12,500	10,971	11,511

8 The state-based science education centres closed in late 2014.

Postgraduate and postdoctoral researchers

Our Postgraduate Scholarship Program provides opportunities in science and engineering for outstanding graduates who enrol at Australian tertiary institutions as full-time postgraduate students for research leading to the award of a PhD. Doctoral students at CSIRO are co-supervised by a university, allowing students to maintain and develop their university connections while being exposed to research in a working environment (see Table 2.6). The number of students fluctuates, with uneven intakes each year and reduced numbers when a cohort moves through the program.

CSIRO Publishing

CSIRO Publishing operates as an independent science publisher within CSIRO on behalf of authors and customers in Australia and overseas. Our publishing program covers a wide range of scientific disciplines, including agriculture, the plant and animal sciences, and the environment. We are Australia's only endemic, scholarly science publisher with a significant digital capability. We provide a viable, local publishing option for CSIRO itself, and for learned and professional societies to publish scholarly content that champions Australian research.

During 2015–16, we published 28 journals. Fourteen were published in partnership with the Australian Academy of Science, a successful relationship dating back to 1948. Eleven journals were produced under agreements with Australian and international societies or institutions. Additionally, special issues of journals were published in connection with societies and international conferences. These journals are available free to developing countries through the United Nations program Research4Life. This program fosters scientific understanding and education in developing nations. Online use of the journals resulted in 2,471,566 articles being downloaded.

In 2015, our two science magazines for kids (*Scientriffic* and *The Helix*) merged into one product, *Double Helix*, to focus our resources and continue bringing children a great range of amazing science stories, activities and more. Producing one magazine every six weeks has helped us do that.

2,471,566 ARTICLES WERE DOWNLOADED THROUGH THE UNITED NATIONS RESEARCH4LIFE PROGRAM, WHICH PROVIDES JOURNALS FREE TO DEVELOPING COUNTRIES.

TABLE 2.6: SCIENCE OUTREACH: CSIRO'S POSTGRADUATE STUDENTS AND POSTDOCTORAL FELLOWS, AS AT 31 MAY 2016

	2011–12	2012–13	2013–14	2014–15	2015–16
Sponsored postgraduates[9]					
PhD	291	294	254	224	280
Master	20	16	19	16	36
Honours	17	22	23	10	19
Total	**328**	**332**	**296**	**250**	**335**[10]
Supervised postgraduates[9]					
PhD	639	642	601	621	599
Master's	77	68	90	70	132
Honours	64	82	61	70	70
Total	**780**	**792**	**752**	**761**	**801**
Postdoctoral Fellows	**326**	**324**	**325**	**303**	**229**

9 A student may be either sponsored, supervised or both. The total number of individual students sponsored and/or supervised was 832, including more than 18 supervised in collaboration with Cooperative Research Centres. See the glossary for definition of sponsorship and supervision.

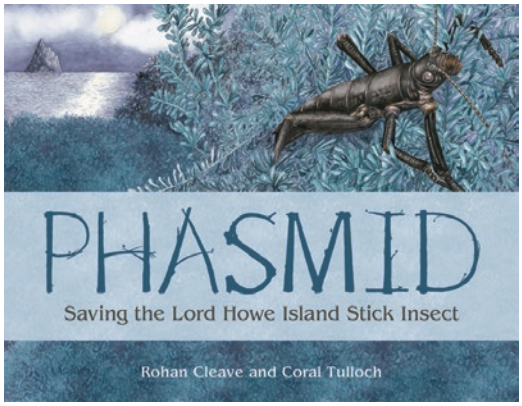
10 Includes 53 students fully sponsored and 282 students partially sponsored by CSIRO.

TABLE 2.7: CSIRO PUBLISHING SUBSCRIBERS

	2011–12	2012–13	2013–14	2014–15	2015–16
CSIRO Publishing journals (downloads)	2,653,848	2,641,160	2,819,798	2,471,566	2,901,602
Double Helix Magazine[11] (subscribers)	13,851	15,958	15,209	11,226	7,216
Science by Email (subscribers)	41,204	42,422	42,011	43,010	43,029
Maths by Email (subscribers)	14,967	17,292	20,381	22,771	23,456

New book titles

During 2015–16, CSIRO Publishing released 33 book titles in print and digital formats. The digital books comprised approximately 12 per cent of sales. A highlight among the titles was our first children's book, *Phasmid: Saving the Lord Howe Island Stick Insect*, which was shortlisted for the Children's Book Council of Australia Book of the Year Awards.



Our first children's book, *Phasmid*, is the amazing, true story of the Lord Howe Island phasmid, or stick insect.

Net profit

CSIRO Publishing delivered a net profit of $518,316 for 2015–16. Total revenue for the period was $10,228,338.

Evidence of economic, social and environmental impacts through demonstrated uptake and adoption of research outputs

Adoption and uptake of research outputs are evidenced by our IP assets, equity portfolio and direct connections with SMEs. IP is a key tool for capturing the benefits of our research for Australia, protecting the results of our activity and ensuring our technologies are not inappropriately copied by competitors. Our Intellectual Property Management framework is provided by the Statement of Intellectual Property Principles for Australian Government Agencies. Strong IP portfolios also provide key positioning in various marketplaces, underpinning our strategy and providing external reputation benefits with customers and potential collaborators and competitors.

Intellectual property

As of June 2016, CSIRO had 597 patent families, 313 trademark families, and 117 different Plant Breeder's Rights. The total number of patent families in the IP portfolio has increased over the last year, as has the number of new inventions (provisional patents) and the number of granted cases. The overall number of live cases appears steady over the last few years.

Of the IP assets listed in Table 2.8, 44 per cent of CSIRO's patent portfolio is either subject to a research right, arose as a result of collaborative activity, was used as background IP in a collaboration/evaluation, or is the subject of a commercial licence. Of the 105 unique Plant Breeder's Varieties, 49 per cent are licensed.

11 Combined subscriptions to both *The Helix* and *Scientriffic*. The reduction in 2015-16 is due to subscribing schools and libraries now taking only one subscription, not two.

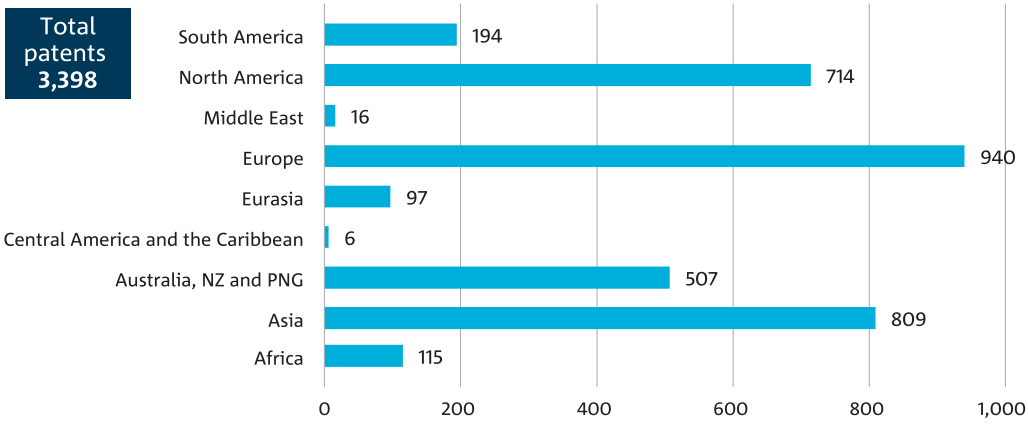
About half of the licences that generate revenue relate to licensing of Registered IP rights (patents, trademarks and Plant Breeder's Rights). A significant component of licensing revenue was generated by cotton seed and wireless LAN royalties. Other IP revenue was derived from our work with contact lenses and coal mining automation. The majority of the remaining revenue was generated from copyright and patent licences. Most of the licences generating revenue were to Australian companies, plus one-third to international entities.

The total number of live patent cases in Asia has been growing steadily over recent years. CSIRO has a large proportion of live patent cases in Asia, with at least 20 per cent in Japan, China, India, South Korea, Hong Kong, Malaysia, Indonesia, Singapore, Vietnam, Taiwan, Thailand and the Philippines (see Figure 2.4). There has also been an increase in the number of filings in South America and Africa, but these regions represent a relatively small portion of our patent portfolio – slightly more than seven per cent. Overall, our spread of patent cases mirrors the geographic regions where we focus our research and its reach.

TABLE 2.8: CSIRO INTELLECTUAL PROPERTY PORTFOLIO

IP CATEGORY	SUB CATEGORY	2011–12	2012–13	2013–14	2014–15	2015–16
Patents	Current Cooperation Treaty (PCT) applications	98	83	56	78	75
	Granted	1,649	1,647	1,755	1,854	1,959
	Live cases	3,582	3,454	3,506	3,430	3,544
Inventions	Patent families	728	718	644	578	597
	New provisional and direct filings	95	87	66	63	70
Trademarks	Australian	275	281	257	250	251
	Foreign	81	88	91	63	62
Plant Breeder's Rights	Australian	83	87	91	89	89
	Foreign	39	24	26	25	25
Registered designs	Australian	3	3	2	2	2
	Foreign	8	8	6	6	6

FIGURE 2.4: CSIRO'S LIVE PATENT CASES BY GEOGRAPHIC REGION[12]



12 Eurasia includes: Armenia, Azerbaijan, Belarus, Kazakhstan, Kyrgyzstan, Republic of Moldova, Russian Federation, Turkmenistan and Ukraine.

Equity portfolio

Central to CSIRO's purpose is the application of our research directly to industry. In doing so, we catalyse the creation of new businesses, connect SMEs with global supply chains, and stimulate jobs growth. We systematically partner with the companies, large and small, best placed to take new technologies to market and deliver positive impact to Australia.

CSIRO licenses technology to existing companies where it is deemed the most likely route of maximising IP value. However, it also directly creates new high-technology SMEs through spinning out IP when that is considered to be the best pathway to commercialisation. As detailed in the Australian Innovation System Report[13], start-ups often behave differently and are more likely to report increases in employment, sales, profitability, productivity, product range and product innovation.

CSIRO's equity holdings are represented by ordinary shares, convertible notes, investments in the CSIRO Innovation Fund and units in a pre-seed investment fund. The total value of CSIRO's equity portfolio at 30 June 2016 was $49.4 million. This is an increase compared with the value at 30 June 2015 of $12.6 million.

A major contributing factor of the revaluation of the portfolio was additional investments in unlisted companies. During the 2015–16 reporting period, CSIRO established three wholly owned companies – CSIRO Financial Services Pty Ltd, CSIRO General Partners Pty Ltd and CSIRO Fund of Funds, LP – which were set up to enable the CSIRO Innovation Fund, and became a shareholder of two new unlisted companies. CSIRO also established one new spinout, Cardihab Pty Ltd, to support the incubation of a successful AcceleratiON project. Two companies exited from the portfolio – one company was deregistered and one AGP company had convertible notes fully repaid.

Currently, CSIRO has interest in 36 companies with a total market value of $574 million.

Connecting to SMEs

Australian businesses are facing a new era of technological advancement and innovation, and operating in a more global environment. To remain competitive and thrive in this new world, they need to deliver a better, more efficient and more innovative service, no matter what area of business they are in. SMEs in particular must adapt their business and take advantage of new knowledge and technology.

CSIRO's SME Connect team works with SMEs to identify opportunities for research to benefit their business, connects them with the best Australian researchers, and facilitates access to research project grants.

SME Connect provides research and grant facilitation services in the Innovation Connections element of the Department of Industry, Innovation and Science Entrepreneurs' Programme, and manages the STEM+ Business Fellowship Program on behalf of the Science and Industry Endowment Fund (SIEF).

In 2015–16, CSIRO worked with over 1,200 SMEs. The CSIRO SME Connect team met with over 500 SMEs, provided detailed research facilitation services to over 140 SMEs, and facilitated 74 Innovation Connections research project grants – 15 of which CSIRO was the research organisation, and 59 involving external research organisations and universities. In addition, CSIRO was the research organisation in 15 other Innovation Connections project grants.

The team has an existing presence in Melbourne, Sydney, Newcastle and Brisbane, and will shortly have research facilitators in Adelaide and Canberra. We have helped businesses operating in a wide range of industries (from food and healthcare, to mining and manufacturing) access technical expertise from across the nation to grow their business.

Adoption case studies

Another way to showcase the achievements by CSIRO staff in attaining adoption and uptake of their work is through case studies. The following section provides examples from each of our Science and Services Business Units of how lives, businesses and communities have benefited from our solutions.

13 The full report is published at: http://www.industry.gov.au/Office-of-the-Chief-Economist/Publications/Pages/Australian-Innovation-System.aspx

Agriculture

Kebari, a new barley grain for people with coeliac disease

There is a large and growing demand for food and beverage products to meet the needs of people with coeliac disease and people who are gluten intolerant. Gluten-free diets are often nutritionally poor, being high in fat and sugar, and low in fibre, minerals and vitamins.

Our scientists, with co-funding from the Grains Research and Development Corporation, have bred the Kebari™ grain, a new barley variety with ultra-low levels of hordeins, the type of gluten found in barley.

Over 12 years of research using conventional plant breeding methods, our researchers have developed Kebari™ barley, a world-first barley grain that has 10,000 times less hordeins, the type of gluten found in barley, than regular barley. The gluten content of Kebari™ barley is less than 5 parts per million – well below the limit of 20 parts per million recommended by the World Health Organization for classification as gluten-free.

As a result, Kebari™ barley has been used to make the first commercially brewed, full-flavoured, barley-based, gluten-free beer. The Pionier beer, produced by German brewer Radeberger, was launched in Germany in April 2016. Pionier beer is stocked in selected Edeka Supermarkets in Germany.

In Germany, the production of beer is regulated by the German Beer Purity Law (*Reinheitsgebot*) which allows only water, barley, yeast and hops to be used in beer-making. By using our Kebari™ grain, Radeberger have been able to release the first ever gluten-free beer produced in Germany under the *Reinheitsgebot* – a fitting celebration of tradition and innovation in 2016, which is the 500th anniversary of the *Reinheitsgebot*.

While Pionier beer is currently only available in Germany, we are exploring opportunities with Australian brewers to develop a local beer using Kebari™ barley. Since the launch of Pionier beer in Germany, we have received interest from both international and Australian brewers to use Kebari™ for future products.

The first version of Kebari™ barley is a malting barley used for production of malt and beer. We are now actively working to develop a hulless version, which can be used as a flour or whole grain in foods. In the future, this will provide more food options for the global population, including one to two per cent of Australians, with coeliac disease and people who avoid gluten in their diet.

Dr Phil Larkin and Dr Crispin Howitt developed the Kebari™ grain used in the world's first gluten-free barley beer.

CSIRO Education and Outreach

Partnering with STEM professionals boosts school students' and teachers' confidence

Science, technology, engineering and maths (STEM) subjects are essential to fostering innovation and critical thinking, yet student participation in STEM subjects is declining.

Our SMiS program is a major national program that partners scientists, mathematicians and ICT professionals with teachers for the benefit of students. SMiS is a volunteer program that brings real science, mathematics and ICT into the classroom through ongoing, flexible partnerships between STEM professionals and teachers.

It not only has a presence in a large number of schools, but is significant as an exemplar for a national agenda in bringing schools and STEM professionals together in collaborative arrangements.

The *Building Productive Partnerships for STEM Education: Evaluating the model and outcomes of the Scientists and Mathematicians in Schools program 2015* report showed that SMiS is a highly effective program in terms of the scale of its operation as a significant part of the Australian STEM education scene; the multiple significant benefits for students, teachers and STEM professionals; and the clear return on investment of resources.

The report shows a range of very significant benefits for students. These include increasing students' engagement with STEM learning and reasoning; increased interest, enjoyment, knowledge and confidence in STEM subjects; a greater awareness of how scientists and mathematicians think and work; and of potential careers.

Findings from the report will be used to inform the program's development in the future. This will include convening a symposium in the second half of 2016 to examine and reflect on the evaluation with stakeholders, including program participants (teachers and STEM professionals).

'The scientist is changing the culture and perception of who and what scientists do, and this is really important from a gender perspective, too', one science teacher said.

Since its inception in 2007, SMiS has brought to life contemporary science and maths practices into classrooms, fostering almost 5,000 partnerships and touching 23 per cent of schools across Australia.

Today there are over 1,900 SMiS partnerships (up 5.6 per cent on 2015–16) involving teachers in 1,300 schools, which includes 243 ICT in Schools partnerships.

SMiS is funded by the Australian Government and CSIRO, and managed by CSIRO.

Our Scientists and Mathematicians in Schools program brings real-life science, technology, engineering and maths into the classroom.

CSIRO Services

Wearable tech reduces aircraft downtime

Queensland aerospace company TAE partnered with SME Connect to help TAE commercialise CSIRO's Guardian Mentor Remote (GMR) wearable technology system to make it available to the global aerospace industry.

GMR is hands-free technology that uses a headset and glasses to connect experts with on-site operators so the experts can provide real-time assistance.

In the aerospace industry, costs associated with aircraft downtime are critical. TAE provides maintenance and engineering support for the aviation industry, and they saw an opportunity to commercialise the GMR technology to help the industry use it all around the world.

Integrating this new technology into TAE's business required direct assistance from the developer to tailor it for the aviation industry and get it ready for commercialisation.

Through the Federal Government's Innovation Connections program, the CSIRO SME Connect team embedded a researcher into TAE's business. The CSIRO researcher who helped develop the GMR system is working with TAE to troubleshoot how the system can be integrated into TAE's business. The researcher will also train and support TAE staff so that they can construct and maintain GMR systems for TAE's customers.

Integrating the GMR technology into TAE will allow the company to repair and maintain aircraft for their customers remotely, providing a more affordable service to reduce aircraft downtime.

Once TAE have customised and tested the GMR system, they will be able to commercialise and make it available to the global aerospace industry. TAE will be making this unique technology available commercially as fountx™.

Guardian Mentor Remote is hands-free, wearable technology that connects remote experts with on-site operators.

Digital Productivity

Data drives Black Saturday response to decrease bushfire risk

Victoria's 2009 Black Saturday fires killed 173 people, destroyed 2,100 homes and left communities in mourning. Another statistic is lesser known: multiple Black Saturday fires were started by powerlines.

Although only a small percentage of bushfires in Australia are started by powerlines, they are associated with over 80 per cent of Australia's bushfire-related deaths since 1950.

When the 2009 Victorian Bushfires Royal Commission recommended to the Victorian Government that it act on this information, and improve electrical infrastructure to keep residents safer, CSIRO knew it could make a contribution.

The Victorian Government established a 10-year, $750 million Powerline Bushfire Safety Program (PBSP) to address two of the recommendations. This work is being undertaken as part of the Victorian Department of Environment, Land, Water and Planning (DELWP) fire-reduction activities. However, putting powerlines underground across the state would cost tens of billions of dollars. We began work to ensure that available funds would make the maximum impact.

We coordinated, processed and mathematically modelled 'big data' related to electrical infrastructure and ignitions starting from 2007. Researchers worked with distribution businesses AusNet Services and Powercor Australia; state bodies including Energy Safe Victoria and the Country Fire Authority, and DELWP; and sourced information from federal bodies such as the Australasian Fire and Emergency Services Authorities Council and the Australian Energy Regulator. Our quantitative approach, much like that used by insurers, meant the government could assess the risks and probabilities associated with individual powerlines and decide where to allocate resources.

CSIRO's analytics showed that by carefully targeting PBSP investment, a large percentage of the bushfire risk from powerlines could be removed across the state. The Victorian government combined CSIRO's data with local knowledge and developed a ranking system for identifying the powerline areas to prioritise.

In 2015, reports showed that investment in network protection had already resulted in a 15.7 per cent reduction in relative risk. Later that year, researchers incorporated new data into the modelling, which prioritised 45 zone substations where Rapid Earth Fault Current Limiter (REFCL) technology will be installed. REFCLs improve fault detection and management to prevent ignitions on existing lines. Further modelling enables regulations that will support effective use of REFCLs. Once the REFCL rollout is complete in 2022, it is projected that up to 60 per cent of ignition risk will be removed from Victoria's distribution networks.

Our risk-reduction approach required a shift in mindset. By communicating the benefits of a data-driven approach to replacing powerlines, we helped government and industry embrace a quantitative view of risk.

The work looks likely to be adopted beyond the PSBP. Industry bodies such as AusNet have expressed an interest in using aspects of the model internally, the Victorian Government is in discussion about its further potential use, and interest has been expressed by a distribution business in the United States.

Most importantly, our work reduces the chance of another Black Saturday event, an incident with a $4 billion damage bill and loss of priceless human life.

A small percentage of bushfires are started by powerlines, but they are exceptionally deadly. Image: Fiona Hamilton/Newspix

Energy

Automation reaps safer, more productive coal mines

Coal currently accounts for around 24 per cent of employment and 27 per cent of total revenue for the Australian mining sector, contributing 15 per cent of our total export income. Coal mining is an inherently hazardous process and represents a major area for research innovation to increase the value of the nation's resources through improved mining selectivity, productivity and safety.

Coal is mined either by open-cut mining – accounting for 80 per cent of total coal production – or underground mining. The latter is dominated by the longwall mining method, which accounts for around 90 per cent of Australia's total underground production, contributing about $7 billion per year to Australia's export income. Technologies for remote and automated longwall mining have influenced the direction and development of present-day mining operations.

In underground coal mining, a longwall shearer machine cuts along the coal seam beneath a temporary roof supported by a system of hydraulic supports, exposing miners to multiple risks. Increasing health, safety and productivity around the longwall mining process has been a long-term industry goal. Despite significant progress, many challenges remain, including how to develop sensors and automated technologies to remove underground miners from potentially hazardous operating conditions.

In partnership with the coal industry, we developed an automation system for underground longwall mining equipment to help mitigate mining hazards and improve productivity. Our system uses specialised guidance technology to automatically steer longwall equipment according to a desired mining extraction plan, removing people from hazards.

The technology has emerged as an essential component of modern automated longwall mining operations: now two-thirds of Australia's longwall underground operations use it. It has been licensed to major international longwall equipment manufacturers and technology suppliers Caterpillar, Joy Global, Eickhoff Australia, Kopex and Nepean Longwall, and is delivering productivity improvements of up to 10 per cent. Net industry benefits over the technology's lifetime are estimated to exceed $790 million.

While productivity improvement is the chief benefit, further benefits are gained through enhanced sensing and automation. The value of the coal is increased because a higher quality product results from less rock introduced into the product during mining. The overall cost of production is decreased because less activity is required post-mining. An environmental benefit is the reduced need for above-ground storage and its associated risks of environmental pollution due to the spoil or 'ash' extracted in the beneficiation processing.

Improved worker health and safety is the main social impact from longwall automation. Using automated systems reduces the time that workers have to spend at the coalface to monitor and adjust the operation of the longwall. Thus, there is less exposure to noise, coal dust and mechanical hazards.

In collaboration with international partners, we recently successfully demonstrated the first longwall automation technology deployment in China, generating the first longwall face profile, with real-time control of the longwall system to follow. This may lead to further commercialisation opportunities that will improve Australia's international position as a provider of digital mining technology, and support our mining equipment and service sector.

Peter Reid is calibrating and validating CSIRO's longwall guidance system electronics module before field commissioning.

Food and Nutrition

Delivering the right ingredients for improved health and wellbeing

In 2015, approximately 63 per cent of Australian adults were overweight or obese, which means that more than 11 million Australians have an increased risk of developing health conditions such as cardiovascular disease, high blood pressure, type 2 diabetes and some cancers. With health spending per person expected to double over the next 40 years, these chronic diseases will continue to place a significant strain on Australia's healthcare system.

Last year, we introduced the CSIRO Healthy Diet Score, a scientifically validated survey that assesses a person's diet against Australia's healthy eating guidelines, providing a single dietary quality score on a 100-point scale. An individual's score is based on food variety, frequency and quantity, as well as age and gender. In addition to their overall score, people who complete the online assessment receive feedback on how they can improve their diet.

The launch of the Healthy Diet Score follows more than three years of research by CSIRO and the University of South Australia, and is capable of providing a similar evaluation to other, more complex diet-assessment methods such as tracking weekly food intake.

Since its launch, more than 70,000 people have completed the CSIRO Healthy Diet Score. In August 2015, we released the findings, giving Australians a grade of 'C', with an average score of 61 out of 100. As there is no one-size-fits-all approach to weight loss, CSIRO's team of scientists are using the principles of higher protein diets to develop programs to suit the varying needs and lifestyles of consumers.

The CSIRO Total Wellbeing Diet has been extended to include optional support with Dietitian Plus, which provides extra guidance and motivation from dietitians through online face-to-face sessions and ongoing telephone support. Research shows that support from a nutrition professional is the best way to succeed in losing weight. The CSIRO Total Wellbeing Diet online has proven to be popular with the public; more than 18,000 people have signed up for the program since its launch at the beginning of 2015.

Another successful product co-developed by CSIRO is the Impromy™ Health and Weight Management program. Impromy™ is delivered through 290 pharmacies Australia-wide, where trained consultants provide testing to assess risk factors such as cholesterol, blood pressure and blood glucose levels. The information is then used to determine an appropriate eating pattern that includes higher protein main meals, and breakfast and lunch meal replacements.

Combining meal replacements with high-protein recipes for dinner helps people feeling full for longer. The pharmacy consultants assist people to monitor progress and keep them on track, which is further improved with ongoing support through a mobile phone app. More than 25,000 Australians have used Impromy™, with research showing that members lose an average of seven kilograms over the 12-week program.

A solid combination of CSIRO's scientific expertise and the commercial skills of industry partners has made a significant impact in improving the health and wellbeing of the Australian community.

A nutritious diet means eating a wide range of foods associated with a healthy lifestyle. Image: iStock

Health and Biosecurity

Home monitoring of chronic diseases saves patient lives and healthcare dollars

Managing the rising cost of delivering healthcare is a major challenge for Australia. Targeting health services to assist the chronically ill and ageing population can help to reduce the load on our health system and hospitals. Older patients with multiple chronic diseases and complex medical conditions typically will visit the hospital two or more times per year.

Funded by the Australian government broadband-enabled Telehealth Pilots Programme, we built on our e-health expertise and partnered with non-government organisations; local health districts; hospitals; and industry partners iiNet, Samsung and TeleMedCare, to deliver a national telehealth trial of home monitoring of chronic disease for aged care. Trial partners across the country – including in Canberra, Townsville, the Grampians, Launceston and Western Sydney – meant this was Australia's first large-scale telehealth clinical trial.

In total, 287 patients participated in the trial across the six sites. Test patients were provided with a telehealth device that included participant/clinician video-conferencing capabilities; messaging features; delivery of clinical and study-specific questionnaires; as well as vital signs devices to monitor their electrocardiography, heart rate, spirometry, blood pressure, oxygen saturation, body weight and body temperature, and glucometry as an optional add-on.

The 12-month trial enabled chronic disease patients to self-manage their conditions at home. Health workers could assess changes in their patients' conditions remotely and provide appropriate care interventions earlier to help them stay out of hospital and improve their quality of life.

Patient surveys showed that they were satisfied using the monitoring device and found instructions easy to understand, which generally led to high compliance with the measurement protocols. Patient self-reported measures included improvements in anxiety, depression and quality of life, with many people finding that home monitoring gave them a better understanding of their chronic conditions.

The trial showed that home telemonitoring not only improved quality of life for patients through timely access to quality care, but was also cost effective. Substantial savings were demonstrated – there was a 46.3 per cent drop in the rate of Medicare Benefits Schedule expenditure, through fewer and less costly General Practitioner (GP) visits, specialist visits and procedures carried out. The study also showed savings in Pharmaceutical Benefits Scheme expenditure, with an overall 25.5 per cent drop in medication spending. Patients also showed a decrease in the rate of hospital admissions and in their length of stay following the intervention – which is significant, considering the cost of a hospital bed is estimated to be about $2,051 per day in Australia. In addition, patients in the trial had a reduced mortality rate of more than 40 per cent.

Over 500,000 Australians aged over 65 would be good candidates for at-home telemonitoring. Our research found the return on investment of a national telemonitoring initiative would be in the order of five to one. It would reduce demand on hospital inpatient and outpatient services, visits to GPs, visits from community nurses and overall on increasingly scarce clinical resources. This could equate to savings in the order of $3 billion per year to Australia's healthcare system.

A clinician shows a patient how to use the home monitoring system.

Land and Water

Increasing the efficiency of logistics infrastructure in Australian agriculture

Over 85 million tonnes of agricultural product is moved from farms to domestic and international markets each year in Australia. Agriculture supply chains in Australia are often characterised by transport distances of over 1,000 kilometres between production and markets; transport costs account for up to 40 per cent of the market price.

To address the transport challenges faced by Australian agriculture enterprises, we developed the Transport Network Strategic Investment Tool (TraNSIT). It was co-funded by the Office of Northern Australia, Northern Territory government, Queensland government and Western Australian government. This state-of-the-art computer-based logistic tool identifies operational, infrastructure investment and regulatory changes that can substantially reduce logistics costs for agriculture at the enterprise and sector level.

TraNSIT optimises transport routes for hundreds of thousands of enterprises and millions of vehicle trips between them and their markets, providing input into operational and investment decisions. Initiated in 2013, the tool incorporates factors such as road/rail conditions, heavy vehicle access restrictions, vehicle choice, driver fatigue, animal welfare regulations, and availability of supporting facilities such as vehicle stops and holding yards. It can be used to manage logistics costs for individual enterprises or whole industries.

TraNSIT currently accommodates 142 million tonnes of agricultural transport, over five million vehicle movements and 15,000 rail trips per year. The tool considers transport from over 148,000 farms or production locations to storage, feedlots, processing, export ports, domestic supply chains, distribution centres and retailers. Over the previous 18 months, as part of the *Agricultural Competitiveness White Paper*, TraNSIT has expanded across the broader Australian agricultural sector to include an additional 25 commodities that, together, represent over 95 per cent of Australia's transport volume.

When used to inform the $100 million Northern Australia Beef Roads Program (October 2015 to April 2016), as part of the federal government's *White Paper on Developing Northern Australia*, the tool demonstrated how certain road upgrade investments are able to reduce livestock transport costs by over $500,000 per year.

TraNSIT has been adopted by both government and industry. State and federal governments have used the tool to target investment in roads. The Queensland Department of Agriculture and Fisheries uses TraNSIT to inform biosecurity regulations, and the Northern Territory Department of Transport has used outputs for the Australian Infrastructure Audit.

Farming associations apply the tool to inform where supply chains within their own industry can be improved, and then communicate this information to farmers and government. Industry organisations, including graziers and processors, use the tool to address bottlenecks in their own supply chains.

The Australian Infrastructure Plan 2016 highlights the tool and recommends that the proposed National Freight and Supply Chain Strategy should be informed by TraNSIT.

TraNSIT optimises transport routes for hundreds of thousands of enterprises.

Manufacturing

3D-printed rib cage helps cancer patient

3D printing has significant advantages over traditional manufacturing methods, particularly for biomedical applications. As well as being customisable, it also allows for rapid prototyping – which can make a big difference for patients waiting for surgery.

CSIRO has leading expertise in metallic 3D printing through Lab 22, our open-access 3D-printing facility. 3D printing with metal is much more complex than using other materials such as plastic. The equipment also has a high capital cost at about $1 million per printer.

Lab 22 offers Australian companies a unique opportunity to access and explore metallic 3D printing, allowing innovation with less capital investment risk. By lowering barriers to entry for industry, CSIRO is making this technology more accessible and increasing its adoption across Australia.

This year, a surgical team from Salamanca University Hospital in Spain determined that a fully customisable 3D-printed sternum and rib cage was the best option for a cancer patient. The team of surgeons turned to Anatomics, a Melbourne-based medical device company, which designed and manufactured the implant, drawing on our expertise and using our Lab 22 facility.

Using CSIRO's Arcam electron-beam metal printer, an implant from a surgical-grade titanium alloy was manufactured. The printer works by directing an electron beam at a bed of titanium powder in order to melt it. This process is then repeated, building the product up layer by layer until a complete implant is constructed.

The Anatomics team created a 3D reconstruction of the patient's chest wall and tumour, allowing the surgeons to plan and accurately define resection margins. While titanium implants have previously been used in chest surgery, flat and plate implants that rely on screws for rigid fixation may come loose over time. This can increase the risk of complications and the possibility of repeat surgery. Our Lab 22 was used to overcome this problem, and an implant with a rigid core and semi-flexible titanium rods (to act as prosthetic ribs attached to the sternum) was produced.

Once the sternum and rib prosthesis was complete, it was couriered to Spain and implanted into the patient. Twelve days after the world-first surgery, the patient was discharged and has recovered well.

This collaboration crossed disciplines and international boundaries, with a clear benefit for both this individual patient and for surgical practice around the globe.

Anatomics is one of 400 manufacturing businesses that CSIRO works with every year. Using advanced materials, systems and processes, we are helping our customers transition to a more innovative, economically viable, high-technology sector.

The 3D-printed titanium sternum and ribs for a cancer patient. Image: Anatomics

Mineral Resources

Saving millions on exploration costs with an on-site lab 'at the rig'

As Australia's easy-to-find, near-surface mineral resources are being depleted, technology solutions are needed to reduce exploration costs so that the minerals industry can efficiently and economically target the next generation of deposits. Minerals exploration companies around the world rely on drilling to prospect the land for new deposits and to better understand potential mineral targets.

Drilling involves sampling rock from the earth to characterise its chemistry and mineralogy. It is a necessary step in exploration and mine planning, but expensive and often time-consuming. In particular, there are high costs and time delays associated with assessing drill samples, which traditionally needed to be sent off-site for manual analysis.

In partnership with Imdex and Olympus Scientific Solutions Americas, under the Deep Exploration Technologies Cooperative Research Centre (DET CRC), we developed a technology that allows exploration companies to make multi-million dollar decisions in minutes rather than months. This leads to cheaper, more dynamic and more productive exploration programs.

The opportunity was identified when the CSIRO-led team observed a diamond-drilling rig operating near Adelaide, South Australia. They realised that during drilling, fluids were carrying rock cuttings to the surface, and the cuttings that were previously regarded as waste could be analysed in real time. The team then developed a system to collect rock cuttings from drill-hole samples and deliver automated analysis results on the spot in a one-hour cycle.

Called Lab-at-Rig®, the system separates the cuttings from the drilling fluids in a solid removal unit. These cuttings (in the form of mud) are then sub-sampled, dried and x-rayed by sensors that deliver data about the chemistry and mineralogy of samples. The technology is small, light and mounted on a trailer so that it is mobile and has little environmental impact. This breakthrough innovation is set to dramatically reduce exploration costs. Taking the lab into the field minimises the turnaround time on results and allows mining or exploration companies to have real-time information about the mineralogy and chemistry of the drill-hole samples, enabling efficient planning of what to do next.

In 2015, we partnered with REFLEX, a business in the ASX-listed Imdex Group of Companies, to commercialise the Lab-at-Rig® technology – allowing the mining and exploration industry to make their exploration programs more cost-effective and efficient.

In addition, a four-year, $11 million collaborative project between CSIRO, DET CRC, Imdex, Olympus, the University of Adelaide and Curtin University has been established to develop the next-generation system. It brings together a diverse team of experienced geologists, geochemists, engineers and end-user representatives who will work together to develop the technology so that it can work to analyse samples from deeper below the surface and sediment cover. The next Lab-at-Rig® model will incorporate new sensor technologies, and improved data analysis and processing for better decision-making.

The on-site transportable Lab-at-Rig© set up at a drilling rig. Image: REFLEX

Oceans and Atmosphere

Forecasting smoke spread to protect community health

Australia has some of the world's most fire-prone environments which are burnt in planned and unplanned events every year. While the devastating losses from fire are well known, the subsequent human health impacts of smoke pollution are less well known. Smoke and dust are the two most significant causes of air pollution in Australia. Smoke from bushfires can travel many hundreds of kilometres and pose health risks for both urban and rural communities.

Research into how fires burn, their likely emissions, and how smoke will be dispersed through the atmosphere is improving the decision-making capabilities of state governments and rural fire agencies, and protecting local communities from undue risk in all weather conditions.

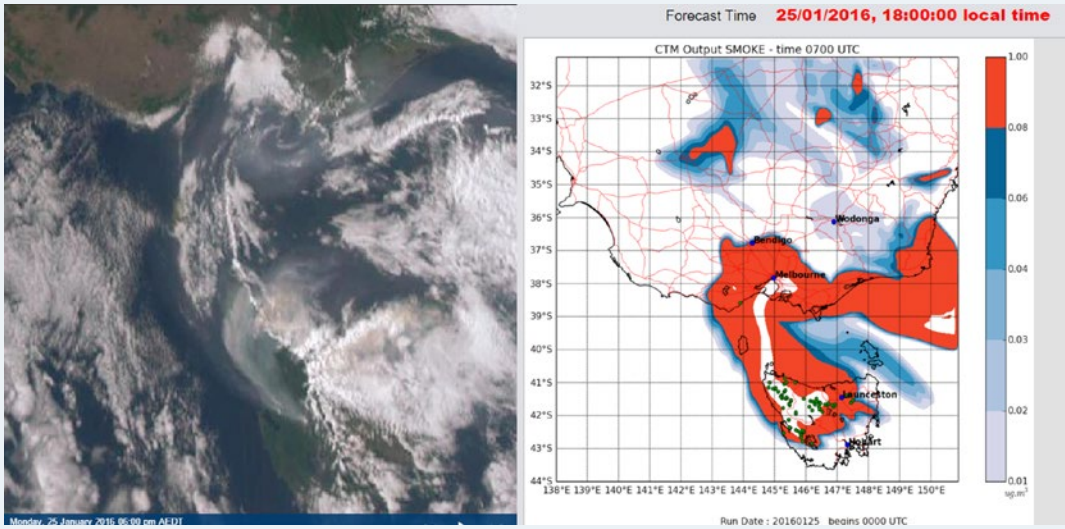
In a project instigated by the Victorian DELWP, a team from CSIRO Oceans and Atmosphere, BOM, the University of Melbourne, Monash University, the University of Wollongong and Macquarie University have developed a state-of-the-art modelling system that can simulate the burn characteristics, the smoke emissions, and the smoke transport from fires.

The Smoke Forecasting System generates crucial information for national fire agencies to help manage planned burns, and also to provide advance warning of smoke from bushfires. Reducing fuel loads through planned burns is considered to be an important tool for mitigating the risk of large bushfires that can have devastating effects on communities.

The system was trialled in Victoria during the 2015–16 southern bushfire season. Embedded as part of operational fire management at the Victorian Government's State Control Centre, the system was able to be used to provide advanced warning of potential smoke exposure to Victorians. This capability was particularly useful when smoke from fires in Tasmania impacted Victoria in January and February 2016.

The capability to forecast smoke dispersion allows fire agencies to understand in what conditions they could complete planned burning, what other atmospheric pollutants may be present (for example, smoke from fires in adjoining states) and whether the forecast pollution would be sufficient to issue warnings or to consider other management options such as rescheduling a burn.

The success of operational trials in Victoria has led DELWP to request that the model be fully operationalised. This is now being considered by BOM who, through collaboration with CSIRO researchers, would be able to tailor the model to all states in Australia, adding significantly to national fire planning and management, and positively impacting the health of all Australians.



A satellite image shows smoke plumes from Tasmanian bushfires alongside an output from the Smoke Forecasting System.

Program 1.2:

National Research Infrastructure – National Facilities and Collections

CSIRO hosts national research infrastructure on behalf of the broader scientific community to assist with the delivery of research. There are two types of national research infrastructure: National Research Facilities and National Biological Collections.

We operate a range of specialised laboratories, scientific and testing equipment, and other research facilities. These are available for use by Australian and international researchers and are not restricted to CSIRO staff. The national research facilities include:

- Australian Animal Health Laboratory (AAHL)
- Australia Telescope National Facility (ATNF)
- Marine National Facility (MNF)
- Pawsey Supercomputing Centre.

CSIRO's National Research Collections Australia (NRCA) comprise six national biological collections and the Atlas of Living Australia (ALA), funded by the National Collaborative Research Infrastructure Strategy (NCRIS). These collections and the ALA are available to all researchers and are storehouses of information on Australia's biodiversity. They support a significant part of the country's taxonomic, genetic, biogeographical and ecological research, and are a vital resource for conservation and science.

The national biological collections include:

- Australian National Fish Collection (ANFC), specialising in marine fishes
- Australian National Herbarium (ANH), specialising in native plants and weeds
- Australian National Insect Collection (ANIC), specialising in terrestrial invertebrates
- Australian National Wildlife Collection (ANWC), specialising in terrestrial vertebrates
- Australian National Algae Culture Collection (ANACC), specialising in living microalgae cultures
- Australian Tree Seed Centre (ATSC), specialising in supplying tree seed to both domestic and overseas customers.

The ALA contains information on all the known species in Australia, aggregated from a wide range of data providers including museums, herbaria, community groups, government departments, individuals and universities.

CSIRO also manages over 20 smaller collections of interest that contribute to the discovery, inventory, understanding and conservation of Australia's biological diversity.

TABLE 2.9: PERFORMANCE SUMMARY FOR PROGRAM 1.2

CRITERIA SOURCE: CORPORATE PLAN 2015–16; PORTFOLIO BUDGET STATEMENTS 2015–16, PROGRAM 1.2, PG 145	
PERFORMANCE CRITERION	**RESULT AGAINST PERFORMANCE CRITERION**
Utilisation of the national research infrastructure and collections (such as research days, observation time or operation time, access to and downloads of digital information, visitor days, the number of loans and/or online resources accessed)	We maintained the availability levels and supported an increase in the use of the national research infrastructure under its custodianship. The new MNF research vessel RV *Investigator* was successfully commissioned and ramped up to a full schedule of research operations, with a total of 248 days at sea.
National research infrastructure maintained and operated to appropriate standard	We achieved compliance with relevant Australian and international standards. New users of the ATNF telescopes are required to observe from the Science Operations Centre at the ATNF's headquarters in Sydney, where they are provided with training and support. Once qualified, astronomers can also operate Parkes or the Compact Array from their home institutions. AAHL continues to maintain or exceed the many regulatory requirements certified by the Department of Agriculture and Water Resources (DAWR), the Office of the Gene Technology Regulator and the Department of Health's Security Sensitive Biological Agents legislation, and all relevant International Organization for Standardization (ISO) accreditation.
Maintain or increase the proportion of collections available to researchers and the public, including digitised and non-digitised collections	We increased the proportion of the national biological collections that are digitised. The Australian National Algae Culture Collection maintained 100% digitisation.
Demonstrated response to national events by providing science-ready facilities in support of CSIRO and external party research	AAHL continued to play a key role in avian influenza surveillance and diagnostics, testing for exclusion of foot-and-mouth disease and quarantine tests to enable global movements of healthy animals, facilitate import of biological materials, exclude exotic diseases in Australian livestock or characterise viruses detected in our region.

ANALYSIS OF PERFORMANCE

The national research infrastructure CSIRO hosts is of global significance, used by the international and Australian research communities. Increasingly, major instruments and facilities are beyond the capacity of a single entity to run, resulting in the rise of multinational, multidisciplinary, applied research institutions collaboratively managing and co-investing in resources. These arrangements present opportunities to be more efficient, effective and sustainable, yet can also present challenges regarding their use.

Additionally, science is experiencing rapid growth in the application of digital technologies and data digitisation in international natural history collections. CSIRO will continue to manage the national collections in a manner that uses the power of digital and genomic technologies to provide rapid access to comprehensive and reliable data.

CSIRO will engage with the 2016 National Research Infrastructure Roadmap process under the leadership of the Chief Scientist.

Australian Animal Health Laboratory

The Australian Animal Health Laboratory (AAHL), located in Geelong (Victoria), is recognised nationally and internationally as a centre of excellence in disease diagnosis, research and policy advice in animal health and human diseases of animal origin (zoonoses). AAHL helps protect Australia's billion-dollar livestock and aquaculture industries, and also the general public, from exotic and emerging infectious diseases. One of the world's largest high-containment laboratories, our facilities enable work on the most dangerous pathogens. Our expertise in biosecurity and biosafety is sought after by customers around the world.

Utilisation

AAHL is supported primarily by CSIRO appropriation, with significant funding from DAWR and, more recently, minor support under NCRIS. AAHL is a crucial part of Australia's biosecurity infrastructure.

AAHL's user base has been expanding through a variety of initiatives. International demand continues for our biosafety and biosecurity training courses, which help reduce the risks of bioterrorism by improving biosecurity measures at high-containment laboratories around the world.

While our primary responsibility is to provide a diagnostic, surveillance and response service to DAWR to underpin Australia's license to trade in animal products, AAHL also serves hundreds of customers through our quarantine testing service. This service covers a range of testing to enable the global movement of animals and biological products including:

- birds – including ducks, chickens and turkeys
- horses, cats and dogs
- tests on vaccine constituents and other products for disease agents.

As the only high-containment animal health laboratory in the Asia-Pacific region, AAHL also services the region with funding provided by the Food and Agriculture Organization of the United Nations, World Organisation for Animal Health (OIE), Australian Centre for International Agricultural Research, and Department of Foreign Affairs and Trade. AAHL has provided, and continues to provide, a range of services to over a dozen countries in the Asian region on matters of biosecurity and food security.

THE PC4 ZOONOSIS SUITE AT AAHL IS ONE OF THE MOST SOPHISTICATED HIGH CONTAINMENT LABORATORIES IN THE WORLD, ENABLING COLLABORATIVE RESEARCH INTO THE MOST LETHAL DISEASES, SUCH AS EBOLA, SARS AND NIPAH.

Maintenance and operation

Maintaining and reviewing the microbiological and physical security of AAHL has been a constant priority since AAHL was officially opened 30 years ago in April 1985. Following a security review in 2014–15, this past year has seen AAHL upgrade and reinforce many of its existing security access systems as well as construct new gates and surveillance systems in the grounds. Work continues on planning a broader capital upgrade program to ensure the facility continues to meet or exceed all regulatory standards, now and into the future.

AAHL continues with its aim to maintain or exceed the many regulatory requirements as certified by DAWR, the Office of the Gene Technology Regulator and the Department of Health's Security Sensitive Biological Agents legislation, while also ensuring all relevant ISO accreditation.

Demonstrated response to national events

Each year, AAHL receives around 3,000 submissions for diagnostic testing, many involving multiple samples and requiring a range of diagnostic tests. Samples are received from around the world for a range of purposes, including to enable global movements of healthy animals, facilitate import of biological materials, exclude exotic diseases in Australian livestock, or characterise viruses detected in our region.

This year, as a designated OIE International Reference Laboratory for avian influenza, AAHL received samples from infected poultry in Myanmar. Testing and characterisation of these identified, for the first time in Myanmar, a strain of avian influenza identified as H5N6. This strain was also identified by AAHL scientists in samples submitted from the Laos veterinary authorities in 2014. This strain causes diseases in poultry, and there have also been a small number of human fatalities associated with this virus.

The rapid diagnosis and characterisation of avian influenza viruses in the region enables quicker response to outbreaks, contributes to matching vaccines to viruses, reduces the risk of spread to humans, and ultimately contributes to regional food security.

In Australia, it is what we rule out as a cause of disease that is critical to our livestock industries. Every month AAHL receives samples for exclusion of foot-and-mouth disease (FMD), collected by field veterinarians in Australia.

FMD is a highly contagious emergency animal disease. An FMD outbreak in Australia would cause major production losses, would seriously interrupt Australia's international livestock trade and cost the economy tens of billions of dollars. While no cases have occurred in Australia in over a century, there have been a number of severe outbreaks in previously FMD-free countries that have caused huge socio-economic impacts – including in the United Kingdom, Japan and the Republic of Korea.

A sample for FMD exclusion is treated as an emergency, and often involves after-hours testing by AAHL staff. The impact of the result on the nation is so important that Australia's Chief Veterinary Officer is notified immediately.

If FMD were diagnosed, the government's National Response to a Foot and Mouth Disease Outbreak would be enacted and AAHL, which was built to cope with an FMD outbreak, would lead the national laboratory response.

AAHL designated International Reference Laboratory for the World Organisation for Animal Health

AAHL's expertise in the management of human diseases of animal origin (zoonotic diseases) is well recognised nationally and internationally, and AAHL is now a designated OIE International Reference Laboratory for Hendra and Nipah viruses, as well as an OIE International Collaborating Centre for new and emerging diseases.

The increasing emergence of zoonotic diseases – which, in recent years, has led to global crises caused by severe acute respiratory syndrome (SARS), Middle Eastern respiratory syndrome (MERS), avian influenza, Ebola and Zika viruses – has seen AAHL in demand by human health organisations as well as the veterinary and agriculture industries.

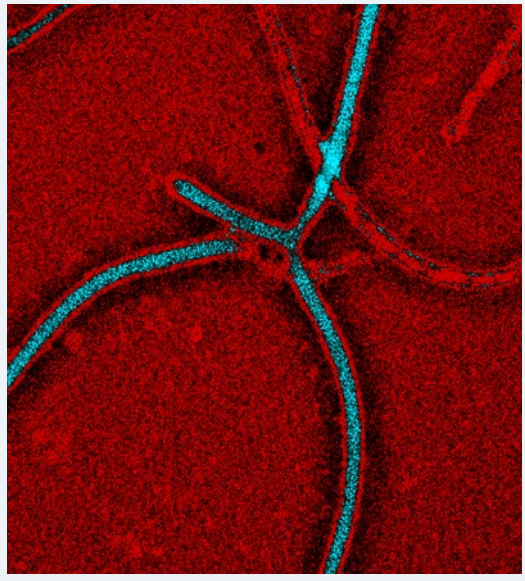
In December 2015, the World Health Organization (WHO) published its list of the top emerging pathogens likely to cause severe outbreaks in the near future, and for which few or no medical countermeasures exist. All of the viruses on the list require containment at biosafety level 3 (BSL3) or 4 (BSL4) – the level at which AAHL operates. The WHO list comprises: Crimean-Congo haemorrhagic fever, Ebola and Marburg virus disease, Lassa fever, MERS and SARS coronavirus diseases, Nipah virus and Rift Valley fever.

As government research institutes and biopharmaceutical companies increase their R&D work to develop new vaccines and therapeutics to control these high-consequence infectious diseases, the demand for high-containment pre-clinical models of human disease also increases. Because human clinical trials involving dangerous pathogens are unethical, the importance of robust animal models to generate quality, reliable data is a critical factor to aid product registration. To date, AAHL has significant experience in this area, as demonstrated with its work on highly pathogenic avian influenza in chickens and ferrets, and testing the efficacy of the Hendra virus equine vaccine.

Building on this experience, this year AAHL signed a major contract with the world's largest non-profit research and development organisation, funded by the United States Government National Institutes of Health, to develop our Ebola virus model in accordance with the Principles of Good Laboratory Practice. This model will help meet the global demand for pre-clinical studies, facilitating the product registration of new vaccines and therapeutics.

A delegation from the United States responsible for managing the contract spent a week at AAHL in November 2015 to assess our capability and processes. The delegation was impressed with our full-service offering which includes pathology, immunohistopathology, immunopathology, bioimaging, *in situ* hybridisation, biomarker identification as well as the BSL3 and BSL4 animal rooms.

The work is being performed in AAHL's Large Animal Facility, specifically in the globally unique BSL4 animal rooms and the BSL4 zoonosis suite. While AAHL's capability in this area is not new, the provision of BSL3+ laboratory serology testing and animal-model pathogenesis, and efficacy and transmissibility studies to serve the Australian and international biopharmaceutical industry is a new growth area for CSIRO and one which increases the value of AAHL as a national facility.



A coloured transmission electron micrograph of the Ebola virus, taken by scientists at AAHL.

Australia Telescope National Facility

The Australia National Telescope Facility (ATNF) is a set of world-class radio-astronomy observatories operated by CSIRO. ATNF observatories are located near the towns of Parkes, Narrabri and Coonabarabran in eastern Australia; and in the mid-west region of Western Australia where the Australian Square Kilometre Array Pathfinder (ASKAP) is being commissioned.

ATNF telescopes support a broad range of studies in galactic (interstellar medium (ISM), pulsar, X-ray binaries, star formation, stellar evolution, magnetic fields), extragalactic (galaxy formation, ISM, Magellanic Clouds, cosmic magnetism) and cosmological science.

The ATNF comprises the major part of CSIRO Astronomy and Space Science, which also operates the Canberra Deep Space Communication Complex (CDSCC) on behalf of the National Aeronautics and Space Administration. CDSCC is responsible for meeting the government's obligations under the US-Australia agreements for deep space tracking and communications in Australia. CSIRO, through CDSCC, provides critical front-line mission control support to NASA for all its deep space missions studying our solar system.

CSIRO also manages Australian astronomers' access to these antennas, which are often used in conjunction with ATNF telescopes as part of the Long Baseline Array (LBA), an array linking radio telescopes in Australia and overseas.

Utilisation

Observing time on ATNF telescopes is awarded to research teams on the basis of the scientific merit of their proposals. Proposals are assessed twice a year, and observations scheduled in two semesters of six months each.

In 2015, research teams of more than 846 individual astronomers from 31 countries submitted proposals to use the Compact Array, Parkes, Mopra and the LBA. For ASKAP, 10 major survey science projects, representing 363 investigators from 131 institutions, have been awarded 75 per cent of the observing time in the first five years of full operation. Most of the observing time on the Mopra telescope near Coonabarabran is allocated to a consortium of university groups who have funded its operation under a three-year agreement with CSIRO.

Observers have an 18-month period after the observation during which they have sole access to their data. After this, the data are made publicly available to astronomers worldwide. Data from the Compact Array, Mopra and Parkes are archived on the Australia Telescope Online Archive, and most Parkes data from pulsar observing is archived on the CSIRO Data Access Portal.

Metrics for time allocation are calculated by dividing the time awarded to an observing project by the number of members in that observing team. The figures for 2015 include the national facility time allocation for the Compact Array, Parkes and Mopra.

TABLE 2.10: UTILISATION OF THE ATNF, IN %

ACCESS TO ATNF	2011–12	2012–13	2013–14	2014–15	2015–16
Time allocated to observations	73.6	76.7	76.8	76.3	77.5
Time lost to equipment failure	2.7	2.7	3.3	2.2	3.0
Time allocated to CSIRO staff	22.0	22.0	19.0	22.5	21.5
Time allocated to other Australian researchers	21.0	28.0	30.3	28.4	33.6
Time allocated to international researchers	57.0	50.0	50.7	49.1	44.9

Maintenance and operation

New users of the ATNF telescopes are required to observe from the Science Operations Centre at the ATNF's headquarters in Sydney, where they are provided with training and support. Once qualified, astronomers can also operate the Parkes telescope or the Compact Array from their home institutions.

Several times each year, the ATNF telescopes combine with other telescopes in Australia and overseas to co-observe using a technique called Very Long Baseline Interferometry. This enables improvement – by a factor of several thousand – in the detail that we can see in resulting images of objects in our galaxy or at the bright cores of distant galaxies and quasars.

IN JULY 2015, THE CANBERRA DEEP SPACE COMMUNICATION COMPLEX WAS THE PRIME TRACKING STATION FOR THE CLOSEST ENCOUNTER BETWEEN THE NEW HORIZONS SPACECRAFT AND DWARF PLANET PLUTO.

Commissioning the ASKAP array in Western Australia continued during the year, using observations made with the Boolardy Engineering Test Array (BETA). The six BETA antennas were fitted with first-generation wide-field phased-array feeds – in essence, 'radio cameras' for imaging the sky – and several scientific papers based on data from BETA were accepted for publication in scientific journals during the year.

BETA was decommissioned in May 2016 to make way for installation of enhanced second-generation receivers. The ASKAP science team has started commissioning activities with ASKAP-12, a set of 12 antennas installed with the new receivers, which will enable the start of the ASKAP Early Science program. We continue to develop and assemble the remaining receivers to complete the full 36-antenna array.

Shape of Galaxy's invisible 'atmosphere' uncovered by Compact Array team

Invisible structures shaped like noodles, lasagne sheets or hazelnuts could be floating around in our galaxy, radically challenging our understanding of gas conditions in the Milky Way. The structures appear to be 'lumps' in the thin gas lying between the stars in our galaxy.

CSIRO used the Australia Telescope Compact Array in eastern Australia, coupled with an innovative technique, to make their breakthrough observations of one of the 'lumps', which they described in the paper published in the journal *Science*.

Astronomers in the United States got the first hints of the mysterious objects 30 years ago when they saw radio waves varying wildly in strength from a bright, distant galaxy called a quasar. The researchers realised that this behaviour was the work of our galaxy's invisible 'atmosphere', a thin gas of electrically charged particles which fills the space between the stars.

Lumps in this gas work like lenses, focusing and de-focusing the radio waves, making them appear to strengthen and weaken over a period of days, weeks or months. These episodes were unpredictable and infrequent, and so hard to find that researchers had given up looking for them. However, short observations of a large number of quasars with CSIRO's Compact Array could reveal this kind of variable behaviour.

Pointing the telescope at a quasar called PKS 1939–315 in the constellation of Sagittarius, researchers observed a lensing event that went on for a year. Astronomers think the lenses are about the size of the earth's orbit around the sun (about 300 million kilometres across) and lie approximately 3,000 light years away, one thousand times further than the nearest star, Proxima Centauri.

Until now their shape could not be determined; however, the team demonstrated that this lens could not be a solid lump or shaped like a bent sheet. By modelling the data, the team found they could be looking at a flat sheet, edge on, or looking down the barrel of a hollow cylinder like a noodle, or at a spherical shell like a hazelnut.

While the lensing event went on, the team observed it with other radio and optical telescopes. The optical light from the quasar did not vary while the radio lensing was taking place. This is important, because it means earlier optical surveys that looked for dark lumps in space could not have found the one this team detected. These lenses could be cold clouds of gas that stay pulled together by the force of their own gravity. That model, worked through in detail, implies the clouds must make up a substantial fraction of the mass of our galaxy.

Nobody knows how the invisible lenses could form, but these structures are real and our observations are a big step forward in determining their size and shapes. Further observations will be able to more precisely determine the geometry of these lumps, and bring us another step closer to answering the fundamental questions about how galaxies evolve and form.

CSIRO's Compact Array in Australia under the night lights of the Milky Way. Image: Alex Cherney

Marine National Facility

Funded by the Australian Government since 1984, and owned and operated by CSIRO, the Marine National Facility (MNF) is a key element of the nation's research infrastructure. The MNF operates the research vessel *Investigator* to provide a world-class blue-water research capability for Australian researchers and their international collaborators for work in Australia's vast and largely unexplored marine estate.

Access is offered through a competitive, independent, peer-reviewed application process focused on scientific and/or technical excellence, the potential to contribute to Australia's national benefit, and the ability of the research team. Through this process, the MNF enables excellent research in the national interest, providing key information to government, industry and the Australian community. The information supports evidence-based decision-making focused on research challenges in regional and global climate, fisheries management, geological resources, coastal and offshore developments, and marine operations.

Utilisation

Following the successful completion of commissioning activities in the first quarter of 2015–16, the MNF research vessel *Investigator* worked up to a full schedule of research operations, commencing with two CSIRO research charters in the Great Australian Bight – in collaboration with Chevron and BP – for a total of 61 days. *Investigator* then completed three granted voyages – in the remote Heard Island and McDonald Islands, Southern Ocean, and from the Antarctic ice-edge to equator – totalling 160 days.

In addition, to maximise efficiencies in the research schedule, the MNF chartered the Australian Institute of Marine Science research vessel *Solander* for 27 days to undertake Indonesian through-flow moorings work out of Darwin. Across these voyages, the MNF provided 248 research voyage days to 235 individual scientists from 29 Australian research agencies and their international collaborators from the United States, Germany, France, Timor Leste and New Zealand.

THE MARINE NATIONAL FACILITY HAS PARTNERED WITH CAPSTAN TO TRAIN AUSTRALIAN POSTGRADUATE MARINE RESEARCH STUDENTS.

The MNF also contributed to developing the next generation of Australian marine researchers by providing training opportunities on board *Investigator*. In total, 25 students were afforded a unique opportunity to obtain blue-water research experience. Furthering this, the MNF has partnered with the Collaborative Australian Postgraduate Sea Training Alliance Network (CAPSTAN) program led by Macquarie University to begin to train Australian postgraduate marine research students, and establish a national syllabus incorporating marine industry safety and survival training certification. CAPSTAN training will commence on *Investigator* in 2016–17.

TABLE 2.11: UTILISATION OF THE MNF

ACCESS TO THE MNF	2014–15	2015–16
Research days scheduled	44	248
Research days delivered	44	248
Scientist days possible	1,300	9,110
Scientist days delivered	947	8,549
Time allocated to CSIRO researchers (%)	61	63
Time allocated to other Australian researchers (%)	39	37

Maintenance and operation

Following the successful commissioning of *Investigator*, preparations for upcoming research voyages continued at its home port of Hobart early in the 2015–16 schedule. This included fitting out a fully equipped on-board surgery to manage medical risks in remote areas. Trial voyages were undertaken to further test *Investigator* and its associated scientific equipment, as well as provide training opportunities for marine crew, MNF support staff and scientists before starting research voyages.

Stakeholder feedback continues to be very positive, with *Investigator* and the broad suite of scientific equipment it provides facilitating new levels of multidisciplinary research for the Australian marine community. Of particular note, complex research charter requirements were successfully accommodated within the MNF research schedule, and *Investigator* successfully completed the first remote research voyage to Heard Island and McDonald Islands during 2015–16.

To ensure best practice in assessing national benefit in the MNF applications process, the MNF Steering Committee has established a new specialist assessment panel for this criterion. To explain the changes, the MNF delivered information sessions across the country and produced a video to raise stakeholder awareness of the new applications process and the MNF in general.

THE *INVESTIGATOR* HAS STATE-OF-THE-ART FEATURES AND CAPABILITIES THAT CAN CAPTURE WATER SAMPLES AS DEEP AS 7,000 METRES TO HELP UNDERSTAND OCEAN CURRENTS AND CHANGES IN DEEP OCEAN TEMPERATURES, OR STUDY MARINE LIFE BETWEEN 1,500 TO 3,000 METRES BELOW THE SURFACE TO BETTER MANAGE OUR FISHERIES.

Science-ready ship enables multidisciplinary research on remote and challenging voyages

In January 2016, Australia's new research vessel *Investigator* departed Fremantle on a 60-day multidisciplinary research voyage. It was heading to the remote Heard Island and McDonald Islands to study the link between submarine volcanoes and the mobilisation of iron which enriches and supports life in the Southern Ocean. These islands are situated around 4,000 kilometres south-west of Perth, providing a remote and challenging operating environment for both the ship and scientific research activities.

The voyage brought together a wide variety of institutions to address research challenges, and involved international collaboration between scientists and students from the University of Tasmania and the Institute for Marine and Antarctic Studies (IMAS), the Antarctic Climate and Ecosystems CRC, Australian National University, University of NSW, Pierre and Marie Curie University/The National Center for Scientific Research (France), Microbial Oceanography Laboratory (LOMIC), European Institute for Marine Studies (France), University of California and CSIRO. Voyages such as this foster a spirit of collaboration among participants, building networks and relationships to facilitate future research collaborations.

The voyage was an outstanding success, providing a unique opportunity for a research team of 40 people and 20 marine crew to systematically map the ocean floor and unlock the secrets of this globally important volcanic system. *Investigator*'s sea-floor mapping and sub-sea acoustic systems allowed survey of the active hydrothermal systems and submarine volcanoes for the first time.

The multidisciplinary capabilities of the ship enabled researchers to conduct a wide array of activities on this voyage, including capturing 3D images of the sea floor; deploying deep-sea cameras and other sensors; collecting rock, sediment and seawater samples to track hydrothermal fluids from the sea floor to the ocean; and identifying phytoplankton blooms. The scientific data collected will allow researchers to test the hypothesis that hydrothermal activity is responsible for phytoplankton blooms which, if correct, has significant implications for the solid earth surface-biosphere linkages in the global carbon cycle.

Investigator's Heard Island and McDonald Islands voyage attracted worldwide media coverage and provided headline news when it captured a rare glimpse of an erupting volcano, Big Ben, on Heard Island. The MNF worked in collaboration with the IMAS to promote the voyage with blogs, video and media, including a live television broadcast from the ship for ABC News 24 and production of a short documentary on the voyage by the Discovery Channel Canada. Media coverage alone reached an estimated audience of over 2.5 million people, providing an international focus on the ship and the research it enables.

The voyage demonstrated the science-ready capability that *Investigator* provides the nation, offering a greatly increased area of operation, accommodation for multiple scientific teams, student training opportunities and a multidisciplinary suite of scientific equipment. Challenged with severe weather and cold conditions, the ship demonstrated its capability to successfully undertake a wide variety of marine research to international standards in the most remote corners of Australia's vast marine estate.

RV *Investigator* approaches the remote Heard Island. Image: Pete Harmsen/Marine National Facility

Pawsey Supercomputing Centre

CSIRO is the centre agent for the Pawsey Supercomputing Centre (Pawsey), a world-class supercomputing facility for Australia. The facility provides access to one of the largest supercomputers in the Southern Hemisphere for Australian researchers in government, academia sector and industry. Pawsey is currently serving over 80 organisations and achieving unprecedented results in science domains such as radio astronomy, geosciences, resources engineering, bioinformatics and health sciences.

Within Pawsey's specially commissioned building, located on CSIRO's Kensington site, are two supercomputers; and advanced data-storage capabilities and tools critical to processing, storing and analysing the data from various projects such as CSIRO's ASKAP facility and the Murchison Wideband Array (MWA). In support of these activities, Pawsey partners closely with the International Centre for Radio Astronomy Research to curate and publish the data for the international research community.

Utilisation

The Pawsey Supercomputing Centre provides access to its supercomputing resources (supercomputers called Cray XC40 Magnus and Cray XC30 Galaxy) through a number of national and local merit-allocation schemes. These schemes are summarised as follows for the 2015–16 period:

- National Computational Merit Allocation Scheme – 25 per cent of resources allocated. The call for proposals was made in September/October, with 12-month allocations, budgeted quarterly.
- Geosciences Merit Allocation Scheme and Energy and Resources Merit Allocation Scheme – 15 per cent of resources allocated. Six-monthly calls (Geosciences in Quarter 2, Energy and Resources in Quarter 4) with large, 12-month allocations, budgeted quarterly.
- Pawsey Partner Merit Allocation Scheme – 30 per cent of resources allocated. Six-monthly calls (in Quarter 2 and Quarter 4) with large, 12-month allocations, budgeted quarterly.
- Pawsey Director's Allocation Scheme – five per cent of resources allocated. Responsive-mode grant assessment process, available most of the year and most resources were made available with small (<0.1 per cent of available resource time), 3-month allocations.
- Radio astronomy operational commitment – 25 per cent of Pawsey resources allocated (100 per cent of Cray XC30 Galaxy). Priority access to these resources was to support MWA operations and ASKAP commissioning. Additional radio astronomy science projects were allocated where resources were available.

Maintenance and operation

The Pawsey Supercomputing Centre is an exemplar collaboration hub involving an unincorporated joint venture that brings together the Australian Government, the Western Australian Government, CSIRO and university partners (Curtin University, Edith Cowan University, Murdoch University and the University of Western Australia) in a consortium that has been steadily producing outcomes for more than 14 years. Rather than a single-service agency, Pawsey is focused on providing integrated research solutions by giving users simultaneous access to world-class expertise and infrastructure in supercomputing, data, and visualisation services.

Pawsey is governed by a Board comprised of core member representatives and several independent members, including the chairman. The primary funding partners for Pawsey are the Australian Government Department of Education and Training, the Minister for Science (WA Government) and the Pawsey members. Pawsey hosts seconded staff from all five member organisations.

TABLE 2.12: UTILISATION OF THE PAWSEY CENTRAL PROCESSING UNIT AND DATA-STORAGE ALLOCATION

CENTRAL PROCESSING UNIT TIME ALLOCATION	2014–15 (%)	2015–16 (%)
NCMAS	15	25
Focused domain (Geoscience)	25	15
Partner share (allocated through merit process)	30	30
Director's discretion	5	5
Radio astronomy (ASKAP and MWA)	25	25
DATA STORAGE ALLOCATION		
Radio astronomy	80	80
General science	20	20

Pawsey reconstructs Australia's greatest naval wreck in 3D

In 1941, the pride of Australia's naval fleet, HMAS *Sydney* (II), was involved in a battle with the German HSK *Kormoran* off the coast of Western Australia, where both ships sank and all 645 crew from the *Sydney* and 82 crew from the *Kormoran* were lost.

It is Australia's greatest naval disaster and, until the wreckages were located 200 kilometres off the WA coast in 2008, remained one of the country's most enduring maritime mysteries.

With the ships resting on the floor of the ocean 2.5 kilometres below the surface, and safely protected from any disturbances by the *Historic Shipwrecks Act 1976*, they are unfortunately out of the reach of the general public.

This drove a team of researchers led by Curtin University and the Western Australian Museum to form the Sydney-Kormoran Project to bring these culturally significant, but highly inaccessible, pieces of maritime history back to the public using virtual environment technologies, 3D-imaging and 3D-reconstruction techniques.

The team's nine-day expedition to the wrecks in 2015 captured half a million high-resolution photos and 300 hours of high-definition video (mostly in 3D). When they calculated that it would take a standard computer about 1,000 years to process the data using conventional techniques, they turned to Pawsey to help solve their big-data problem.

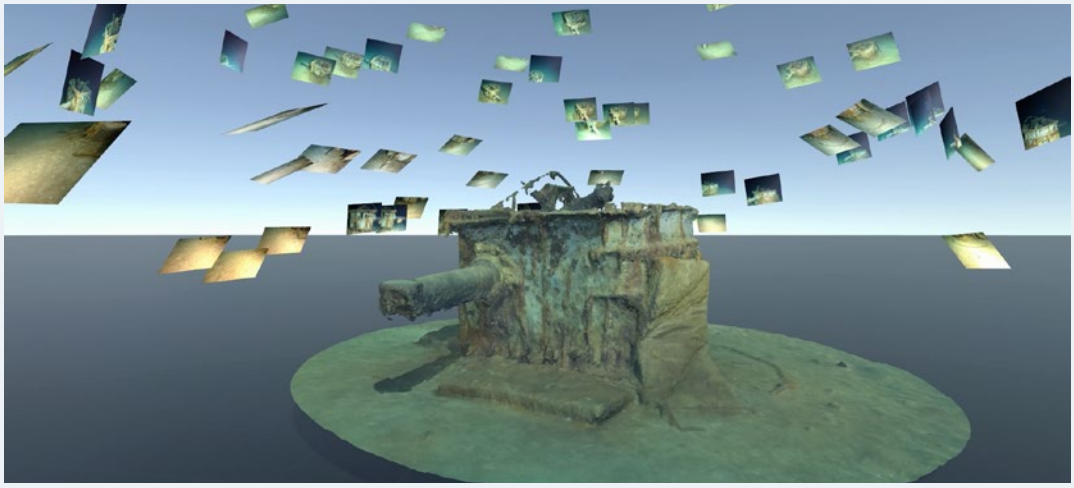
As one of the joint venture partners of the Pawsey Supercomputing Centre, Curtin University researchers have access to state-of-the-art, high-performance computing facilities including Magnus – Pawsey's biggest supercomputer and the most powerful public research computer in the southern hemisphere.

Magnus is making the project's time frame possible by performing many thousands of tasks in parallel using 3D-reconstruction software that matches and stitches the photos together to reconstruct the wreckage in 3D.

This is the first time in the history of Australian maritime archaeology a project like this has been undertaken, and now the team are working hard to make the once-lost wrecks 'virtually' accessible to the general public: bringing history to life.

So far the wrecks have been partially reconstructed in 3D, and the team are expecting to make the full reconstruction available to museum-goers within two to three years, with the continued help of Magnus. Because the wrecks are protected at the sites and artefacts are not allowed to be removed, researchers have also been exploring the use of 3D printing to create physical replicas.

The team anticipates that the algorithms and techniques they develop for this project will help bring 3D reconstruction to other areas, such as surveying oil and gas sub-sea infrastructure, and terrestrial applications such as documenting fields of rock art.



A visualisation of HMAS *Sydney* surrounded by the images used to construct it. Image: courtesy of Curtin University and Western Australian Museum. Copyright Western Australian Museum

National Research Collections of Australia

Australia is home to more than half a million species of plants and animals. Three-quarters of them are found nowhere else on earth. Our unique biodiversity is a national treasure. It is also crucial environmental infrastructure, providing ecosystem services and representing an economically valuable resource.

The National Research Collections of Australia (NRCA) are a vital resource for conservation, science and innovation. NRCA's six biological collections contain more than 15 million specimens, representing a 240-year time-series of data on the occurrence and distribution of native and introduced plants, terrestrial vertebrates, insects, fish, algae and tree seeds.

These collections are Australia's most reliable set of nationally representative biological collections. They underpin research in agriculture, biosecurity, biodiversity and climate change, and are used by researchers all over the world.

NRCA's role is to secure and mobilise the rich biological information in its collections to explore, conserve and exploit our nation's unique biodiversity for the benefit of our environment, the community and industry. The collections enable us to identify, quantify and explore Australia's biodiversity over time, inform public policy decisions, support biosecurity and contribute to environmental management. Importantly, the collections also underpin exploration of biodiversity for commercial purposes.

THE AUSTRALIAN NATIONAL INSECT COLLECTION HOLDS 12 MILLION SPECIMENS, INCLUDING A WEEVIL COLLECTED BY CHARLES DARWIN AT KING GEORGE (PRESENT DAY ALBANY, WA) IN MARCH 1836.

Utilisation

The Australian National Insect Collection (ANIC) is critical biosecurity infrastructure for Australia. Two DAWR staff working as part of ANIC identify hundreds of insects intercepted at Australia's borders each year. ANIC's other biosecurity activities – sponsored by DAWR, Plant Health Australia, the Department of Foreign Affairs and Trade and private industry – involve a diverse range of users from government, private industry and universities from Australia, the Pacific and the Association of Southeast Asian Nations region. ANIC also reviewed Australia's biosecurity diagnostic system and runs training courses that build national biosecurity capacity.

The Australian National Wildlife Collection, especially its cryo-frozen tissue collection, continued to be a major research resource for the international community, with 1,126 tissue samples sent for DNA sequence–based research during 2015–16.

The Australian National Algae Culture Collection (ANACC), through the Australian National Algae Supply Service (ANASS), provides microalgae strains as starter cultures to industry, research organisations and educational institutions in more than 70 countries. During 2015–16, ANASS supplied a total of 400 living microalgae cultures to 98 customers (67 per cent Australian and 33 per cent international), resulting in total sales revenue of $61,233.

The Australian Tree Seed Centre (ATSC) supplies wild and genetically improved native tree seeds to Australian and international customers. During 2015–16, ATSC supplied a total of 118 seed orders (51 per cent Australian and 49 per cent international) to 93 customers, resulting in total sales revenue of $377,000.

TABLE 2.13: COMBINED UTILISATION OF NATIONAL RESEARCH COLLECTIONS[14]

USE OF NATIONAL RESEARCH COLLECTIONS OF AUSTRALIA	2011–12	2012–13	2013–14	2014–15	2015–16
Number of specimens dispatched	15,548	13,660	30,514	20,156	18,588
Outward-going loans	157	153	222	171	177
Tissue samples sent	3,819	2,415	8,461	4,033	2,884
Tissue sample grants	43	74	34	61	74
Number of visitors hosted				417	404
Total visitor research days				**651**	**1,018**
Number of tours hosted				90	126
Total number of visitors on tours				**695**	**888**

Maintain or increase collections available to researchers and the public

Digitisation is key to making biological collections available to researchers and the public. It covers a spectrum of activities from capturing a specimen's metadata, to including images, 3D scans and genomic work. NRCA has drafted a strategy to digitise existing specimens and facilitate the digitisation of newly collected specimens. NRCA has successfully piloted a new collections-management system, worked with Data61 and other CSIRO groups on innovations in digitisation and curation, and is investigating high-resolution imaging of the entire Australian National Herbarium (ANH) collection.

The Atlas of Living Australia (ALA) is the primary mechanism through which NRCA's digitised biological collection data is made freely available in electronic format to the wider community. The ALA delivers more than 60 million records provided by partners who include museums, state and local governments, non-government organisations, universities and CSIRO (through NRCA). During 2015–16, 3.8 billion records were downloaded from the ALA for uses including education, research and management. Approximately 32 million of the records downloaded were provided by NRCA.

During 2015–16, the Australian National Wildlife Collection (ANWC) focused on digitising bird specimens from expeditions to remote locations including Cape York Peninsula, the Kimberley and Papua New Guinea, adding rare and valuable specimen record data to the ALA. During this period, 7,222 sound files, comprising 35,881 species records, were registered to the ANWC sound archive and ANWC now makes 41,955 species-occurrence sound records available through the ALA.

ANIC delivers scientific expertise in taxonomy, and technical expertise in collections and their management to researchers and governments. ANIC has developed digitisation and imaging techniques that place it in a leading position in Australia.

The majority of the Australian National Fish Collection specimens are digitised. Recent activity has focused on adding unregistered specimens collected during fieldwork over the past 30 years to the database, which represent approximately 15 per cent of the entire collection. Approximately 80 per cent of registered specimen records are available publicly through the ALA.

The majority of the ANH Australian specimen records are digitised and available through the Australia's Virtual Herbarium and the ALA. Imaging of ANH type specimens has largely been completed as part of a joint initiative across Australian herbaria, funded by the Andrew W. Mellon Foundation. More than 7,700 images of ANH type specimens are now available online via the Global Plants Initiative hosted by JSTOR, a publicly available, searchable resource that stores digital documents and images. ANH has started imaging its lichen type specimens and orchid type specimens.

14 Excludes ATSC and ANACC, because the function of these collections is a supply service, not coverage.

Core culture and accession information is digitised for all ANACC specimens; additional imaging, georeferencing, genomic and phenotypic characterisation have been digitised to different levels. Eighty per cent of ANACC strains have been successfully sequenced using four phylogenetically useful gene regions. Taxonomic validation and digitisation of this data is ongoing. Approximately 60 per cent of these data are available publicly through the ANACC public database and the ALA.

The ATSC focused on digitising paper records, or provenance sheets, that have been scanned into PDF format and made searchable from ATSC's web-served database. These sheets often have collection notes, maps and photographs that supplement categorical data entered directly into the database.

THE OLDEST SPECIMEN IN THE AUSTRALIAN NATIONAL HERBARIUM WAS COLLECTED IN 1770 BY JOSEPH BANKS.

TABLE 2.14: DIGITISATION OF THE NATIONAL BIOLOGICAL COLLECTIONS

	PROPORTION OF COLLECTION DIGITISED (%)				
COLLECTION	2011–12	2012–13	2013–14	2014–15	2015–16
Australian National Insect Collection	5.0	5.0	5.0	5.0	5.0
Australian National Wildlife Collection (excluding sound archive)	91.0	92.0	92.0	92.0	99.9
Australian National Fish Collection	100.0	100.0	100.0	85.0	85.0
Australian National Herbarium	76.0	76.0	76.0	76.0	80.0
Australian National Algae Culture Collection	-	-	-	100.0	100.0
Australian Tree Seed Centre	66.0	67.0	68.0	70.0	70.0

Mobilising the biodiversity data of Papua New Guinea for better decision-making

The globally significant biodiversity of Australia's regional neighbour Papua New Guinea (PNG) is under increasing threat from population growth, economic activity and climate change. Understanding PNG's biodiversity is challenging because of a lack of easily accessible biodiversity data, which makes it difficult for the PNG government to make informed management decisions for sustainable land use and development.

The NRCA contain many representations of PNG biological specimens, resulting from land-use surveys in PNG during the 1950s, 1960s and 1970s, and ongoing research into connections between the biodiversity of Australia and its regional neighbours.

NRCA's PNG collection is a rich source of biodiversity data and has incredible potential to support conservation, development and tourism but, until recently, specimens were not readily available to the PNG government and other agencies due to not being digitised.

To resolve this, NRCA undertook to mobilise the biodiversity data held within its PNG collection and provide this data to the PNG government. Focusing on plants from the Kokoda Track and Owen Stanley Range, the ANH in Canberra began to capture data from its holdings of more than 200,000 PNG plant specimens.

There are many challenges in working with ANH's PNG plant specimens. Some older specimens have limited label information that exclude details such as latitude and longitude, now regarded as essential in modern collections. Identifying exactly where a specimen was collected can be made more difficult due to the complex and changing geography of PNG villages. Many PNG plant species are undescribed, making some specimens difficult to identify, and many PNG plant specimens are fragile and difficult to handle because tropical plants often have large, soft leaves that become crisp and brittle when dry.

Beginning with the Ericaceae, a family that includes showy plants such as rhododendrons and is richly represented in the Kokoda area, ANH staff ensured specimens were correctly identified and captured detailed information on name, collection date, location, altitude, habitat and more in the ANH electronic specimen database.

NRCA then expanded the project to include biodiversity data from birds, mammals, reptiles and amphibians from PNG held in the ANWC, and from butterflies, dragonflies and beetles from PNG held in the ANIC.

In early 2016, NRCA delivered this trove of biodiversity data to the PNG government. NRCA intends to make future investments in PNG biodiversity data-capture and information management, adding other plant groups from the ANH PNG collection, such as ferns, figs and umbrella trees.

This work was funded by the then Australian Government Department of the Environment to validate and provide biological collection data to the PNG Department of Environment and Conservation for inclusion in the PNG National Biodiversity Information System.

The ANH is part of the Centre for Australian National Biodiversity Research, a joint venture between Parks Australia's Australian National Botanic Gardens and CSIRO.

A rhododendron specimen collected in 1961 by Dick Schodde during CSIRO's land survey in Wabag-Tari, Papua New Guinea

Program 1.3:
Science and Industry Endowment Fund

The Science and Industry Endowment Fund (SIEF) is a separately constituted trust under the *Science and Industry Endowment Act 1926*. The Fund invests in science that addresses issues of national economic, industrial, environmental and cultural priority and contributes to Australia's sustainable future, including:

- fundamental research for sustainable resource use, environmental protection and community health
- tactical research, seeking solutions to national challenges
- collaborative research between organisations working on solutions to national challenges
- scholarships sustaining young researchers capable of working on national challenges.

The CSIRO Chief Executive Dr Larry Marshall is Trustee of the SIEF, and awards funding to parties across the national innovation system. The SIEF Advisory Council provides independent advice and recommendations on funding of proposals. CSIRO manages the Fund on behalf of the Trustee.

Some programs operate on a competitive basis, others by invitation on the basis of identified needs. SIEF funds the:

- Experimental Development Program (EDP)
- Joint CSIRO–Macquarie University Chair in Wireless Communications
- Promotion of Science Fellowships and Scholarships Program (competitive)
- Research Infrastructure Program
- Research Project Program (competitive)
- SIEF–AAS Fellowships to the Lindau Nobel Laureate meeting, facilitated by the Australian Academy of Science (competitive)
- SIEF STEM+ Business Fellowships, facilitated by CSIRO
- Special Research Program.

The contribution of research to solving issues of national importance can only be measured long-term, but key performance indicators have been developed for early program stages. As the funds available for allocation diminishes and fewer new projects are commenced, some KPI results do not change from previous years.

TABLE 2.15: PERFORMANCE SUMMARY FOR PROGRAM 1.3

CRITERIA SOURCE: CORPORATE PLAN 2015–16; 2015–16 PORTFOLIO BUDGET STATEMENTS, PROGRAM 1.3 PG 147	
PERFORMANCE CRITERION	**RESULT AGAINST PERFORMANCE CRITERION**
Proportion of projects aligning with SIEF purpose and strategic objectives	All research projects, research infrastructure and special research program activities align with the SIEF purpose – in particular, being of national benefit. Almost 90% of promotion of science scholarships and fellowships align with national priorities, and this figure has been increasing over time.
Proportion of projects involving more than one organisation	An emphasis on collaboration has seen the overall proportion of SIEF activities involving more than one organisation continue to increase. Preliminary bibliometric analysis indicates over 275 organisations representing over 35 countries are involved (through co-authorship).
Financial contributions of partners	Co-investment rates have increased steadily over time, reflecting the ongoing requirement of collaborators to indicate their commitment via co-investment.
Number of publications from SIEF projects	Publication numbers continue to increase, with preliminary bibliometric analysis indicating that the quality of science being reported is well above world average.
Number of Early Career Researchers (ECRs) funded through SIEF projects	ECR numbers have increased, albeit modestly, because several programs have concluded. The new STEM+ Business Fellowship program will add a further 25 ECRs over the next few years.

ANALYSIS OF PERFORMANCE

SIEF provides funding across Australia's national innovation system via a comprehensive portfolio of activities, while maintaining independence and transparency. During the past year, the Australian National Audit Office (ANAO) conducted a performance audit on the *Administration of the CSIRO's Gift to the SIEF*[15]. The purpose of the audit was to evaluate the design and implementation of the administration of the gift, and to evaluate whether the financial assistance from the gift had been administered effectively and the expected outcomes achieved. The audit found that CSIRO's gift to SIEF was being transparently and efficiently managed. The audit process itself was rigorous, and required considerable time and effort from the SIEF management team to assist and respond to the ANAO auditors.

The monies gifted to SIEF in 2009–10 are finite and most of these funds have now been committed. Projects are now drawing to the end of their SIEF funding and the research teams are securing and consolidating the ongoing and alternative resources they will need to take their work to the next stage of development.

The SIEF Trustee, guided by the independent SIEF Advisory Council, has a role in identifying funding gaps across the national innovation system. The recently established SIEF EDP was designed to address the dearth of funding options available for progressing technology development to a stage suitable for attracting commercial investment and market uptake. This program opens a new pathway for publicly funded research agencies in the Industry Portfolio to progress their common goal of increasing the commercialisation of research.

15 The audit report is available at: www.anao.gov.au/work/performance-audit/administration-commonwealth-scientific-and-industrial-research-organisations

Proportion of projects aligning with SIEF purpose and strategic objectives

One of SIEF's primary purposes is to provide grants in support of research that is of national benefit. All SIEF research programs and most of our fellowships and scholarships are funded on this basis (see Table 2.16). In 2015–16, two new programs were added to the SIEF portfolio; these programs are designed to accelerate innovation, develop research outputs into commercial opportunities, and strengthen industry–research collaborations in order to develop solutions to national challenges:

- STEM+ Business Fellowships: ECRs, research organisations and Australian small-to-medium enterprise (SME) businesses work together to develop innovative commercial solutions that build Australia's national competitiveness. This program provides long-term, in-firm placement of R&D capability as well as practical experience in industry for ECRs, thus creating and sustaining a cohort of developing researchers capable of addressing national challenges.
- Experimental Development Program: This program is designed to address a significant gap in current funding options available for progressing technology development to a stage suitable for attracting commercial investment and market uptake. Funding supports activities that translate research for commercial impact, move discoveries along the pathway to commercialisation, accelerate commercialisation and entrepreneurial activities, and reduce risks for future commercial investors.

Proportion of projects involving more than one organisation

More than 93 per cent of SIEF-supported activities involve more than one organisation (see Table 2.16), fostering communication, interaction and collaboration. Over 60 organisations are formally involved in one or more SIEF-funded projects, representing national and international research organisations as well as industry and end users. Many more organisations draw on SIEF-funded activities, particularly via the Research Infrastructure and Special Research Programs, where development and/or availability of research infrastructure plays an important role in supporting Australian innovation for the future.

Further evidence of collaborative activity resulting from SIEF funding is shown by the over 275 organisations, representing some 34 countries, that co-author publications with SIEF grant recipients (by preliminary analysis).

Financial contributions of partners

Research Projects leverage an average of more than 60 per cent co-investment from partner organisations. The Research Infrastructure and Special Research Programs have higher co-investment levels, indicating the longer term commitment to these activities by the partner organisations. The STEM+ Business Fellowship Program requires co-investment from the SME partner to demonstrate the commitment of the partners to work together to realise the potential impact of the research. Similarly, co-investment by applicants for experimental development activities must at least match the SIEF grant. The impact of these two new programs will be seen over the coming years.

TABLE 2.16: PERFORMANCE INDICATORS FOR PROGRAM 1.3

KEY PERFORMANCE INDICATOR	2011–12	2012–13	2013–14	2014–15	2015–16
Projects involving research in areas of national priority[16]	100% Research projects. 76% Promotion of science.	100% Research projects, research infrastructure and special research program. 83% Promotion of science.	100% Research projects, research infrastructure and special research program. 84% Promotion of science.	100% Research projects, research infrastructure and special research program. 84% Promotion of science.	100% Research projects, research infrastructure and special research program. 88% Promotion of science.
Projects involving more than one organisation[17]	>85%	>90%	>92%	>92%	>93%
Financial contributions of partners	Approximately 57%	Approximately 69%	Approximately 68%	Approximately 70%	Approximately 73%

16 Data include research projects, research infrastructure, special research and promotion of science programs. Undergraduate degree scholarships are excluded because there is no expectation that the undergraduates will address national priorities, collaborate, co-invest or publish. The EDP was launched in May 2016 and, as at 30 June 2016, had funded one project, with several proposals under assessment.

17 Cumulative for all projects awarded up to 30 June 2016.

THE FIRST EXPERIMENTAL DEVELOPMENT PROGRAM SUPPORTED RESEARCH IS INVESTIGATING ANTIVIRALS FOR BLACK TIGER PRAWNS, POTENTIALLY ADDING $2.2 MILLION OF VALUE TO THE AUSTRALIAN PRAWN INDUSTRY.

Number of publications from SIEF projects

Publication numbers continue to increase year on year (see Figure 2.5). However, it should be noted that the recorded publication numbers are likely to under-represent the true level of publications associated with SIEF funding. Publications resulting from grants in the Research Infrastructure and Special Research Programs are not included and, once SIEF funding has ended, it is challenging to capture all subsequent publications.

Early indications from bibliometric analysis show that the quality of science being undertaken in the overall SIEF Portfolio is high. Citations are 105 per cent higher than the global average (substantially ahead of the national average, which is 39 per cent above global), and 3.1 per cent of SIEF publications appear in the top one per cent of publications globally[18].

Early-career researchers funded through SIEF projects

SIEF has a remit to support ECRs and does this in several ways, through scholarships and fellowships, project funding and travel support. The number of ECRs has risen steadily over the past five years (see Figure 2.6). The geographical distribution of SIEF-supported ECRs shows a good spread across all Australian states and territories. This indicates funding opportunities available through SIEF are well known and sought after across the national innovation system.

ECRs work on SIEF-funded research projects and are associated with Research Infrastructure and Special Research Programs[19]. The SIEF–AAS Nobel Laureate Meeting Fellowships continue to ensure that young Australian researchers have the opportunity to interact with Nobel Laureate scientists, as well as their top peers from around the globe.

The John Stocker Postgraduate Scholarship program and the Honours and Vacation scholarship programs are no longer offering new scholarships, and the final cohort of John Stocker Postdoctoral Fellowships commenced in 2016. Over the last five years, these programs have helped over 60 young researchers and scholars further their careers.

The SIEF STEM+ Business Fellowship Program offers young researchers experience working in industry and it is anticipated that projects funded under the new Experimental Development Program will also involve ECRs.

18 Data source: Web of Science, 2011–16.
19 Early-career researcher figures are not collected for Research Infrastructure and Special Research Programs.

FIGURE 2.5: PUBLICATIONS ARISING FROM SIEF FUNDING, 2011–12 TO 2015–16

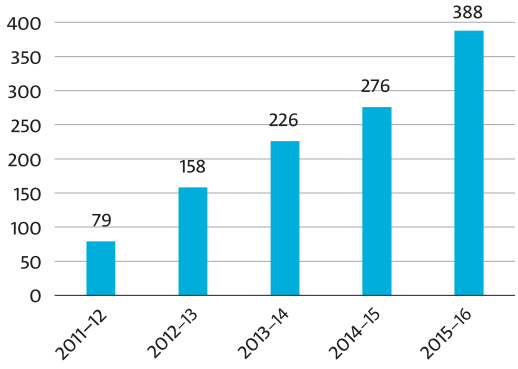
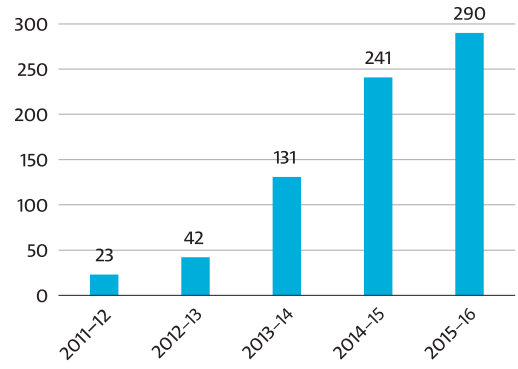


FIGURE 2.6: ERCs FUNDED THROUGH SIEF, 2011–12 TO 2015–16



CSIROseven was an internal and external campaign to celebrate our science and scientists by raising the awareness of CSIRO careers and how to do business with us.

Part 3
Our organisation

Management and accountability

OPERATING MODEL

Our organisation operates within a model designed to support the successful execution of our strategy and delivery of our goals. It defines the roles, relationships and accountabilities of our leaders and operating units. It contains our processes for planning, investment, review and reporting, and the CSIRO Policy Framework[20].

LEGISLATION AND GOVERNMENT POLICY

CSIRO is an Australian Government statutory authority constituted and operating under the provisions of the *Science and Industry Research Act 1949* (SIR Act).

Our primary functions are to:

- carry out scientific research to:
  - assist Australian industry and to further the interests of the Australian community
  - contribute to national and international objectives and responsibilities of the Commonwealth
- encourage or facilitate the application and use of the results of CSIRO scientific research.

Our secondary functions include international scientific liaison, training of research workers, publication of research results, technology transfer of other research, provision of scientific services and dissemination of information about science and technology.

Reporting, accountability and other rules for our operations are set out in the *Public Governance, Performance and Accountability Act 2013* (PGPA Act).

Pursuant to a service agreement, CSIRO also provides administrative support services to the Trustee of the SIEF consistent with the *Science and Industry Endowment Act 1926*. The Fund has its own governance structure. See pages 146–148 for more information on the Fund.

In October 2015, CSIRO submitted an annual Compliance Report to the Australian Government, covering the 2014–15 reporting year, regarding the organisation's compliance with the PGPA Act and the PGPA Rule. For 2015–16, in accordance with the revised disclosure requirements, CSIRO had no significant non-compliance matters to report to its Minister. There were no government policy orders to CSIRO during 2015–16.

RESPONSIBLE MINISTER

As at 30 June 2016, the responsible Minister for CSIRO was the Hon Christopher Pyne MP, Minister for Industry, Innovation and Science. The Hon Ian Macfarlane MP, Minister for Industry and Science was responsible Minister for CSIRO from 1 July 2015 until 21 September 2015.

The Hon Christopher Pyne MP, Minister for Industry, Innovation and Science

Under the SIR Act, the Minister has power to:

- add to the purposes for which CSIRO may carry out scientific research (SIR Act, section 9)
- provide to the CSIRO Board, in writing, directions and guidelines with respect to the performance of the functions, or the exercise of the powers, of the Board or of the Organisation (SIR Act, section 13).

The Minister provides CSIRO with a Statement of Expectations and the Board responds with a Statement of Intent. These documents are available at: www.csiro.au/en/About/Leadership-governance/Minister-and-Board/Statement-of-Expectations.

20 Further information about our operating model can be found at: www.csiro.au/en/About/Strategy-structure/Operating-model

MINISTERIAL DIRECTIONS AND NOTIFICATIONS

On 15 July 2014, the CSIRO Minister directed the CSIRO Board to apply the Australian Government Public Sector Workplace Bargaining Policy to Enterprise Bargaining Agreement negotiations in CSIRO. CSIRO continued to keep the Minister and Finance Minister informed through the Board in accordance with Section 19 of the PGPA Act during 2015–16.

GOVERNMENT ENGAGEMENT

Throughout 2015–16, we had regular meetings with ministers, parliamentarians and senior staff from relevant government departments to listen to their needs, share our research activities, and provide scientific information and advice to inform policy development and program implementation and evaluation. This included contributing to the development of the National Innovation and Science Agenda. CSIRO made 13 submissions to Federal Parliamentary inquiries, and our staff attended 13 inquiry hearings to provide further evidence to committees.

DURING 2015–15 CSIRO MADE 13 SUBMISSIONS TO FEDERAL PARLIAMENTARY INQUIRIES, AND STAFF ATTENDED 13 INQUIRY HEARINGS.

CSIRO BOARD

We are governed by a Board[21], who are responsible to the Australian Government for the overall strategy, governance and performance of our organisation.

The CSIRO Board comprises nine part-time, non-executive members including the Chairman, plus a full-time Chief Executive. All non-executive members are appointed by the Governor-General. The Chief Executive is appointed by the CSIRO Board, in consultation with the Minister.

In 2015–16 our Board operated in part through two standing committees:

- Board Audit and Risk Committee
- Board People, Health and Safety Committee.

On appointment, Board members receive a formal induction on the organisation and their duties. Members maintain their professional development and, to inform their decision-making, they participate in visits to CSIRO sites, and governance and business briefings. In the pursuit of their duties, Board members may take such independent professional advice as is considered necessary, and have complete access to senior management.

Under its Charter and Operating Guidelines, the CSIRO Board reviews its performance, composition and skill base at regular intervals to ensure it is operating efficiently, effectively and with regard for the principles of good corporate governance. At least once per year, the members of each Committee formally meet to discuss and document any item of business, but in particular its prior year performance, and then report to the Board meeting on these outcomes[22].

Details of our Board members, including their qualifications and terms of appointment, are on page 74. Details of remuneration, membership of Board committees, attendance at meetings, and related party directorships and associations are shown in the financial statements.

CSIRO EXECUTIVE MANAGEMENT

Our Chief Executive conducts the affairs of our organisation in accordance with the strategy, plans and policies approved by our Board and the Board Directions to the Chief Executive.

Our Chief Executive is supported by our Executive Team (ET). As a team and through their individual roles, the members lead, direct, coordinate and control CSIRO's operations and performance. Details of the members are on page 75. This year and in accordance with the Executive Team Charter, the ET developed the Corporate Plan 2016–17, Budget and new Policy Framework (see page 71). The ET is assisted by two standing committees:

- The Science, Strategy, Investment and Impact Committee (SICOM) supports the ET to direct and control the organisation's strategic science, capability, investment and impact planning.
- The Major Transactions Committee (MTC) controls CSIRO's involvement in major transactions, and related matters and investments.

21 The Board Charter and membership profiles are available at: www.csiro.au/en/About/Leadership-governance/Minister-and-Board
22 The outcomes from this assessment are internal to CSIRO and not for public release.

During 2015–16 SICOM met in session 14 times and considered a number of matters out of session. The MTC held 16 meetings, including six out-of-session meetings. Our CSIRO Leadership Team of senior managers provides a forum for sharing and discussing issues relating to the management and future strategy for CSIRO.

DISCLOSURE OF INTERESTS AND RELATED ENTITY TRANSACTIONS

Board members and the Chief Executive declare material interests in accordance with the SIR Act and PGPA Act as appropriate. The Board Governance document contains processes for managing conflicts of interest including a requirement that members absent themselves from discussions and voting where a member has declared a material personal interest, or where a potential or actual conflict of interest or duty arises.

In 2015–16, the Board did not consider any transactions where a Board member was also a director of the other entity involved in the transaction.

CSIRO has a system of delegated powers that enables transactions to be appropriately considered. Significant transactions are reviewed by either, or both of CSIRO's MTC or SICOM. MTC considers the soundness of the commercial strategy; strategic alignment, including financial and capital implications; details of transaction; compliance with policy, standards and procedure; and risk mitigation strategies, including proposed management and financial controls. The recommendation of the MTC then goes to the Chief Executive, and where appropriate the CSIRO Board.

SICOM will recommend to the ET specific investment options, preferably at strategic or concept stage; oversight the science standing and preparedness of CSIRO; oversight delivery against impact goals; monitor and review organisational performance against strategic investment decisions and plans; and provide advice on other matters related to science and innovation, as required.

There have been 206 transactions above $10,000 which came to a total combined value of $22.9 million.

PLANNING AND MONITORING PERFORMANCE

The CSIRO Strategy 2020 outlines the broad objectives, policies and strategies to be achieved by 2020 and details how achievement against the objectives is to be measured. The strategy maintains our focus on addressing national challenges and opportunities through our Research Business Units, and on continuing to develop Australia's scientific capability and preparedness by managing and investing in the infrastructure and people required.

In accordance with the requirements of the PGPA Act, our Corporate Plan 2015–16 set out the activities we committed to carry out and the resources allocated to these activities. Specifically, it included the annual delivery targets set by our ET and agreed by our Board for the financial year, in the form of strategy key performance indicators (KPIs). A summary of our performance against this year's KPIs is on pages 15–16.

To ensure we remain on track, our ET and Board receive regular updates on how we are performing against the plans, our KPIs, our budget and other internal performance indicators. In addition, our Research Business Units are periodically reviewed by panels which are chaired by independent experts, who assess the strength of our capability as well as the relevance and impact of our research. No Business Unit reviews were undertaken in 2015–16, but independent assessments of economic, environmental and social impacts from projects in Agriculture, Manufacturing, and Oceans and Atmosphere were completed (see page 17 for further information).

RISK MANAGEMENT

CSIRO is committed to effectively identifying and managing risk as a vital part of successfully capturing the opportunities created through scientific research and delivering on our purpose as an organisation. Risk is managed at all levels of the organisation and is the responsibility of all our people. Risk represents one of five organisational policy statements, and is supported by our risk standard, procedure and guidelines.

At the enterprise level, CSIRO develops and maintains an Organisational Risk Profile in alignment with our strategic plan that identifies the key strategic and operational risks to our goals and objectives. In 2015, this profile was prepared by the ET and reported to the CSIRO Board Audit

and Risk Committee and full CSIRO Board in July 2015. Subsequently, the status of organisational risks was reported on a monthly basis to the ET and Board. In addition, the Board Audit and Risk Committee received an update on the status of CSIRO's Risk Framework at each of its meetings throughout the year. An Issues Management Team, comprised of functional and business leaders, met on a weekly basis to ensure that emerging risks of significance to the organisation were identified and appropriately managed.

General insurance including General Liability and Professional Indemnity insurance is through Comcover. CSIRO's worker's compensation liability is covered by a premium paid to Comcare.

ADVISORY MECHANISMS

Our Advisory Committees provide advice on our longer-term strategic directions and research and development priorities and on how we can meet the research, technical and business needs of customers or communities. The committees meet at least twice a year, or more regularly if required. The advice provided by these committees focus on maximising the effectiveness of our individual businesses to achieve their goals. The committees comprise of representatives from industry, government, non-government organisations and other stakeholders.

Following Ministerial Directions in 2014–15, the CSIRO Board resolved to establish the Marine National Facility Steering Committee as an advisory committee to the CSIRO Board under s24 of the *Science and Industry Research Act 1949* (SIR Act). In the previous reporting year, the CSIRO Board established the Australia Telescope Steering Committee under s24 of the SIR Act, after we received a similar Ministerial Direction.

POLICIES, STANDARDS AND PROCEDURES

Our CSIRO Policy Framework comprises policies, standards, procedures and guidelines. In 2016, the CSIRO Board approved a change to the Policy Framework to better support the CSIRO Strategy 2020 and streamline the available information for use by CSIRO officers. The new Policy Framework comprises policies, principles and procedures, and will be progressively implemented in 2016–17. This will be supported by our CSIRO Delegations and Authorities Framework.

The policy statements[23], approved by our Board, cover our commitment in relation to:

- Science and Delivery
- People
- Governance
- Risk
- Health, Safety and Environmental Sustainability
- Freedom to Conduct CSIRO Research and Technology Transfer.

The policy statements are reviewed annually to ensure they continue to clearly articulate CSIRO's commitments.

During 2015–16, the following standards and procedures were introduced or amended.

Standards

- Procurement
- Probity

Procedures

- Accelerated advancement
- Access control and visitor management
- Advisory Committees
- Anti-Bribery
- Authorship and Publishing
- Capital Works Procurement
- Classification appeals
- Collaborative Sites
- Commercial Contracts
- Consultancy procurement
- Contract management
- Contractor HSE[24] Management Admin Scientific
- Contractor HSE Management
- Electrical Safety
- Ethical Conduct in Human Research
- Export Control
- Field Work
- First Aid
- Fraud Control
- Goods and Services Procurement
- House Keeping
- HSE Inductions
- Indigenous Cadetship
- Information Security
- International Assignments

23 Our policy statements are available at: www.csiro.au/en/About/Policies-guidelines/Our-core-policies
24 HSE: Health Safety and Environment.

- Legal Advice
- Legal Assistance
- Living Allowance
- Lost or Stolen Computing Devices
- Managing Learning and Professional Development
- Managing the Learning Management System
- Miscellaneous Leave
- Mobile Devices
- Motor Vehicles
- Overtime
- Panel arrangement
- Parental Leave
- Personal Computer Fleet management
- Performance cash rewards
- Post-Separation Obligations
- Postgraduate Studentship
- Print and Image Services
- Probation
- Procurement Exemption
- Procurement Identification and Planning
- Public comment by CSIRO staff
- Recognition (Non-cash) rewards
- Redeployment and redundancy
- Resignation
- Sanctions
- Security Alert and Scalable Response System
- Security Clearance and Sustainability Checks
- Senior Staff Rewards
- Software Acquisition and Management
- Superannuation
- Term promotion
- Travel
- Use of Email
- Vacation scholarships scheme

Guidelines

- Classified Document Management
- Contact Reporting Scheme
- CSIRO Event Security
- Due Diligence
- External Complaints Handling
- Lock and Key Management
- Raising Concerns in CSIRO
- Risk
- Social Media

ETHICS AND THE CODE OF CONDUCT

Our CSIRO Code of Conduct sets out the standard of behaviour expected of CSIRO and of everyone working in it. All staff members and CSIRO affiliates are required to undertake training on the Code including on commencement with CSIRO.

In addition, we have procedures for Ethical Conduct In Human Research, and on the Care And Use Of Animals For Scientific Purposes. Our practices comply with national codes and relevant state and federal legislative requirements. CSIRO operates two human research ethics committees to cover its social and interdisciplinary science and health- and medical-related research. These committees review around 200 new projects each year, and provide ongoing monitoring and support for over 350 active projects at any given time. These committees provide independent, expert advice regarding appropriately engaging people and communities in research; and ensuring effective management of issues such as privacy, informed consent and managing risks and benefits flowing from research, throughout all stages of a project's implementation.

200 NEW PROJECTS UNDERGO HUMAN RESEARCH ETHICS REVIEW AND 150 NEW PROJECTS UNDERGO ANIMAL RESEARCH ETHICS REVIEW EACH YEAR.

CSIRO also operates seven Animal Research Ethics Committees (AECs) that provide review of all CSIRO research involving the care and use of animals. This research covers a diverse range of fields including wildlife conservation, farm animal production, nutrition, disease control and prevention, and human health. Approximately 150 new projects are reviewed each year. AECs also play an active role in monitoring the ongoing care and wellbeing of animals throughout the duration of any research and ensuring CSIRO's compliance with all regulatory requirements.

During 2015–16, we began a process of integration from across several Business Units to a centralised support function for the governance arrangements for CSIRO's animal and human ethics. The centralised function is located with the Science and Government Group in the Enterprise Support Services. This shift has provided improved levels of service delivery and support for CSIRO AECs and research staff, and a more consistent approach to regulatory compliance and project oversight.

INTERNAL CONTROLS

Assurances about our financial state of affairs, compliance and control environment are provided through a range of processes, including the role of the Internal Audit, Risk, Legal, Fraud Control and Security units; system design and monitoring; compliance reporting by senior managers; and the operation of our CSIRO Public Interest Disclosure Scheme.

From a fraud-control perspective, and as a corporate Commonwealth entity, CSIRO complies with the PGPA Act, which the Commonwealth Fraud Control Framework 2014 underpins. The CSIRO Fraud Control Team continues to review and update CSIRO's Fraud Risk, Governance and Fraud Control strategies. During 2015–16, there were no instances of fraud reported to or identified by the Fraud Control Team. Across 2015–16, the CSIRO Security Teams continued to progress compliance against the Australian Government Protective Security Policy Framework and the Information Security Manual, using a risk-based approach in line with our business model.

The progress is being overseen by the CSIRO Security Committee and Security Executive, who endorse all changes to security governance and risk mitigation strategies within CSIRO.

REVIEWS BY OUTSIDE BODIES

External audit is provided by the Australian National Audit Office.

The Senate Standing Committees on Economics examines the operations of CSIRO following the Federal Budget, the tabling in Parliament of our CSIRO Annual Report, and the introduction to Parliament of the additional Appropriation Bills. This year, senior executives appeared before the Committee on three occasions and responded to all related questions on notice. The Committee reviewed the Annual Report 2014–15 and commended the CSIRO on its user-friendly annual report[25].

The Senate Select Committee into the Scrutiny of Government Budget Measures held a number of hearings in March and April 2016 to investigate the '*potential ramifications of proposed cuts to the CSIRO*'. The committee tabled an interim report on 3 May 2016 which made five recommendations to Government. The Government went into a caretaker period on 9 May 2016 and consideration of the inquiry's recommendation was deferred until after the caretaker period.

JUDICIAL DECISIONS

During 2015–16, there were no judicial decisions or decisions of administrative tribunals that have had, or may have, a significant effect on the operations of CSIRO.

25 Last year's report is available at: www.csiro.au/annual-report2015

Board membership

Mr David Thodey

(Chairman)
BA FAICD
Company Director
15 October 2015 – 14 October 2020
NB: Commenced duties
19 November 2015

Dr Eileen Doyle

(Deputy Chairman until
14 February 2016)
BMath (Hons) MMath PhD FAICD
Company Director
15 February 2006 –
14 February 2016

Ms Shirley In't Veld

(Deputy Chairman from
22 April 2016)
BCom LLB FAICD
Company Director
28 June 2012 – 27 June 2020

Dr Larry Marshall

(Chief Executive)
BSc (Hons) PhD AICD
1 January 2015 –
31 December 2016

Dr Michele Allan

BAppSc MMgtTec
MCommLaw DBA FAICD
Company Director
5 May 2016 – 4 May 2019

Ms Jane Bennett

FAICD
Company Director
25 October 2012 –
24 October 2015

Prof Edwina Cornish AO

BSc (Hons) PhD FTSE AICD
Provost and Senior
Vice-President, Monash University
26 November 2015 –
25 November 2020

Mr David Knox

BSc (Hons) Mech Eng MBA
FIE Aust FTSE GAICD
Company Director
5 May 2016 – 4 May 2019

Prof Tanya Monro

BSc (Hons) PhD
FAA FTSE FOSA FAIP GAICD
Deputy Vice Chancellor and Vice
President: Research and Innovation,
University of South Australia
25 February 2016 – 24 February 2021

Mr Hutch Ranck

BSc Economics FAICD
Company Director
1 May 2011 – 30 April 2016
Reappointed: 5 May 2016 –
4 May 2018

Dr Peter Riddles

BSc (Hons), PhD, Grad Dip Bus,
FAICD
Company Director
24 April 2014 – 23 April 2017

Mr Brian Watson

BComm
Company Director
14 September 2015 –
13 September 2020

Details of the operation of our Board are on page 69.

Executive Team members

Dr Larry Marshall

BSc (Hons) PhD AICD
Chief Executive

Dr Anita Hill

BEng (Hons) MSc PhD FTSE GAICD
Executive Director – Future Industries

Mr Craig Roy

BSc MSc MBA FAICD
Deputy Chief Executive

Dr David Williams

BSc (Hons) PhD
Executive Director – Digital, National Facilities and Collections

Ms Hazel Bennett

BSc (Hons) ACA FCPA GAICD FAIM
Chief Finance Officer

Dr Alex Wonhas

Physik Diplom (Bsc (Hons) MSc (Hons) equivalent) PhD GAICD
Executive Director – Environment, Energy and Resources

Previous members

- Dr Andrew Johnson, BAgrSc (Hons) PhD MPA: Executive Director – Environment (until 12 September 2015)
- Dr Brian Keating, BAgrSc (Hons) PhD: Executive Director – Agriculture, Food and Health (until 26 February 2016)

Details of our Executive management are on page 69.

Health and safety

At CSIRO we aspire to 'Zero Harm' and are committed to the safety, health and wellbeing of our people, partners, customers and the environment. In 2015–16, 30 staff suffered an injury serious enough to prevent them from coming to work, five fewer than in 2014–15. These injuries occurred at a rate of 3.3 per million hours worked, which is an improvement from the rate of 3.7 in 2014–15. In 2015–16, we also had a significant decrease in injuries that required medical treatment. These combined reductions resulted in a 30 per cent reduction in the Recordable Injury Frequency Rate in the financial year.

Musculoskeletal injuries remain the most frequent cause of injury to our people. Although not life-threatening, these injuries are always painful and often debilitating. In 2015–16, 94 of our staff experienced an injury which required time off work or medical treatment, and 67 per cent of these were musculoskeletal. The focus on preventing these injuries has continued through equipment upgrades to reduce manual handling, Wellnomics Computer WorkPace® software being in place, Move 4 Life training, and a focus on reducing repetitive manual tasks. Establishing a dedicated Injury and Rehabilitation Management team with specialist physiology skills has also improved the early intervention and return-to-work programs, resulting in better outcomes for our people.

We are also focused on preventing injuries that are low-frequency but have the potential to cause death or permanent disability. These high-potential incidents are typically reportable to Comcare or, in the case of radiation incidents, the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA). In 2015–16, there were 10 reportable incidents, down from 13 in 2014–15. All of these incidents have been fully investigated by CSIRO and prevention measures are being implemented. Comcare issued CSIRO a Prohibition Notice under the *Work Health and Safety Act 2011* (WHS Act) after an incident involving an angle grinder in Queensland. CSIRO has implemented improved procedures across the organisation to the satisfaction of Comcare.

In 2015–16 there were no radiation incidents that were reportable to ARPANSA. There were also no incidents reportable to the Office of the Gene Technology Regulator or Security Sensitive Biological Agents.

FIGURE 3.1: CSIRO RECORDABLE INJURY FREQUENCY RATE[26], 2011–12 TO 2015–16

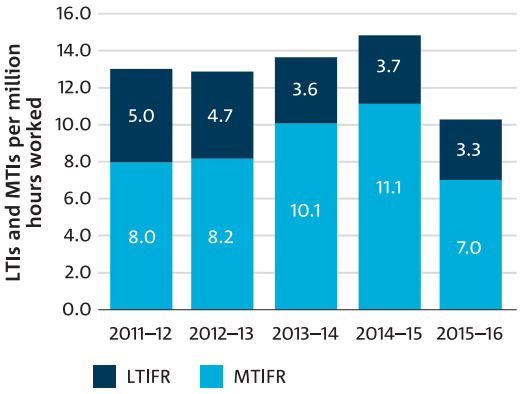
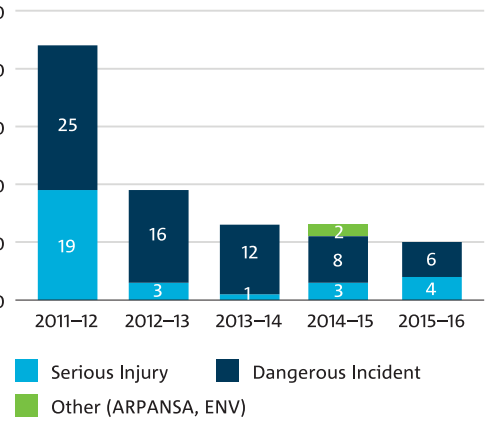


FIGURE 3.2: REGULATORY NOTIFIABLE INCIDENTS[27], 2011–12 TO 2015–16



26 The Recordable Injury Frequency Rate is calculated as the sum of Lost Time Injuries per million hours worked (LTIFR) plus the Medical Treatment Injuries per million hours worked (MTIFR).

27 The *Work Health and Safety Act 2011* came into effect on 1 January 2012, changing the criteria that determine which incidents must be notified to Comcare. This change accounts for much of the steep decline in notifiable incidents between 2011–12 and 2012–13.

HEALTH SAFETY AND ENVIRONMENT STRATEGY

In 2015–16, the CSIRO Health Safety and Environment (HSE) 2020 Plan was developed to support the CSIRO Strategy 2020. This plan builds upon the key initiatives of the CSIRO 2011–2015 HSE Strategy, which focused on a 'one CSIRO' approach to HSE processes and practices and the growth of CSIRO's HSE capability. During this period, significant programs such as the Wellbeing at Work strategy and Fatality Prevention program were developed and implementation commenced. The HSE 2020 Plan builds upon this work; core elements are having simple processes and empowering all leaders. This will be achieved by the HSE staff working in collaboration with the Business Units and support staff and being heavily involved in the cultural change programs used to facilitate the broader CSIRO 2020 Strategy.

The CSIRO HSE 2020 Plan was developed in consultation with the Business Units and other internal stakeholders. The key themes of the plan are:

- Safety leadership – enabling all CSIRO team members to be safety leaders
- Global and collaborative – CSIRO teams everywhere are enabled and supported to be safe
- Systems and processes – simple, agile and adaptable systems and processes that empower
- Monitoring and review – learning from our partners and continually improving
- Health and wellbeing – supporting a 'whole person' approach.

These themes are underpinned by two guiding principles:

1. Tools and processes to effectively manage key risks are developed with end users (our scientists/technicians/support staff).
2. Strong HSE partnerships are developed with other CSIRO support teams and the science businesses.

Environmental performance

CSIRO has adopted government policy to reduce its emissions by five per cent by the end of June 2020 (compared to 1999–2000 levels). This aggressive carbon emission reduction target represents a 20 per cent reduction, measured against business-as-usual projections. As a result, CSIRO's Scope 1, 2 and 3 carbon emissions will fall from a projected 282 kilotonnes carbon dioxide equivalent ($ktCO_2$-e) to approximately 227 $ktCO_2$-e by 2020.

Emission reductions will be achieved through six focus areas:

- Sustainable buildings
- Sustainable laboratories
- Travel and transport
- Low-emission energy technologies
- Sustainable procurement
- Site consolidation and greater use of facilities to meet future research and enterprise needs.

Energy consumption (electricity and gas) decreased by two per cent compared with 2014–15. Energy consumption has fallen by four per cent over the last five years (see Figure 3.3). Electricity consumption has plateaued over the last five years, while natural gas use decreased by 13 per cent over the same time frame.

Factors that have influenced electricity and gas consumption in the last year include:

- CSIRO's Highett facility closing, and ongoing remediation of CSIRO's Belmont facility, resulting in significant decreases in electricity and gas consumption and an offset of increases at other sites, such as at Black Mountain and Kensington
- building improvement projects, such as lighting upgrades and building tuning
- operational changes to facilities and commencement of new research projects (resulting in increased consumption)
- increased electricity demand by the *Investigator* research vessel when it is in port
- reduced capacity for electricity generation at CSIRO's Newcastle facility, which has increased consumption of grid-fed electricity at the site.

The reduction in gas consumption enabled CSIRO to reduce its Scope 1 and 2 carbon emissions from 122 $ktCO_2$-e in 2014–15 to 117 $ktCO_2$-e over the past year. Over the last five years, CSIRO's carbon emissions attributed to grid-fed electricity and gas have fallen by eight per cent. Site-consolidation activities, focused efforts to improve building energy efficiency, and engagement with staff have contributed to emission reductions. Changes to research activities can influence the year-to-year energy consumption at any given site. However, the general organisational trend in our energy consumption and emissions is downwards.

Our water consumption remained steady at 350 megalitres compared to the previous year.

CSIRO air travel had been trending down over the last four years, with a decrease in 2014–15 primarily driven by government and internal policy (see Table 3.1). However, an average 17 per cent increase in air travel occurred during 2015–16, with a 13 per cent increase in domestic air travel and a 20 per cent increase in international travel.

FIGURE 3.3: CSIRO ENERGY AND WATER CONSUMPTION, AND GREENHOUSE GAS EMISSIONS (ELECTRICITY AND GAS ONLY)

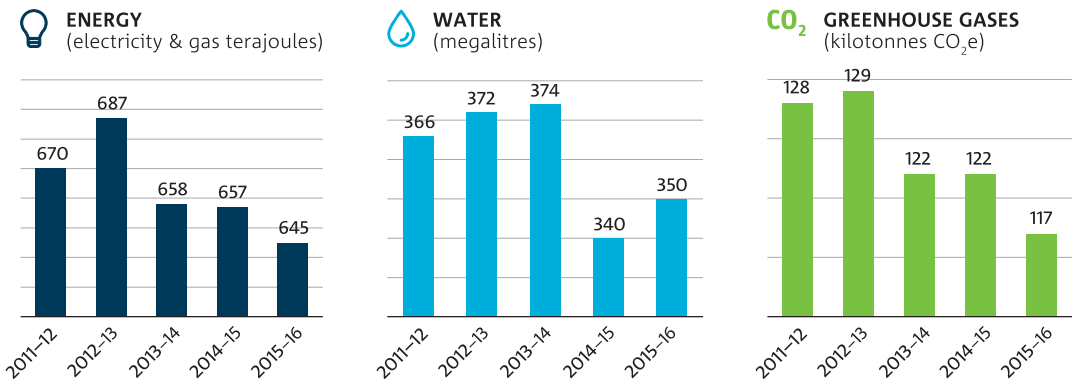


TABLE 3.1: CSIRO ENERGY, AIR TRAVEL AND WATER INTENSITIES

PERFORMANCE MEASURE	INDICATOR(S)	2011–12	2012–13	2013–14	2014–15	2015–16
Energy	Purchased energy (electricity and gas) consumed per employee (GJ/FTE)[28]	117	119	121	136	131
Air travel	Million air kilometres travelled (km)	114	116	113	100[29]	117
	Air travel per employee (km/FTE)	19,930	20,214	20,853	18,874	24,187
Relative mains water use	Amount of total water use per employee (kilolitres/FTE)	64	65	69	70	72

28 GJ/FTE is gigajoules per full-time equivalent [staff]. FTE refers to CSIRO Officers as at June 2016.
29 Updated after we received new June 2015 data.

Vehicle fleet

The first of 10 completely electric (petrol-free) Nissan LEAF vehicles were unveiled to staff at Canberra's Black Mountain site in Canberra in April 2016. This was the first of a multi-site rollout, and the latest initiative aimed at reducing CSIRO's carbon footprint and drawing attention to the opportunities. Other CSIRO locations that will take delivery of new electric cars include: Clayton, Pullenvale, Townsville, Hobart, Floreat and Newcastle to complement the 36 electric/petrol hybrid cars that were introduced to the CSIRO fleet in 2015 to replace petrol-only vehicles.

To ensure that emissions attributed to recharging the vehicles are minimal, we are installing a 30 kilowatt photovoltaic solar array on Black Mountain to offset the grid-fed electricity used to charge the vehicles; any residual power generated will provide a small portion of the building's electricity requirements.

Building energy-efficiency

CSIRO continued investing in improving building energy-efficiency as part of the Sustainable Buildings Program under the CSIRO Carbon Strategy. The Clayton site lighting upgrade was expanded to include more buildings and laboratories, resulting in almost 500 tonnes CO_2-e emissions less per year and estimated annual cost savings of $60,000. The Building Recommissioning Program was expanded also to investigate potential efficiency opportunities at Black Mountain, Floreat, Kensington, Newcastle and Kintore Avenue sites, resulting in identifying more than 300 tonnes CO_2-e of potential emission savings.

CSIRO is participating in an industry trial to evaluate commercial fault diagnostic and detection tools. The trials are part of a collaborative research project led by the CSIRO Energy team, with support through the Cooperative Research Centre (CRC) for Low Carbon Living. The trial will progress for the next 12 months.

Implementation of a new submetering program has commenced. In the coming year, approximately 500 submeter points will be connected to a central data-collection system that will greatly improve CSIRO's internal and external reporting, assist with monitoring projects under the CSIRO Carbon Strategy, and improve data building information and its availability.

On-site renewable generation

A feasibility study has shown that there are good opportunities to install at least five megawatts of PV cells across a number of CSIRO sites, enabling CSIRO to reduce carbon emissions by approximately nine $ktCO_2$-e per year. The study is the first step towards large-scale, on-site generation under the CSIRO Carbon Strategy. At present CSIRO has approximately 0.5 megawatts of PV capacity installed across sites in New South Wales and Western Australia.

Following promising results from a test of First Solar thin-film solar panels on the western façade of the CSIRO Energy Centre in Newcastle, CSIRO proceeded to integrate this solar panel in the new design of the façade. The new 24-kilowatt solar façade combines the thin-film panels with other coloured-glass panels to generate electricity, while being aesthetically pleasing, waterproof, and allowing light but not heat to enter the atrium. The new western façade increases the total installed PV capacity at the Newcastle site to 299 kilowatts.

WASTE AND RECYCLING

Improved oversight of waste and recycling practices across our national sites under the CSIRO National Waste and Recycling Services Contract highlights the benefits of a nationally coordinated approach to waste and recycling, with the added bonus of a national dataset. We now actively manage 30 waste and recycling categories.

CSIRO diverted 11,233 cubic metres (weighing 3,765 tonnes) of waste from landfill, equating to 995 tonnes CO_2-e saved in the period May 2015 to April 2016. The organisation currently remains at an approximate 40 per cent diversion rate by volume. The target of 50 per cent diversion from landfill by December 2015, although not met by volume, was met by weight on a rolling 13-month average – CSIRO achieved a 50.2 per cent diversion rate as measured by weight. We have calculated cost savings (via national contract service delivery) on a worst case to best case scenario of $1.8 million to $3.8 million respectively, over five years.

CSIRO continues its signatory status with FluoroCycle, committing to recycling all mercury-containing lighting on sites where CSIRO has operational control of the facility.

To ensure a whole-of-life approach is applied to material flows in and out of CSIRO, the Environmental Sustainability Team is leading a collaborative project involving expertise from CSIRO's industrial ecology and life-cycle assessment researchers to develop the CSIRO Sustainable Procurement Strategy 2020. Initial results indicate that at least half of CSIRO's carbon footprint is made up of Scope 3 emissions, attributable to our supply chain. It is anticipated that the Sustainable Procurement Strategy will be delivered for ET and Board endorsement by January 2017.

OUR CARBON STRATEGY 2020 COMMITS US TO A 20% REDUCTION IN CARBON EMISSIONS BY JUNE 2020.

ENGAGEMENT WITH OUR STAFF

Cultural shifts are necessary for staff to incorporate environmental sustainability in their day-to-day decision-making. A key pillar of the Carbon Strategy 2020 is the Sustainable Labs Program, which focuses on reducing energy and water consumption, and related emissions – plus reducing costs – by embedding sustainable behaviours in our labs and increasing environmental awareness.

The 'Shut the Sash' initiative's goal of having 90 per cent of fume cupboard sashes shut when unattended has been met by nine of the top 10 energy-consumption sites, and our engagement (including training) continues with the remaining sites. The program has already achieved an estimated electricity reduction of 2.2 megawatt-hours, reduced Scope 2 and 3 emissions by 2.6 $ktCO_2$-e, and saved approximately $207,000 across sites.

CSIRO has implemented the behavioural change initiatives for staff using Variable Air Volume (VAV) fume cupboards and is now conducting a trial upgrading VAV fume hoods at our Black Mountain site to increase energy and maintenance savings.

The next phase of the Sustainable Labs Program focuses on reducing energy consumption from fridges and freezers, using the Hobart site as a pilot site.

CSIRO's change-management approach to increase staff ownership and accountability during 2015–16 was underpinned by a variety of promotional campaigns. These included: commitment to environmentally sustainable action in staff Annual Performance Agreements, battery recycling and recharging, office recycling, Earth Hour and inclusion of environmental sustainability implications for Capital Expenditure approval.

ENVIRONMENTAL MANAGEMENT AND HERITAGE

Heritage management

CSIRO recognises its responsibility to protect and conserve the Commonwealth and national heritage values of the places it owns or controls, and we manage these values in accordance with the requirements of the *Environmental Protection and Biodiversity Conservation Act 1999*. CSIRO has prepared a Heritage Strategy for CSIRO Land and Buildings 2016–2026[30]. The strategy outlines our objectives and responsibilities for the management of heritage values and has been endorsed by the Australian Heritage Commission.

In recognition of its responsibilities, CSIRO intends to nominate parts of the Ginninderra field site for inclusion on the ACT Heritage Register for its Indigenous and historic heritage values. This will ensure the protection of these heritage values are not compromised when the land status changes from National Land to Territory Land.

Environmental management

After CSIRO scientists reviewed due diligence reports and independently identified values that reflect CSIRO's aspirations, the proposed Ginninderra redevelopment has preserved 80 hectares in addition to the area required under the legislation for items of heritage and threatened species such as grasslands, birds, insects and trees.

The approach to conservation and heritage management at the CSIRO Ginninderra site is part of an overall avoidance and mitigation strategy that seeks to limit the impacts of urban development as far as possible.

30 The Heritage Strategy, along with a list of CSIRO land or buildings with Commonwealth heritage values can be found at: www.csiro.au/en/About/Strategy-structure/Heritage-management

Contribution to ecologically sustainable development

CSIRO upholds the principles of Ecologically Sustainable Development (ESD) outlined in the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) through its operations and research activities. Table 3.2 provides examples of how CSIRO supports the ESD principles.

To achieve its research goals, CSIRO operates numerous types of infrastructure, such as laboratories, glasshouses, farm properties and telescope facilities, as well as managing plants and livestock. These activities require significant quantities of energy and water, and produce waste.

TABLE 3.2: EXAMPLES OF CSIRO'S CONTRIBUTION TO ESD PRINCIPLES

PRINCIPLES	CSIRO'S ACTIVITIES
Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations.	The Ocean and Atmosphere eReefs models aim to improve management of the Great Barrier Reef. This comprehensive, real-time, reef information system provides an important tool for reef managers by helping them improve environmental decision-making. The system's capability to forecast the outcomes of different scenarios is expected to greatly assist in setting water-quality targets and support the implementation of the Reef 2050 Plan. There are already a number of users of the eReef models, including: • the Great Barrier Reef Marine Park Authority • the Queensland government • BOM (and the users of its online marine water-quality dashboard).
If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.	Data61 is reducing the risk of bushfires through the Powerline Bushfire Safety Program, which informs the Department of Environment, Land, Water and Planning (DELWP) fire reduction activities, including improvements to electrical infrastructure. In 2015, reports showed that our activities had resulted in investment in network protection with a 15.7% reduction in relative risk.
The principle of inter-generational equity – that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.	AAHL provides diagnostic, surveillance and response service for the Department of Agriculture and Water Resources (DAWR), but also serves hundreds of customers through its quarantine-testing service. It enables the movement of biological products and animals to maintain environmental integrity, biosecurity and food security, and is now designated a World Organisation for Animal Health International Reference Laboratory for zoonotic diseases.
The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making.	ANIC is a critical and authoritative resource for systematics, evolutionary biology, ecology, natural resource management, biosecurity and biogeography. For example, ANIC is mobilising the biodiversity data of Papua New Guinea to provide to the Papua New Guinean government so it make informed management decisions for sustainable land use and development.
Improved valuation, pricing and incentive mechanisms should be promoted.	One of the CSIRO Strategy 2020 objectives is to embed a rigorous impact and investment planning, monitoring and evaluation framework into our business and employ it to continually optimise our performance. The organisation under Strategy 2020 demands greater emphasis on and a culture of delivering and providing evidence of triple-bottom-line impact and evidence of progress against planned milestones.

Our people

To become Australia's innovation catalyst, we must create a culture and environment that encourages our people to work collaboratively and creatively to deliver a positive impact for Australia and the world.

During 2015–16 we continued to develop and support our staff and leaders as outlined in our People Strategy. This involved making performance incentives available to all our staff, and simultaneously encouraging an appropriate work–life balance by supporting flexible working conditions and fostering a family-friendly environment across the organisation.

Through the ongoing efforts of our Human Resources and Organisation Development teams, we continued to provide leadership on matters relating to our people, in addition to offering guidance and ensuring compliance with the *Equal Employment Opportunity (Commonwealth Authorities) Act 1987*.

In 2015–16, we focused on the following areas from our People Strategy:

- Empower – Our leaders and staff are empowered to deliver our strategy.
- Mobility and agility – CSIRO is motivated and able to mobilise swiftly to deliver impact.
- Talent – We actively attract and develop innovative capability to meet the needs of our customers.
- Diversity and inclusion – Our diverse and inclusive teams drive innovation and delivery to our customers.

ENTERPRISE AGREEMENTS

Enterprise agreements set the terms and conditions of employment for CSIRO staff. Two enterprise agreements are in operation: the CSIRO Enterprise Agreement 2011–2014 and the CDSCC Enterprise Agreement 2014–2017.

The CSIRO Enterprise Agreement came into operation on 7 July 2011 following formal approval processes and a staff vote. This agreement reached its nominal expiry date in August 2014 and will continue in operation until it is replaced or terminated in accordance with the *Fair Work Act 2009*. Negotiations for a replacement agreement commenced in July 2014 and are ongoing within the parameters established by the Australian Government Public Sector Workplace Bargaining Policy, which applies to the Australian Public Service (APS) and non-APS Australian government agencies, including CSIRO.

LEARNING AND DEVELOPMENT

During 2015–16, CSIRO provided 7,621 development days, a 45 per cent increase on the previous year and a continuation of over five years of growth. This year's marked increase is due to the release of new programs explicitly supporting the Strategy 2020, including the Lean LaunchPad, Customer Conversations and CSIRO's Intensive Development Centres[31]. These new offerings complement CSIRO's core curriculum of over 47 programs.

In line with global workplace learning trends, this year has seen the transfer of Working Smart with Outlook courses to a virtual program, supporting our move towards more collaborative online learning across the curriculum. We also introduced a new suite of three interactive, scenario-based eLearning modules. The result was a 60 per cent increase in eLearning participation compared to last year, with 2,876 people completing the Impact module, 3,280 people completing the Diversity and Inclusion module, and 3,329 completing CSIRO's Behaviours module. Moreover, 96 per cent of participants indicated they would apply their learning in the workplace and that they understood the importance of their contribution to these critical, strategy-related areas.

Across the curriculum, all programs are monitored to ensure a minimum of 80 per cent of participants agree that they achieved 'value for investment' and 'would recommend' the programs to colleagues. If these ratings are not achieved, programs are either redesigned or stopped.

WE PROVIDED 7,621 DEVELOPMENT DAYS THROUGH OUR LEARNING AND DEVELOPMENT CURRICULUM.

31 These figures exclude accelerator development days, which will be captured under the ON program.

DIVERSITY AND INCLUSION

Diversity and Inclusion initiatives under our 2012–15 Diversity and Inclusion Plan continued this year, and we started developing the 2016–19 Plan.

The 2016–19 Plan builds on the achievements of the previous plan, with a strong emphasis on accelerating our efforts to create opportunities for women to progress to senior science roles.

The CSIRO Strategy and the People Strategy clearly articulate our commitment to realising the innovation benefits that derive from an inclusive workforce diverse in its background, thinking and experiences. The Diversity and Inclusion Plans reflect these aspirations and commitment to action.

Some highlights of 2015–16 include:

- increased leader engagement through Business Unit Diversity and Inclusion Committees, Leadership Team development programs and representation on key diversity-project teams
- establishment of diversity and inclusion reference groups and/or committees across all Business Units to support the rollout of enterprise and local initiatives, including the establishment of Business Unit Diversity and Inclusion Plans
- selection of CSIRO as an inaugural member of the Science in Australia Gender Equity (SAGE) pilot of Athena SWAN Charter in Australia to address the improvement of gender equity in science, technology, engineering and mathematics (STEM)
- continuation of unconscious bias training across Business Units
- integration of Diversity and Inclusion content into the CSIRO Leadership and Team development curriculum
- establishment of the GLBTI@CSIRO staff network to provide support and social networking for our gay, lesbian, bisexual, transgender and intersex identifying staff and GLBTI-friendly staff
- introduction of Transition Guidelines to support leaders supporting transgender staff.

Additionally, since 1994, Commonwealth departments and agencies have reported on their performance as policy adviser, purchaser, employer, regulator and provider under the Commonwealth Disability Strategy. In 2007–08, reporting on the employer role was transferred to the Australian Public Service Commission's State of the Service report and the APS Statistical Bulletin. These reports are available at: www.apsc.gov.au. From 2010–11, departments and agencies have no longer been required to report on these functions.

The Commonwealth Disability Strategy has been overtaken by the National Disability Strategy 2010–2020, which sets out a 10-year national policy framework to improve the lives of people with disability, promote participation and create a more inclusive society. A high-level two-yearly report will track progress against each of the six outcome areas of the Strategy and present a picture of how people with disability are faring. The first of these reports is available at: www.dss.gov.au/our-responsibilities/disability-and-carers/program-services/government-international/national-disability-strategy#05.

The percentage of staff with disability in CSIRO as at 30 June 2016 was 3.9 per cent.

INDIGENOUS ENGAGEMENT STRATEGY

CSIRO believes that Indigenous Australians have made and will continue to make extraordinary contributions to Australia across cultural, economic and scientific domains. Furthermore, CSIRO recognises the social and economic disadvantage experienced by Aboriginal and Torres Strait Islander people and is committed to overcoming the gap between Aboriginal and Torres Strait Islander people and non–Indigenous Australians.

CSIRO initiated its Indigenous Engagement Strategy in July 2007. The Strategy aims to achieve greater participation by Aboriginal and Torres Strait Islander people in CSIRO's research and development agenda and activities, and to improve outcomes for Aboriginal and Torres Strait Islander people. To focus our efforts in this area, CSIRO has developed its first Reconciliation Action Plan, outlining a range of activities and deliverables aimed at closing the gap between Aboriginal and Torres Strait Islander people and non-Indigenous Australians.

Human Resources staff and the CSIRO Office of Indigenous Engagement are working together to review and revise CSIRO's cultural awareness program and the Aboriginal and Torres Strait Islander Employment Strategy. This strategy will provide a range of activities aimed at improving the recruitment, development, promotion and retention of Aboriginal and Torres Strait Islander staff. As at 30 June 2016, 99 (1.8 per cent) of our employees identify as Aboriginal or Torres Strait Islander, an increase from 22 (0.3 per cent) on 30 June 2011.

Of these, there are 25 cadets, 14 trainees, 3 research scientists, 10 technical support staff, 18 research technicians, 15 administrative services staff, 9 communication staff and 5 general services staff.

We engage and partner with Aboriginal and Torres Strait Islander people across a broad range of areas, such as marine and environmental science, human resources, property services, astronomy and space science, information management and technology, forestry, mining, horticulture and aquaculture. In this way, Aboriginal and Torres Strait Islander people are engaged and contributing to research impacting the productivity and sustainability of Australian industry. Similarly, CSIRO also has Aboriginal and Torres Strait Islander people represented on high-level advisory committees such as the Minerals Resources Advisory Council and the Indigenous Strategic Advisory Council.

Research engagement has continued to develop with Aboriginal and Torres Strait Islander people, including exciting new partnerships led by Land and Water, Oceans and Atmosphere, Health and Biosecurity, Astronomy and Space Science and Education Services. CSIRO has confirmed that it is working towards meeting the Commonwealth Government's target that three per cent of all purchases will be made with Aboriginal and Torres Strait Islander–owned businesses.

In partnership with the BHP Billiton Foundation, CSIRO is implementing a five-year, $28.8 million education project aimed at increasing the participation and achievement of Aboriginal and Torres Strait Islander students in STEM. For further information on this program please see page 26. The project's development, implementation and evaluation is guided by recognising the fundamental importance of culture and identity in student achievement, a strong cultural aspect and a rigorous academic focus.

STAFF DEMOGRAPHICS

Our people are employed under Section 32 of the SIR Act. At 30 June 2016, CSIRO had a total of 5,367 staff, a full-time equivalent (FTE) of 4,864. Table 3.3 shows our planned future average staffing levels (ASL). Table 3.4 shows the number of staff employed in different functional areas.

Overall, the number of staff increased by 1.9 per cent (98) over the last 12 months. Research science staff decreased by 3.6 per cent (54). Voluntary staff turnover remained low at 4.6 per cent. The proportion of female staff remained constant at 40 per cent, and the proportion of female research science staff also remained constant at 26 per cent.

TABLE 3.3: FORECAST AVERAGE STAFFING LEVELS (FTE)

	2015–16	2016–17	2019–20 (FORECAST)
ASL	4,766	5,078	5,335

TABLE 3.4: STAFF NUMBERS (HEADCOUNT)

FUNCTIONAL AREA	2015–16	% FEMALE IN 2015–16
Research scientists	1,466	26
Research project staff	1,752	42
Senior specialists	20	50
Research management	248	15
Research consulting	54	19
Technical services	586	13
Communication and Information Services	203	75
General services	23	61
Administrative support[32]	909	75
General management	106	34
Total headcount	**5,367**	**40**
FTE	**4,864**	**37**

32 Administrative Support: Staff who provide science-based administrative and management services and systems.

Awards and honours

Outstanding performance in research is recognised by various international and national award schemes. Here are a few selected examples of awards and honours granted in 2015–16 that demonstrate our effectiveness in research and its application in industry, and the community and calibre of our people.

ORDER OF AUSTRALIA

The Order of Australia is the principal and most prestigious means of recognising outstanding members of the community at a national level. In 2016, five CSIRO staff and affiliates were recognised.

Companion of the Order (AC)

Professor Brian David Anderson for eminent service to information and communications technology, to engineering and to higher education, as an academic, researcher and author, to professional scientific associations, and as a mentor of young scientists.

Officer of the Order (AO)

The late **Dr Michael Raupach** for distinguished service to science in Australia and internationally as a leader and researcher into climate change and land systems, and to professional organisations.

Dr Thomas Joseph Higgins for distinguished service to agricultural biotechnology as a biologist and researcher, particularly in the area of plant nutritional value and resistance to pests and disease, and to professional scientific organisations.

Dr Craig Mudge for his distinguished service to science, particularly through pioneering initiatives in the information technology sector, as a researcher and author, and as a mentor of young scientists.

Medal of the Order (OAM)

John Sarkissian for service to astronomy.

THOMSON REUTERS 'THE WORLD'S MOST INFLUENTIAL SCIENTIFIC MINDS'

This annual citation analysis identifies the scientists – as determined by their fellow researchers – who have made the most significant global impact within their respective field of study.

Dr John Manners and **Dr Kemal Kazan** were named among the most cited authors in their field, Plant and Animal Science.

Dr Ezio Rizzardo and **Dr Graeme Moad** were named among the most cited authors in Chemistry

Dr Brian Walker was named among the most cited authors in Social Sciences, General.

NATURE BIOTECHNOLOGY TOP 20 TRANSLATIONAL RESEARCHERS

The Nature Biotechnology Top 20 translational researchers ranking highlights scientists whose work and patents facilitate new discoveries and advances in medicine and healthcare. The ranking is based on an examination of the year's most active scientists for patenting.

Dr Surinder Singh is the only Australian researcher named among the Top 20. He and team members in the Plant Oil Engineering Group were awarded 10 separate United States patents in 2014.

AUSTRALIAN ACADEMY OF SCIENCE JOHN BOOKER MEDAL

The Australian Academy of Science John Booker Medal in Engineering Science recognises outstanding research in the sciences that underpin chemical, civil, electrical, mechanical or materials engineering, and their associated disciplines.

Dr Paolo Falcaro was awarded the medal this year for his research achievement and impact in engineering nanoparticles and ultra-porous crystals for medical and environmental applications.

AUSTRALIAN ACADEMY OF TECHNOLOGICAL SCIENCES AND ENGINEERING FELLOWSHIP

ATSE Fellows are some of the most influential names in technological sciences and engineering, responsible for a number of key technological advancements over the past 40 years. Two CSIRO staff were elected Fellows in 2015.

Dr Paul Cleary was elected Fellow for his significant impact on the development and worldwide adoption of particle-based methods for modelling fluid and particles flows.

Dr Jennifer Stauber was recognised for being Australia's foremost ecotoxicologist, who pioneered the development and application of environmental assessment techniques for contaminants for regulators and industry.

AUSTRALIAN ACADEMY OF SCIENCE FELLOWSHIP

The Australian Academy of Science is an organisation of Australia's top research scientists, founded on 16 February 1954. In 2016 they elected three CSIRO staff as Fellows, owing to their outstanding contributions to science and research.

Dr John Kirkegaard was elected for major contributions towards improving global agricultural productivity. His innovations in conservation farming systems have greatly increased the effectiveness with which crops use water and nutrients.

Dr Anna Koltunow was elected Fellow for making outstanding contributions to understanding plant reproduction. She discovered mechanisms controlling seedless fruit formation and has generated seedless fruit in crops.

Professor Toby Walsh was elected for his important contributions to artificial intelligence, constraint programming and computational social choice, as well as the theory and practice of how optimisation problems are solved in industry.

AUSTRALIAN MARINE SCIENCES ASSOCIATION AWARDS

Each year the Australian Marine Sciences Association presents awards to individuals, recognising outstanding contributions to marine science in Australia.

Dr Barry Bruce received the Jubilee Award, honouring a scientist who has made a significant contribution to marine research in Australian during their career.

Ms Lesley Clementson was recipient of the Technical Award, recognising outstanding achievements in the field of technical support to marine science in Australia and emphasising the value of technical and logistical support services which make research possible.

AUSTRALIAN MUSEUM EUREKA PRIZES

Presented annually by the Australian Museum, the Eureka Prizes reward excellence in the fields of scientific research and innovation, science leadership, school science, and science journalism and communication. Three of our teams were finalists in 2015.

The Marine Debris Team was a finalist for the New South Wales Office of Environment and Heritage Eureka Prize for Environmental Research. The team applied interdisciplinary research towards understanding the sources and distribution of marine debris, and was able to translate scientific information into effective policy and behavioural change.

The BioCode team was a finalist for the University of New South Wales Eureka Prize for Excellence in Interdisciplinary Scientific Research. The team used 'omics' approaches to unravel the insulin/IGF1 signalling pathway that plays essential roles in health, obesity and diseases such as diabetes.

Dr Lisa Harvey-Smith, of CSIRO's Astronomy and Space Science division, was a finalist for the Department of Industry and Science Eureka Prize for Promoting Understanding of Australian Science Research. Lisa was nominated for bringing astronomy and its real-world impacts to life, particularly for girls and Indigenous Australians.

L'ORÉAL AUSTRALIA FOR WOMEN IN SCIENCE FELLOWSHIP

The L'Oréal Australia for Women in Science Fellowships recognise outstanding early-career female scientists, helping them consolidate their careers and rise to leadership positions in science.

Dr Shari Breen received a Fellowship in 2015 to develop her use of masers to investigate the evolution of high mass stars using the Parkes radio telescope.

SOIL SCIENCE AUSTRALIA PRESCOTT MEDAL

The Prescott medal is awarded to a person who has made an outstanding contribution to soil science.

Dr Gupta Vadakattu was awarded the medal in recognition of his impact and achievements throughout his career. Gupta's research focuses on genetic diversity, functional capability and resilience of soil biota in agricultural soils.

ROYAL HORTICULTURE SOCIETY WESTONBIRT ORCHID MEDAL

The Royal Horticulture Society Westonbirt Orchid Medal is awarded annually to an individual for any scientific, literary or any other outstanding personal achievement in connection with orchids.

Dr Mark Clements has been awarded this prestigious award for his significant contributions to the field over his 40-year career, including having discovered about 250 new species of Australian orchids and curated tens of thousands of specimens.

CSIRO CHAIRMAN'S MEDAL

The CSIRO Chairman's Medal honours the very best in CSIRO research. It is awarded to the scientist or team whose research is of national or international importance in advancing scientific knowledge, technology application or commercialisation.

The Phased Array Feed Receivers for Radio Astronomy Team was awarded the 2015 CSIRO Chairman's Medal for revolutionising astronomy. The team developed a spectacular new capability for observing wide areas of the sky using the world's first wide-field imaging receivers for radio astronomy on the antennas of the ASKAP radio telescope.

Team members: Dr Brian J Boyle, Dr John Bunton, Dr Aaron Chippendale, Dr David DeBoer, Prof Ron Ekers, Dr Grant Hampson, Dr Stuart Hay, Dr Simon Johnston, Dr John O'Sullivan, Dr John Reynolds, Antony Schinckel, Robert Shaw and Dr Michelle Storey.

CSIRO MEDAL FOR LIFETIME ACHIEVEMENT

The CSIRO Medal for Lifetime Achievement is awarded to individuals who have a record of sustained and meritorious achievement over a prolonged period of CSIRO service.

Dr Ralph Holmes was awarded the medal for his CSIRO career spanning more than 43 years in the field of mineral processing and international standards development, both as a research manager and practitioner benefiting both CSIRO and Australia.

Field of our Ultra-low Gluten Kebari™ Barley.
***Kebari*™ has been used to produce the first gluten free beer produced under the German beer purity law.**

Part 4
Financial statements

INDEPENDENT AUDITOR'S REPORT

To the Minister for Industry, Innovation and Science

I have audited the accompanying annual financial statements of the Commonwealth Scientific and Industrial Research Organisation and the consolidated entity for the year ended 30 June 2016, which comprise:

- Statement by the Chairman of the Board, Chief Executive and Chief Finance Officer;
- Statement of Comprehensive Income;
- Statement of Financial Position;
- Statements of Changes in Equity
- Cash Flow Statement; and
- Notes to and forming part of the financial statements, comprising significant accounting policies and other explanatory information.

The consolidated entity comprises the Commonwealth Scientific and Industrial Research Organisation and the entities it controlled at the year's end or from time to time during the year.

Opinion

In my opinion, the financial statements of the Commonwealth Scientific and Industrial Research Organisation and the consolidated entity:

(a) comply with Australian Accounting Standards and the *Public Governance, Performance and Accountability (Financial Reporting) Rule 2015*; and

(b) present fairly the financial positions of the Commonwealth Scientific and Industrial Research Organisation and the consolidated entity as at 30 June 2016 and their financial performance and cash flows for the year then ended.

My opinion should be read in conjunction with the rest of this report.

Board Members' Responsibility for the Financial Statements

The members of the Commonwealth Scientific and Industrial Research Organisation's board are responsible under the *Public Governance, Performance and Accountability Act 2013* for the preparation and fair presentation of annual financial statements that comply with Australian Accounting Standards and the rules made under that Act. The board members are also responsible for such internal control as is necessary to enable the preparation and fair presentation of financial statements that are free from material misstatement, whether due to fraud or error.

GPO Box 707 CANBERRA ACT 2601
19 National Circuit BARTON ACT
Phone (02) 6203 7300 Fax (02) 6203 7777

Auditor's Responsibility

My responsibility is to express an opinion on the financial statements based on my audit. I have conducted my audit in accordance with the Australian National Audit Office Auditing Standards, which incorporate the Australian Auditing Standards. These auditing standards require that I comply with relevant ethical requirements relating to audit engagements and plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

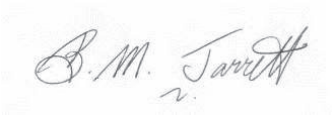
An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgement, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. An audit also includes evaluating the appropriateness of the accounting policies used and the reasonableness of accounting estimates made by the Accountable Authority of the entity, as well as evaluating the overall presentation of the financial statements.

I believe that the audit evidence I have obtained is sufficient and appropriate to provide a basis for my audit opinion.

Independence

In conducting my audit, I have followed the independence requirements of the Australian National Audit Office, which incorporate the requirements of the Australian accounting profession.

Australian National Audit Office



Brandon Jarrett

Executive Director

Delegate of the Auditor-General

Canberra

8 September 2016

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION
Financial Statements

for the period ended 30 June 2016

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION
STATEMENT BY THE CHAIRMAN OF THE BOARD, CHIEF EXECUTIVE AND CHIEF FINANCE OFFICER

In our opinion, the attached financial statements for the year ended 30 June 2016 comply with subsection 42(2) of the *Public Governance, Performance and Accountability Act 2013* (PGPA Act), and are based on properly maintained financial records as per subsection 41(2) of the PGPA Act.

In our opinion, at the date of this statement, there are reasonable grounds to believe that the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and its subsidiaries will be able to pay its debts as and when they fall due.

This statement is made in accordance with a resolution of the directors.

David Thodey
Chairman of the Board
8 September 2016

Larry Marshall
Chief Executive and Board Member
8 September 2016

Hazel Bennett
Chief Finance Officer
8 September 2016

CONSOLIDATED FINANCIAL STATEMENTS
STATEMENT OF COMPREHENSIVE INCOME
For the period ended 30 June 2016

		Consolidated		CSIRO	
		2016	2015	**2016**	2015
	Notes	**$'000**	$'000	**$'000**	$'000
NET COST OF SERVICES					
Expenses					
Employee benefits	1.1A	**730,863**	664,584	**689,293**	664,129
Suppliers	1.1B	**438,848**	433,012	**403,278**	416,375
Depreciation and amortisation	2.2A	**168,878**	146,094	**168,431**	146,041
Finance leases		**2,201**	2,535	**2,178**	2,521
Write-down and impairment of assets	1.1C	**4,083**	15,795	**4,083**	15,795
Foreign exchange losses - non-speculative		**-**	254	**-**	250
Losses from asset sales		**3,352**	905	**3,362**	905
Total expenses		**1,348,225**	1,263,179	**1,270,625**	1,246,016
Own-Source Income					
Own-source revenue					
Sale of goods and rendering of services	1.2	**420,607**	370,648	**369,214**	377,473
Interest - bank and term deposits	1.2	**9,296**	12,946	**6,457**	9,707
Rental income	1.2	**9,409**	8,633	**8,129**	8,633
Royalties and licence fees	1.2	**59,832**	60,809	**59,749**	60,809
Other revenues	1.2	**29,480**	22,630	**18,970**	22,153
Total own-source revenue		**528,624**	475,666	**462,519**	478,775
Gains					
Gain on recognition of assets		**-**	6,722	**-**	6,722
Foreign exchange gains - non-speculative	1.2	**293**	-	**267**	-
Gain on revaluation of investment properties	1.2	**929**	1,004	**929**	1,004
Total gains		**1,222**	7,726	**1,196**	7,726
Total own-source income		**529,846**	483,392	**463,715**	486,501
Net cost of services		**(818,379)**	(779,787)	**(806,910)**	(759,515)
Revenue from Government	1.2	**750,281**	745,268	**750,281**	745,268
Share of net operating surplus/(deficit) of joint venture accounted for using equity method		**(10)**	(300)	**(10)**	(300)
Surplus on continuing operation		**750,271**	744,968	**750,271**	744,968
Surplus/(Deficit)		**(68,108)**	(34,819)	**(56,639)**	(14,547)
OTHER COMPREHENSIVE INCOME					
Items not subject to subsequent reclassification to net cost of services					
Increase/(decrease) in asset revaluation reserves	1.3A	**(1,848)**	42,078	**(7,664)**	42,078
Items subject to subsequent reclassification to net cost of services					
Increase/(decrease) in other reserves	1.3B	**(959)**	(2,246)	**(915)**	(2,269)
Total other comprehensive income		**(2,807)**	39,832	**(8,579)**	39,809
Total comprehensive income/(loss)		**(70,915)**	5,013	**(65,218)**	25,262

The above Statement should be read in conjunction with the accompanying notes.

CONSOLIDATED FINANCIAL STATEMENTS
STATEMENT OF FINANCIAL POSITION
For the period ended 30 June 2016

		Consolidated		CSIRO	
		2016	2015	**2016**	2015
	Notes	**$'000**	$'000	**$'000**	$'000
ASSETS					
Financial Assets					
Cash and cash equivalents		**302,096**	267,129	**176,827**	182,331
Trade and other receivables	2.1A	**57,859**	73,482	**51,723**	69,453
Investments accounted for using the equity method	2.1B	**-**	10	**-**	10
Other investments	2.1C	**21,386**	12,601	**49,446**	12,601
Total financial assets		**381,341**	353,222	**277,996**	264,395
Non-Financial Assets					
Land and buildings	2.2A	**1,605,336**	1,604,300	**1,601,668**	1,604,300
Plant and equipment	2.2A	**580,878**	597,147	**575,475**	596,703
Heritage and cultural	2.2A	**4,206**	4,206	**4,206**	4,206
Intangibles	2.2A	**20,687**	21,377	**20,680**	21,377
Investment properties	2.2B	**50,222**	49,292	**50,222**	49,292
Inventories		**1,334**	1,235	**1,334**	1,235
Other non-financial assets	2.2C	**45,868**	115,810	**45,848**	115,779
Total non-financial assets		**2,308,531**	2,393,367	**2,299,433**	2,392,892
Properties held for sale		**5,200**	5,200	**5,200**	5,200
Total assets		**2,695,072**	2,751,789	**2,582,629**	2,662,487
LIABILITIES					
Payables					
Suppliers	2.3A	**62,176**	111,505	**60,135**	110,539
Other payables	2.3B	**127,820**	146,877	**122,224**	140,275
Total payables		**189,996**	258,382	**182,359**	250,814
Interest Bearing Liabilities					
Leases	2.4A	**42,022**	48,725	**42,022**	48,725
Deposits	2.4B	**5,798**	5,559	**6,848**	6,609
Total Interest bearing liabilities		**47,820**	54,284	**48,870**	55,334
Provisions					
Employee provisions	4.1A	**238,734**	201,185	**231,671**	201,095
Provision for remediation		**29,703**	-	**29,703**	-
Total provisions		**268,437**	201,185	**261,374**	201,095
Total liabilities		**506,253**	513,851	**492,603**	507,243
Net assets		**2,188,819**	2,237,938	**2,090,026**	2,155,244
EQUITY					
Contributed equity		**270,954**	270,954	**270,646**	270,646
Asset revaluation reserves		**1,387,548**	1,389,396	**1,381,732**	1,389,396
Other reserves		**(1,704)**	(745)	**(1,683)**	(768)
Retained surplus		**532,021**	578,333	**439,331**	495,970
Total equity		**2,188,819**	2,237,938	**2,090,026**	2,155,244

The above Statement should be read in conjunction with the accompanying notes.

CONSOLIDATED FINANCIAL STATEMENTS
STATEMENT OF CHANGES IN EQUITY – CONSOLIDATED
For the period ended 30 June 2016

	Retained earnings		Asset revaluation reserve		Other reserves		Contributed equity/capital		Total equity	
	2016	2015	**2016**	2015	**2016**	2015	**2016**	2015	**2016**	2015
	$'000	$'000	**$'000**	$'000	**$'000**	$'000	**$'000**	$'000	**$'000**	$'000
Opening balance	**578,333**	613,152	**1,389,396**	1,347,318	**(745)**	1,501	**270,954**	268,520	**2,237,938**	2,230,491
Comprehensive income										
Other comprehensive income[1]	**-**	-	**(1,848)**	42,078	**(959)**	(2,246)	**-**	-	**(2,807)**	39,832
Surplus/(deficit) for the period	**(68,108)**	(34,819)	**-**	-	**-**	-	**-**	-	**(68,108)**	(34,819)
Total comprehensive income	**(68,108)**	(34,819)	**(1,848)**	42,078	**(959)**	(2,246)	**-**	-	**(70,915)**	5,013
Other Movements[2]	**21,796**								**21,796**	-
Contributions by owners										
Equity injection	**-**	-	**-**	-	**-**	-	**-**	2,326	**-**	2,326
Contributions by owners – other	**-**	-	**-**	-	**-**	-	**-**	108	**-**	108
Closing balance	**532,021**	578,333	**1,387,548**	1,389,396	**(1,704)**	(745)	**270,954**	270,954	**2,188,819**	2,237,938

The above Statement should be read in conjunction with the accompanying notes.

1. See Note 1.3.
2. Other movements includes the first time recognition of NICTA's opening balance ($21m)

Accounting Policy

Equity Injections

Amounts that are designated as equity injections for a year are recognised directly in contributed equity in that year.

CONSOLIDATED FINANCIAL STATEMENTS
STATEMENT OF CHANGES IN EQUITY – CSIRO
For the period ended 30 June 2016

	Retained earnings		Asset revaluation reserve		Other reserves		Contributed equity/capital		Total equity	
	2016	2015	**2016**	2015	**2016**	2015	**2016**	2015	**2016**	2015
	$'000	$'000	**$'000**	$'000	**$'000**	$'000	**$'000**	$'000	**$'000**	$'000
Opening balance	**495,970**	510,517	**1,389,396**	1,347,318	**(768)**	1,501	**270,646**	268,320	**2,155,244**	2,127,656
Comprehensive income										
Other comprehensive income[1]	**-**	-	**(7,664)**	42,078	**(915)**	(2,269)	**-**	-	**(8,579)**	39,809
Surplus/(deficit) for the period	**(56,639)**	(14,547)	**-**	-	**-**	-	**-**	-	**(56,639)**	(14,547)
Total comprehensive income	**(56,639)**	(14,547)	**(7,664)**	42,078	**(915)**	(2,269)	**-**	-	**(65,218)**	25,262
Contributions by owners										
Equity injection	**-**	-	**-**	-	**-**	-	**-**	2,326	**-**	2,326
Contributions by owners – other	**-**	-	**-**	-		-	**-**	-	**-**	-
Closing balance	**439,331**	495,970	**1,381,732**	1,389,396	**(1,683)**	(768)	**270,646**	270,646	**2,090,026**	2,155,244

The above Statement should be read in conjunction with the accompanying notes.

1. See Note 1.3.

CONSOLIDATED FINANCIAL STATEMENTS
CASH FLOW STATEMENT
For the period ended 30 June 2016

		Consolidated		CSIRO	
		2016	2015	**2016**	2015
	Notes	**$'000**	$'000	**$'000**	$'000
OPERATING ACTIVITIES					
Cash received					
Receipts from Government		**750,281**	745,268	**750,281**	745,268
Sale of goods and rendering of services		**569,472**	500,703	**502,667**	506,454
Interest		**10,172**	12,140	**7,036**	8,906
Net GST received		**30,603**	8,913	**29,273**	16,013
Total cash received		**1,360,528**	1,267,024	**1,289,257**	1,276,641
Cash used					
Employees		**717,786**	724,123	**677,383**	723,534
Suppliers		**526,043**	468,036	**477,987**	461,879
Finance costs		**2,201**	2,535	**2,178**	2,521
Deposits		**78**	7,989	**78**	6,939
Total cash used		**1,246,108**	1,202,683	**1,157,626**	1,194,873
Net cash from operating activities	3.1	**114,420**	64,341	**131,631**	81,768
INVESTING ACTIVITIES					
Cash received					
Proceeds from sales of property, plant and equipment		**464**	3,294	**463**	3,294
Proceeds from sales of equity investments and intellectual property		**-**	1,108	**-**	1,108
Total cash received		**464**	4,402	**463**	4,402
Cash used					
Purchase of property, plant and equipment		**102,839**	167,647	**100,004**	167,273
Equity investments		**848**	1,343	**30,848**	1,344
Other selling costs		**43**	477	**43**	477
Total cash used		**103,730**	169,467	**130,895**	169,094
Net cash used in investing activities		**(103,266)**	(165,065)	**(130,432)**	(164,692)
FINANCING ACTIVITIES					
Cash received					
Contributed equity		**-**	2,326	**-**	2,326
Total cash received		**-**	2,326	**-**	2,326
Cash used					
Payment to the Commonwealth		**-**	27,896	**-**	27,896
Finance leases		**6,703**	4,750	**6,703**	4,750
Total cash used		**6,703**	32,646	**6,703**	32,646
Net cash from financing activities		**(6,703)**	(30,320)	**(6,703)**	(30,320)
Net increase (decrease) in cash held		**4,451**	(131,044)	**(5,504)**	(113,244)
Cash and cash equivalents at the beginning of the reporting period		**267,129**	398,173	**182,331**	295,575
Transition of opening balance of NICTA cash and cash equivalents		**30,516**	-	**-**	-
Cash and cash equivalents at the end of the reporting period		**302,096**	267,129	**176,827**	182,331

The above Statement should be read in conjunction with the accompanying notes.

CONSOLIDATED FINANCIAL STATEMENTS
NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS

Overview

Objectives of the CSIRO and its Subsidiaries (the Group)

CSIRO is an Australian Government controlled not-for-profit entity and is classified as a Corporate Commonwealth entity under the *Public Governance, Performance and Accountability Act 2013*. CSIRO is a research enterprise that aims to deliver great science and innovative solutions for industry, society and the environment.

CSIRO is structured to meet the following outcome:

> Innovative scientific and technology solutions to national challenges and opportunities to benefit industry, the environment and the community, through scientific research and capability development, services and advice.

The continued existence of CSIRO in its present form and with its present programs is dependent on Government policy and on continuing funding by Parliament for CSIRO's administration and programs.

The Basis of Preparation

The financial statements are required by section 42 of the *Public Governance, Performance and Accountability Act 2013* and are general purpose financial statements.

CSIRO and the Group's Consolidated Financial Statements have been prepared in accordance with:

- Financial Reporting Rule (FRR) for reporting periods ending on or after 1 July 2015; and
- Australian Accounting Standards and Interpretations issued by the Australian Accounting Standards Board (AASB) that apply for the reporting period.

The financial statements have been prepared on an accrual basis and in accordance with the historical cost convention, except for certain assets and liabilities at fair value. Except where stated, no allowance is made for the effect of changing prices on the results or the financial position.

The financial statements are presented in Australian dollars and values are rounded to the nearest thousand dollars unless otherwise specified.

Key Judgements and Estimates

In the process of applying the Group's accounting policies, management has made a number of judgements and applied estimates and assumptions to future events. Information around judgements and estimates which are material to the financial statements are found in the following notes:

- Note 4.1 Employee Provisions
- Note 5.3 Fair Value Measurements

In 2015-16, CSIRO raised a provision (under other provisions) for remediation costs required at a remote CSIRO location, based on estimates provided by internal and external qualified experts. The provision is predominantly based on externally provided costings, with additional amounts derived from comparable remediation works. The provision is based on the scope of work as it currently stands. As the remediation process progresses, the scope and costs may be subject to change. The work is expected to take several years to reach completion. This is further discussed below under Significant Changes in the Reporting Period.

Consolidation

The consolidated financial statements comprise the financial statements of the CSIRO and its subsidiaries (referred to as 'the Group'). CSIRO's subsidiaries are WLAN Services Pty Ltd (WLAN), Science and Industry Endowment Fund (SIEF), the CSIRO Chile Research Fundación (Fundación), National ICT Australia (NICTA), General Partner Co Pty Ltd (GPCo) and CSIRO Fund of Funds (AFOF). Refer to Note 4.6 for further information.

The consolidated financial statements incorporate the assets and liabilities of all entities controlled by CSIRO as at 30 June and the results of the controlled entities for the year then ended. Subsidiaries are consolidated from the date on which control is obtained through to the date on which control ceases. The Group applies consistent accounting policies and the effects of all transactions and balances between the entities are eliminated in full.

Foreign Currency Translation

The functional currency of CSIRO and its Australian subsidiaries is Australian dollars. The Group has one overseas subsidiary, the Fundación. On consolidation, that entity's:

- assets and liabilities are translated into Australian dollars at the rate of exchange prevailing at the reporting date; and
- the statement of comprehensive income is translated at average exchange rate.

The exchange rate differences arising are recognised in the net cost of services.

New Australian Accounting Standards

Adoption of new Australian Accounting Standard requirements

No Accounting Standard has been adopted earlier than the application date as stated in the standard. CSIRO has reviewed new standards, revised standards and interpretations/amending standards issued prior to the signing of the financial statements and considers that none of these have had a material financial impact.

Future Australian Accounting Standard requirements

No new or revised pronouncements were issued by the Australian Accounting Standards Board prior to the finalisation of the financial statements which are expected to have a material financial impact on the entity in future reporting periods. The following new or revised standards will be adopted and their implementation will require enhanced disclosure in future reporting periods:

Standard	Effective for reporting periods beginning on or after:	Nature of impending changes and likely impact on application
AASB 124 *Related Parties Disclosures*	1 July 2016	Requires reporting of related party transactions with ministers and key management personnel. Minor impact with increased disclosures around related parties.
AASB 9 *Financial Instruments*	1 January 2018	Change to requirements for classifying and measuring financial assets and liabilities. May have a moderate impact on the recognition and measurement of financial instruments.
AASB 15 *Revenue from Contracts with Customers*	1 January 2018	Specifies the accounting treatment of revenue arising from contracts with customers. CSIRO considers this will have minimal impact.
AASB 16 *Leases*	1 January 2019	Moderate impact as a new accounting standard which requires assessment of all operating and finance leases.

Taxation

In accordance with Section 53 of the *Science and Industry Research Act 1949*, CSIRO is exempt from all forms of Australian taxation except the fringe benefits tax (FBT) and the goods and services tax (GST). The Group pays applicable taxes in overseas countries.

Revenues, expenses, assets and liabilities are recognised net of GST except:

- where the amount of GST incurred is not recoverable from the Australian Taxation Office; and
- for receivables and payables.

The SIEF is exempt from income tax in Australia. WLAN is subject to all applicable taxes in Australia and the Fundación is subject to all applicable taxes in Chile. NICTA is exempt from income tax however NICTA's subsidiaries (including NICTA IPR Pty Ltd) are subject to applicable taxes in Australia.

Significant Changes in the Reporting Period

On 28 August 2015, the members of National ICT Australia Limited (NICTA) resolved to adopt a revised company constitution which provides CSIRO with effective control of NICTA. Due to this decision, NICTA's accounts have been included in the consolidated Group's accounts for the first time in 2015-16. The accounts for NICTA have been included for the period since effective control took place on 28 August 2015 to 30 June 2016. The impact of this additional entity to the Group can be seen throughout the financial statement note disclosures and the increases to the current year consolidated figures.

As part of the National Innovation and Science Agenda announced by the Australian Government in December 2015, CSIRO has established an Innovation Fund to invest in the development of early stage technology opportunities from the public research sector, to increase their translation into commercial opportunities to be taken up by Australian industry. CSIRO invested $30m into the fund in 2015-16. The Australian Government has committed to invest a further $70m over the next 10 years into the Fund.

During 2015-16 ongoing work with regulatory bodies has identified the need for remediation works to be undertaken on waste material at a remote facility. A provision of $29.7m (under other provisions) has been raised in 2016, which reflects the estimated costs associated with the remediation. The assumptions used to value the provision have been provided above under Key Judgements and Estimates.

Events after the Reporting Period

CSIRO is exploring future possibilities for the Ginninderra Field Station, a 701 hectare area of land which CSIRO owns in north Canberra. Due to rapid urban growth in the surrounding area, the site has become under-utilised and the field station requires relocation to a more rural setting. As part of its focus on exploring the future possibilities for this site, CSIRO requested the National Capital Authority (NCA) to include the site as 'Urban Area' on the General Policy Plan for Metropolitan Canberra in the National Capital Plan draft Amendment 86. The Amendment was approved by the Federal Minister for Major Projects, Territories and Local Government on 5 May 2016. This Amendment is subject to a disallowance period that commenced upon resumption of Parliament on 30 August and runs for fourteen days.

This initial step in rezoning the land has allowed CSIRO to commence a process to identify a suitable development partner to progress with the next steps in the planning for the future of the site which will involve ongoing significant community and stakeholder consultation. Once a development partner and plan is selected, it is expected that there will be a material increase in the recorded value of the Ginninderra land. This is expected to occur in early 2017.

At the time of completion of these financial statements, the Group is not aware of any other significant events occurring after the reporting date.

1. Financial Performance

This section analyses the financial performance of CSIRO for the year ended 30 June 2016.

1.1. Expenses

	Consolidated		CSIRO	
	2016	2015	**2016**	2015
	$'000	$'000	**$'000**	$'000
Note 1.1A: Employee Benefits				
Wages and salaries	**531,584**	500,744	**496,883**	500,435
Superannuation	**89,679**	83,070	**87,175**	83,003
Leave and other entitlements	**88,788**	82,321	**85,790**	82,242
Separation and redundancies	**29,006**	1,411	**27,639**	1,411
Gross employee benefits	**739,057**	667,546	**697,487**	667,091
Less				
Capitalised labour	**(7,510)**	(2,714)	**(7,510)**	(2,714)
Employee cost recovery from joint ventures	**(684)**	(248)	**(684)**	(248)
Total employee benefits	**730,863**	664,584	**689,293**	664,129

Accounting Policy

Accounting policy for employee related expenses is contained in the People and Relationships section.

Note 1.1B: Suppliers				
Goods supplied	**95,393**	134,594	**93,586**	132,086
Services rendered	**332,719**	282,835	**299,071**	268,712
Total goods and services supplied or rendered	**428,112**	417,429	**392,657**	400,798
Other suppliers				
Operating lease rentals - minimum lease payments	**6,276**	10,012	**6,276**	10,012
Workers compensation expenses	**4,460**	5,571	**4,345**	5,565
Total other suppliers	**10,736**	15,583	**10,621**	15,577
Total Suppliers	**438,848**	433,012	**403,278**	416,375

Leasing commitments

The CSIRO in its capacity as lessee has the following commitments that arise from effectively non-cancellable operating leases:

Office and Scientific Research Accommodation - Lease payments are subject to annual increases in accordance with the terms of the agreement (such as CPI increases). The accommodation leases are current and each may be renewed at the Group's option.
Motor Vehicles - No contingent rentals exist and there are no purchases options for vehicle leases.
Computer Equipment - Provision of computer equipment as designated necessary in the supply contract for a general period of 2-3 years.

Commitments below are stated inclusive of GST.

Commitments for minimum lease payments in relation to non-cancellable operating leases are payable as follows:

Within 1 year	**40,208**	38,565	**35,653**	38,565
Between 1 to 5 years	**118,067**	119,836	**116,562**	119,836
More than 5 years	**19,449**	49,211	**19,449**	49,211
Total operating lease commitments	**177,724**	207,612	**171,664**	207,612

Accounting Policy

Research and Development Expenditure and Intellectual Property

All research and development costs, including costs associated with protecting intellectual property (e.g. patents and trademarks), are expensed as incurred.

Leases

A distinction is made between finance leases and operating leases. Finance leases effectively transfer from the lessor to the lessee substantially all the risks and rewards incidental to ownership of leased assets. An operating lease is a lease that is not a finance lease. In operating leases, the lessor effectively retains all such risks and benefits.

Where an asset is acquired by means of a finance lease, the asset is capitalised at either the fair value of the lease or, if lower, the present value of minimum lease payments at the inception of the contract and a liability recognised at the same time and for the same amount.

The discount rate used is the interest rate implicit in the lease. Leased assets are amortised over the period of the lease. Lease payments are allocated between the principal component and the interest expense.

Operating lease payments are expensed on a straight-line basis which is representative of the pattern of benefits derived from the leased assets.

	Consolidated		CSIRO	
	2016	2015	**2016**	2015
	$'000	$'000	**$'000**	$'000
Note 1.1C: Write-down and impairment of assets				
Asset write-downs and impairments from:				
Bad debts	**78**	128	**78**	128
Decrease in allowance for impairment of receivable	**127**	(368)	**127**	(368)
Impairment of available for sale investments	**3,088**	150	**3,088**	150
Net impairment loss on revaluation of properties held for sale and investment properties	**-**	940	**-**	940
Net realisation of fair value loss reserve on available for sale investments	**-**	943	**-**	943
Write down and impairment of assets[1]	**790**	14,002	**790**	14,002
Total write-down and impairment of assets	**4,083**	15,795	**4,083**	15,795

[1] The gain arising from revaluation of investment properties was reported as a net amount against the write down and impairment of assets in 2014-15, but has been reclassified to be reported as a gain in the 2015-16 financial statements (refer note 1.2).

1.2. Revenue and Gains

	Consolidated		CSIRO	
	2016	2015	**2016**	2015
	$'000	$'000	**$'000**	$'000
Revenues from Government	**750,281**	745,268	**750,281**	745,268
Sale of goods	**10,129**	10,295	**10,129**	10,295
Rendering of services	**410,478**	360,353	**359,085**	367,178
Total sale of goods and rendering of services	**420,607**	370,648	**369,214**	377,473
Bank and term deposits interest	**9,296**	12,946	**6,457**	9,707
Rental Income	**9,409**	8,633	**8,129**	8,633
Royalties and licence fees	**59,832**	60,809	**59,749**	60,809
Total interest, rental and royalties and licence income	**78,537**	82,388	**74,335**	79,149
Other revenues				
Sale of primary produce	**1,244**	1,293	**1,244**	1,293
Donation	**15**	20	**15**	20
Capital contributions	**6,114**	5,945	**7,114**	7,945
Education programs and subscriptions	**422**	1,497	**422**	1,497
Other	**21,685**	13,875	**10,175**	11,398
Total other revenues	**29,480**	22,630	**18,970**	22,153
Total own-source revenue	**528,624**	475,666	**462,519**	478,775
Gain on recognition of assets	**-**	6,722	**-**	6,722
Gain on foreign exchange (non speculative)	**293**	-	**267**	-
Gain on revaluation of investment properties[1]	**929**	1,004	**929**	1,004
Total own-source revenue including gains	**529,846**	483,392	**463,715**	486,501

[1] The gain arising from revaluation of investment properties was reported as a net amount against the write down and impairment of assets in 2014-15 (note 1.1C)

Leasing - Rental Income Commitments

CSIRO has commitments receivable for the sub leasing areas of office and scientific research accommodation to external parties:

Within 1 year	**7,676**	10,166	**6,613**	10,166
Between 1 to 5 years	**17,172**	16,017	**16,958**	16,017
More than 5 years	**8,132**	5,862	**8,132**	5,862
Total lease commitments receivable	**32,980**	32,045	**31,703**	32,045

Accounting Policy

Sale of Goods and Services Revenue

Revenue from sale of goods is recognised when:

- The risks and rewards of ownership have been transferred to the buyer;
- The entity retains no managerial involvement or effective control over the goods;
- The revenue and transaction costs incurred can be reliably measured; and
- It is probable that the economic benefits associated with the transaction will flow to CSIRO.

Revenue from rendering of services is recognised by reference to the stage of completion of contracts at the reporting date. The revenue is recognised when:

- The amount of revenue, stage of completion and transaction costs incurred can be reliably measured; and
- It is probable that the economic benefits associated with the transaction will flow to CSIRO.

The stage of completion of contracts at the reporting date is determined by reference to the estimated progress of the contracted deliverables to date. The balances of contract research and development activities in progress are accounted as either contract research work in progress (Note 0C), being the gross unbilled amount expected to be collected from clients for contract research and services performed as at 30 June 2016, or contract research revenue received in advance (Note 2.3B), where revenue for contract research and services received and/or billed exceeded revenue earned.

Interest Revenue

Interest revenue is recognised using the effective interest method as set out in AASB 139 Financial Instruments: Recognition and Measurement.

Royalties and License Fees

Royalties and licence revenue are recognised on an accrual basis in accordance with the substance of the relevant royalty agreements.

Revenue from legal settlements related to intellectual property is recognised on an accrual basis in accordance with the substance of the relevant licensing agreements.

Revenues from Government

Funding received from the Australian Government Department of Industry and Science (appropriated to CSIRO as a corporate Commonwealth entity payment item) is recognised as Revenue from Government unless it is in the nature of an equity injection or a loan.

Other Revenue

Other revenues includes sale of CSIRO publications and products, conferences and 'pass through' funding for costs of suppliers and external service providers.

Resources Received Free of Charge

Resources received free of charge are recognised as either revenue or gains depending on their nature. They are recorded as revenue when, and only when, the fair value can be reliably determined and the services would have been purchased if they had not been donated. Use of those resources is recognised as an expense.

Contributions of assets at no cost of acquisition or for nominal consideration are recognised as gains at their fair value when the asset qualifies for recognition, unless received from another Government agency or authority as a consequence of a restructuring of administrative arrangements.

Sale of Assets

Gains from disposal of non-current assets are recognised when control of the asset has passed to the buyer.

1.3. Other Comprehensive Income

	Consolidated		CSIRO	
	2016	2015	**2016**	2015
	$'000	$'000	**$'000**	$'000
Items that will not be classified to income or loss				
Note 1.3A: Changes in asset revaluation reserves				
Revaluation of land and buildings	**1,489**	42,089	**-**	42,089
Revaluation of plant and equipment	**(3,337)**	-	**(7,664)**	-
Revaluation of heritage and cultural assets	**-**	(11)	**-**	(11)
Net increase/(decrease) in asset revaluation reserves	**(1,848)**	42,078	**(7,664)**	42,078
Items that may be reclassified to income and loss				
Note 1.3B: Change in other reserve				
Net change in fair value gain/(loss) of available for sale of investments	**(915)**	(2,139)	**(915)**	(2,139)
Net change arising from foreign exchange movements on conversion of subsidiary accounts	**(44)**	23	**-**	-
Realisation of fair value loss on sale and impairment of available for sale investment	**-**	(130)	**-**	(130)
Net increase/(decrease) in other reserve	**(959)**	(2,246)	**(915)**	(2,269)

2. Financial Position

This section analyses CSIRO's assets used to generate financial performance and the operating liabilities incurred as a result. Employee related information is disclosed in the People and Relationships section.

2.1. Financial Assets

	Consolidated		CSIRO	
	2016	2015	**2016**	2015
	$'000	$'000	**$'000**	$'000
Note 2.1A: Trade and other receivables				
Goods and services	**44,683**	43,891	**44,805**	43,985
Statutory receivables	**5,860**	9,826	**5,028**	9,175
Interest	**1,083**	1,959	**632**	1,211
Other receivables	**6,587**	18,082	**1,612**	15,358
Total trade and other receivables (gross)	**58,213**	73,758	**52,077**	69,729
Less: impairment allowance for trade and other receivables	**(354)**	(276)	**(354)**	(276)
Total trade and other receivables (net)	**57,859**	73,482	**51,723**	69,453
Trade and other receivables (gross) aged as follows				
Not overdue	**49,049**	66,853	**43,207**	62,824
Overdue by				
0 to 30 days	**4,135**	4,213	**4,111**	4,213
31 to 60 days	**3,498**	1,529	**3,498**	1,529
61 to 90 days	**889**	564	**889**	564
More than 90 days	**642**	599	**372**	599
Total receivables (gross)	**58,213**	73,758	**52,077**	69,729
Impairment allowance aged as follows				
Not overdue	**-**	-	**-**	-
Overdue by				
0 to 30 days	**-**	-	**-**	-
31 to 60 days	**-**	-	**-**	-
61 to 90 days	**-**	-	**-**	-
More than 90 days	**354**	276	**354**	276
Total impairment allowance	**354**	276	**354**	276
Reconciliation of impairment allowance				
Opening balance	**276**	644	**276**	644
Increase /(decrease) recognised in net surplus	**78**	(368)	**78**	(368)
Closing balance	**354**	276	**354**	276

Accounting Policy

Loans and Receivables

Receivables for goods and services, which have 30 day terms, are recognised at the nominal amounts due less any impairment allowance. Collectability of debts is reviewed on an ongoing basis and allowances are made when collectability of the debt is no longer probable. All trade and other receivables are expected to be recovered in no more than 12 months.

Impairment of Financial Assets

Financial assets are assessed for impairment at the end of each reporting period. Where there is objective evidence that an impairment loss has been incurred for loans and receivables, the amount of the loss is measured as the difference between the asset's carrying amount and the present value of estimated future cash flows discounted at the asset's original effective interest rate. The carrying amount is reduced by way of an allowance account. The loss is recognised in the Statement of Comprehensive Income.

	Consolidated		CSIRO	
	2016	2015	**2016**	2015
	$'000	$'000	**$'000**	$'000
Note 2.1B: Investments accounted for using the equity method				
Movements of the carrying amount of investment in the MDFRC joint venture entity are as follows:				
Carrying amount at beginning of the financial year	**10**	309	**10**	309
Share of MDFRC's net operating surplus/(deficit) for the year	**(10)**	(431)	**(10)**	(431)
Adjusted based on audited accounts	**-**	132	**-**	132
Carrying amount of investment in MDFRC as at 30 June	-	10	-	10

No indicators of impairment were found for investments accounted for using the equity method.

Accounting Policy

Joint Venture Entities – Unincorporated

CSIRO's 50.0% (2015: 50.0%) interest in the Murray-Darling Freshwater Research Centre (MDFRC) is accounted for using the equity method. The MDFRC is a collaborative joint venture for the purpose of Murray-Darling Basin Freshwater Research to support the generation of knowledge required to ensure the sustainable management of water and associated environmental resources of the Murray-Darling Basin. In accordance with the joint venture agreement, the operating surplus/(deficit) is shared by participants in the joint venture.

Note 2.1C: Other Investments

Listed companies	**4,023**	3,970	**4,023**	3,970
Unlisted companies	**7,363**	8,631	**5,423**	8,631
Other investments	**10,000**	-	**40,000**	-
Total investments	**21,386**	12,601	**49,446**	12,601

All other investments are expected to be recovered in more than 12 months.

Available for sale investments were impaired by $3.0m in 2016 (2015: $0.2m).

Accounting Policy

CSIRO has investments in a number of unlisted start-up companies over which it does not have significant influence or control. These companies have been established for the purpose of commercialisation of CSIRO's intellectual property. CSIRO also has some investments in companies which have been listed on the Australian Stock Exchange.

CSIRO's investments in listed and unlisted companies are accounted for in accordance with AASB 139 *Financial Instruments: Recognition and Measurement*, and have been designated as 'available-for-sale' financial assets. See note 5.2 for further information.

2.2. Non-Financial Assets

Note 2.2A: Reconciliation of the opening and closing balances of Land and Buildings, Plant and Equipment and Intangibles

(a) Reconciliation of the opening and closing balances of Land and Buildings, Plant and Equipment and Intangibles for 2016 - Consolidated

	Land	Buildings	Total land and buildings	Plant and equipment	Heritage and Cultural	Intangibles	Total
	$'000	$'000	$'000	$'000	$'000	$'000	$'000
As at 1 July 2015							
Gross book value	382,413	2,593,167	2,975,580	1,145,278	11,947	51,024	4,183,829
Accumulated depreciation and amortisation	-	(1,371,280)	(1,371,280)	(548,131)	(7,741)	(29,647)	(1,956,799)
Net book value as at 1 July 2015	382,413	1,221,887	1,604,300	597,147	4,206	21,377	2,227,030
Additions:							
By purchase	-	84,866	84,866	67,467	-	6,612	158,945
Assets first recognised through a gain in net cost of services	-	-	-	-	-	-	-
Reclassification	2,261	3,120	5,381	(5,333)	-	(48)	-
Revaluations recognised in other comprehensive income	-	1,489	1,489	(3,337)	-	-	(1,848)
Impairments recognised in net cost of services	-	-	-	(790)	-	-	(790)
Depreciation expense	-	(90,334)	(90,334)	(71,269)	-	(7,275)	(168,878)
Disposals	-	(513)	(513)	(3,259)	-	-	(3,772)
Other Movements (NICTA Opening Balances)	-	147	147	252	-	21	420
Net book value as at 30 June 2016	384,674	1,220,662	1,605,336	580,878	4,206	20,687	2,211,107
Net book value as at 30 June 2016 represented by:							
Gross book value	384,674	2,675,023	3,059,697	1,130,985	11,947	58,908	4,261,537
Accumulated depreciation and amortisation	-	(1,454,361)	(1,454,361)	(550,107)	(7,741)	(38,221)	(2,050,430)
	384,674	1,220,662	1,605,336	580,878	4,206	20,687	2,211,107

(b) Reconciliation of the opening and closing balances of Land and Buildings, Plant and Equipment and Intangibles for 2015 - Consolidated

	Land	Buildings	Total land and buildings	Plant and equipment	Heritage and Cultural	Intangibles	Total
	$'000	$'000	$'000	$'000	$'000	$'000	$'000
As at 1 July 2014							
Gross book value	365,868	2,499,362	2,865,230	1,060,351	11,713	54,639	3,991,933
Accumulated depreciation and amortisation	-	(1,301,892)	(1,301,892)	(511,953)	(7,496)	(23,266)	(1,844,607)
Net book value as at 1 July 2014	365,868	1,197,470	1,563,338	548,398	4,217	31,373	2,147,326
Additions:							
By purchase	-	77,693	77,693	113,401	-	1,787	192,881
Assets first recognised through a gain in net cost of services	-	6,722	6,722	-	-	-	6,722
Reclassification	109	4,564	4,673	(10)	-	(4,663)	-
Revaluation recognised in other comprehensive income	16,436	25,653	42,089	-	(11)	-	42,078
Impairments recognised in net cost of services	-	-	-	(529)	-	-	(529)
Depreciation expense	-	(76,104)	(76,104)	(62,870)	-	(7,120)	(146,094)
Disposals	-	(637)	(637)	(1,243)	-	-	(1,880)
Write off of assets recognised in net cost of services	-	(13,474)	(13,474)	-	-	-	(13,474)
Net book value as at 30 June 2015	382,413	1,221,887	1,604,300	597,147	4,206	21,377	2,227,030
Net book value as at 30 June 2015 represented by:							
Gross book value	382,413	2,593,167	2,975,580	1,145,278	11,947	51,024	4,183,829
Accumulated depreciation and amortisation	-	(1,371,280)	(1,371,280)	(548,131)	(7,741)	(29,647)	(1,956,799)
	382,413	1,221,887	1,604,300	597,147	4,206	21,377	2,227,030

(c) Reconciliation of the opening and closing balances of Land and Buildings, Plant and Equipment and Intangibles for 2016 - CSIRO

	Land	Buildings	Total land and buildings	Plant and equipment	Heritage and Cultural	Intangibles	Total
	$'000	$'000	$'000	$'000	$'000	$'000	$'000
As at 1 July 2015							
Gross book value	382,413	2,593,168	2,975,581	1,144,780	11,947	51,024	4,183,332
Accumulated depreciation and amortisation	-	(1,371,281)	(1,371,281)	(548,077)	(7,741)	(29,647)	(1,956,746)
Net book value as at 1 July 2015	382,413	1,221,887	1,604,300	596,703	4,206	21,377	2,226,586
Additions:							
By purchase	-	82,664	82,664	66,834	-	6,612	156,110
Assets first recognised through a gain in net cost of services	-	-	-	-	-	-	-
Reclassification	2,261	3,120	5,381	(5,333)	-	(48)	-
Revaluations recognised in other comprehensive income	-	-	-	(7,664)	-	-	(7,664)
Impairments recognised in net cost of services	-	-	-	(790)	-	-	(790)
Depreciation expense	-	(90,166)	(90,166)	(71,004)	-	(7,261)	(168,431)
Disposals	-	(511)	(511)	(3,271)	-	-	(3,782)
Net book value as at 30 June 2016	384,674	1,216,994	1,601,668	575,475	4,206	20,680	2,202,029
Net book value as at 30 June 2016 represented by:							
Gross book value	384,674	2,670,081	3,054,755	1,107,276	11,947	57,588	4,231,566
Accumulated depreciation and amortisation	-	(1,453,087)	(1,453,087)	(531,801)	(7,741)	(36,908)	(2,029,537)
	384,674	1,216,994	1,601,668	575,475	4,206	20,680	2,202,029

(d) Reconciliation of the opening and closing balances of Land and Buildings, Plant and Equipment and Intangibles for 2015 - CSIRO

	Land	Buildings	Total land and buildings	Plant and equipment	Heritage and Cultural	Intangibles	Total
	$'000	$'000	$'000	$'000	$'000	$'000	$'000
As at 1 July 2014							
Gross book value	365,868	2,499,362	2,865,230	1,060,344	11,713	54,639	3,991,926
Accumulated depreciation and amortisation	-	(1,301,892)	(1,301,892)	(511,952)	(7,496)	(23,266)	(1,844,606)
Net book value as at 1 July 2014	365,868	1,197,470	1,563,338	548,392	4,217	31,373	2,147,320
Additions:							
By purchase	-	77,694	77,694	112,909	-	1,787	192,390
Assets first recognised through a gain in net cost of services	-	6,722	6,722	-	-	-	6,722
Reclassification	109	4,564	4,673	(10)	-	(4,663)	-
Revaluation recognised in other comprehensive income	16,436	25,653	42,089	-	(11)	-	42,078
Impairments recognised in net cost of services	-	-	-	(529)	-	-	(529)
Depreciation expense	-	(76,104)	(76,104)	(62,817)	-	(7,120)	(146,041)
Disposals	-	(638)	(638)	(1,242)	-	-	(1,880)
Write off of assets recognised in net cost of services	-	(13,474)	(13,474)	-	-	-	(13,474)
Net book value as at 30 June 2015	382,413	1,221,887	1,604,300	596,703	4,206	21,377	2,226,586
Net book value as at 30 June 2015 represented by:							
Gross book value	382,413	2,593,168	2,975,581	1,144,780	11,947	51,024	4,183,332
Accumulated depreciation and amortisation	-	(1,371,281)	(1,371,281)	(548,077)	(7,741)	(29,647)	(1,956,746)
	382,413	1,221,887	1,604,300	596,703	4,206	21,377	2,226,586

	Consolidated		CSIRO	
	2016	2015	**2016**	2015
	$'000	$'000	**$'000**	$'000
Contractual commitments for fixed assets:				
Capital commitments comprise outstanding payments for buildings under construction and commitments for purchase of plant and equipment. Commitments are reported inclusive of GST.				
Land and buildings	**21,532**	19,725	**19,959**	19,725
Plant and equipment	**1,807**	5,412	**1,807**	5,412
Total commitments payable	**23,339**	25,137	**21,766**	25,137
Within 1 year	**20,889**	25,137	**19,316**	25,137
Between 1 to 5 years	**2,450**	-	**2,450**	-
More than 5 years	**-**	-	**-**	-
Total commitments payable	**23,339**	25,137	**21,766**	25,137

Accounting Policy

Acquisition of Assets

Assets are recorded at cost on acquisition except as stated below. The cost of acquisition includes the fair value of assets transferred in exchange and liabilities undertaken. Financial assets are initially measured at their fair value plus transaction costs where appropriate.

Assets acquired at no cost or for nominal considerations are initially recognised as assets and revenues at their fair value at the date of acquisition. Property, plant and equipment which are purchased from contract research funds and where the control and subsequent sale proceeds are refunded to contributors under the terms of the agreements, are expensed during the year of purchase.

Asset Recognition Threshold

Purchases of property, plant and equipment are recognised initially at cost in the Statement of Financial Position, except for purchases costing less than $3,000, which are expensed in the year of acquisition (other than where they form part of a group of similar items which are significant in total).

Revaluations

Following initial recognition at cost, property, plant and equipment, including assets under finance leases are carried at fair value less accumulated depreciation and accumulated impairment losses. Valuations are conducted with sufficient frequency to ensure the carrying amount of assets do not differ materially from the assets' fair value as at reporting date. The regularity of valuation depends upon the volatility of movements in the market values for the relevant assets.

Revaluation adjustments are made on a class basis. Any revaluation increment is credited to equity under asset revaluation reserve, except to the extent that it reverses a previous revaluation decrement of the same asset class that was previously recognised in the surplus or deficit. Revaluation decrements for a class of assets are recognised directly through surplus/deficit except to the extent that they reverse a previous revaluation increment for that class.

Any accumulated depreciation as at the revaluation date is restated proportionately with the change in the gross carrying amount of the asset so that the carrying amount of the asset after revaluation equals its revalued amount.

Fair value for each class of asset is determined as follows:

- Land, which will continue to be used for research activity, is valued by independent valuers at fair value (highest and best use). Highest and best use is determined from the perspective of market participants. An entity's current use of a non-financial asset is presumed to be its highest and best use unless market or other factors suggest otherwise. Land underwent a full revaluation as at 30 June 2015 by Savills.

- Buildings and leasehold improvements, which will continue to be used for research activities, are valued by independent valuers at fair value (highest and best use). Building valuations include plant, fit-outs, fixtures and fittings, which form an integral part of buildings. Buildings underwent a full revaluation as at 30 June 2015 by Savills.

- Plant and equipment which will continue to be used for research activities are valued by independent valuers at fair value (highest and best use). Plant and equipment assets were revalued as at 30 June 2016 by Australian Valuation Solutions.

- Properties held for sale are valued at fair value annually by independent valuers. The property held for sale is valued at its contracted sale price.

- Heritage and cultural assets are valued by independent valuers at their depreciated replacement cost. Heritage assets underwent a full revaluation as at 30 June 2015 by Savills.

Depreciation and Amortisation

Depreciable property, plant and equipment assets are written-off to their estimated residual values over their estimated useful lives using, in all cases, the straight-line method of depreciation. Leasehold improvements are depreciated on a straight-line basis over the lesser of the estimated useful life of the improvements or the unexpired period of the lease. Land is not depreciated.

Depreciation/amortisation rates (useful lives), residual values and methods are reviewed at each reporting date and necessary adjustments are recognised in the current, or current and future reporting periods, as appropriate.

Depreciation rates applying to each class of depreciable asset are based on the following useful lives:

Buildings on freehold land	40 to 80 years
Leasehold improvements	Lease term
Buildings under finance lease	Lease term
Passenger vehicles	7 years
Agricultural and transport equipment	8 to 20 years
Computing equipment	2 to 5 years
Scientific equipment	5 to 20 years
Furniture and office equipment	5 to 15 years
Workshop equipment	20 to 25 years
Research vessel	25 years
Australia telescope	15 to 58 years
Heritage and cultural assets	Indefinite

Impairment

All assets were assessed for impairment as at 30 June 2016. Where indications of impairment exist, the asset's recoverable amount is estimated and an impairment adjustment made if the asset's recoverable amount is less than its carrying amount.

The recoverable amount of an asset is the higher of its fair value less costs to sell and its value in use. Value in use is the present value of the future cash flows expected to be derived from the asset. Where the future economic benefit of an asset is not primarily dependent on the asset's ability to generate future cash flows, and the asset would be replaced if the entity were deprived of the asset, its value in use is taken to be its depreciated replacement cost.

No indications of impairment were identified at 30 June 2016, except for two items of plant and equipment.

Derecognition

An item of property, plant and equipment is derecognised upon disposal or when no further future economic benefits are expected from its use or disposal.

Heritage and Cultural Assets

Heritage and cultural items include buildings of historical or cultural significance. CSIRO has classified them as heritage and cultural assets as they are primarily used for purposes that relate to their cultural significance and original purpose. Heritage and cultural assets are stored and managed in ways to preserve their heritage and cultural value over time. Where conservation and preservation activities, specified in an asset's Heritage Management Plan, demonstrate that an asset will be maintained for an indefinite period, these items are considered to have indefinite useful lives and therefore, not subject to depreciation. Copies of the Heritage Management Plans may be obtained by contacting enquiries@CSIRO.au.

Intangibles

Intangibles comprise licenses and internally developed and acquired software for internal use. These assets are carried at cost, less accumulated amortisation and impairment losses, except where the estimated cost of software is less than the $250,000 threshold and expensed in the year of acquisition. Licenses and software are amortised on a straight-line basis over their anticipated useful lives. The useful lives are 2 to 10 years (2015: 2 to 10 years). All software assets were assessed for indications of impairment as at 30 June 2016.

Properties Held for Sale

Properties which are expected to be recovered primarily through sale rather than through continuing use are classified as 'properties held for sale'. Immediately before classification, the properties are remeasured in accordance with the Group's accounting policies. Thereafter, at reporting date the properties are measured at the lower of their carrying amount and fair value less cost to sell.

Impairment losses on initial classification as held for sale and subsequent gains or losses on re-measurement are recognised in the Statement of Comprehensive Income.

	Consolidated		CSIRO	
	2016	2015	**2016**	2015
	$'000	$'000	**$'000**	$'000
Note 2.2B: Investment properties				
Reconciliation of the opening and closing balances of investment properties				
As at 1 July	**49,292**	48,288	**49,292**	48,288
Net gain/(loss) from fair value adjustments	**930**	1,004	**930**	1,004
Carrying value of assets sold	**-**	-	**-**	-
Total as at 30 June	**50,222**	49,292	**50,222**	49,292

Commitments from investment properties:

Commitments comprise rental income receivable from CSIRO's investment properties

Within 1 year	**738**	3,114	**738**	3,114
Between 1 to 5 years	**1,200**	-	**1,200**	-
More than 5 years	**350**	-	**350**	-
Total commitment receivable	**2,288**	3,114	**2,288**	3,114

No indicators of impairment were identified for investment properties.

Accounting Policy

Investment properties are recorded at their fair value, which is assessed annually by independent valuers. Investment properties were valued as at 30 June 2016 by Colliers. Revaluation increments are recorded as a gain or loss in the Statements of Comprehensive Income as disclosed in Note 1.2. Rental income from investment properties is included in the rental income disclosed in Note 1.2 and was $3.1m for 2016 (2015:$3.1m). Operating costs that are recoverable amounted to $1.0m (2015: $0.4)

Note 2.2C: Other non-financial assets				
Contract research work in progress - at cost	**31,566**	34,983	**31,566**	34,983
Capital prepayments	**1,266**	63,689	**1,266**	63,689
Other prepayments	**13,036**	7,138	**13,016**	7,107
Uniseed Fund Payment[1]	**-**	10,000	**-**	10,000
Total other non-financial assets	**45,868**	115,810	**45,848**	115,779

[1] In 2015, CSIRO provided $10m to be held in trust by Uniseed Management Pty Ltd for the purpose of establishing a new pre-seed and seed fund that is expected to invest in early stage technology development. Once established during 2015-16, this was reclassified as an Investment asset (Note 2.1C).

No indicators of impairment were identified for other non-financial assets. Other non-financial assets are expected to be recovered in no more than 12 months.

Accounting Policy

Accounting policy for contract research work in progress is contained in Note 1.2.

2.3. Payables

	Consolidated		CSIRO	
	2016	2015	**2016**	2015
	$'000	$'000	**$'000**	$'000
Note 2.3A: Suppliers				
Suppliers payable	**62,176**	111,505	**60,135**	110,539
Total	**62,176**	111,505	**60,135**	110,539

Suppliers payable are expected to be settled within 12 months.
Settlement is usually made within 30 days.

Note 2.3B: Other Payables				
Accrued salaries and wages	**3,779**	22,148	**3,667**	22,000
Contract research revenue received in advance	**99,558**	99,089	**99,558**	99,089
Other revenue received in advance	**16,258**	16,234	**12,466**	11,174
Other creditors and accrued expenses	**8,225**	9,406	**6,533**	8,012
Total other payables	**127,820**	146,877	**122,224**	140,275

All other payables are expected to be settled within 12 months.

Accounting Policy

Accounting policy for contract revenue received in advance is contained in Note 1.2.

2.4. Interest Bearing Liabilities

	Consolidated		CSIRO	
	2016	2015	**2016**	2015
	$'000	$'000	**$'000**	$'000
Note 2.4A: Finance Leases				
Payable				
Within one year				
Minimum lease payments	**5,814**	7,217	**5,814**	7,217
Deduct: future finance charges	**(1,547)**	(2,210)	**(1,547)**	(2,210)
Total payable within one year (current)	**4,267**	5,007	**4,267**	5,007
In one to five years				
Minimum lease payments	**22,641**	24,768	**22,641**	24,768
Deduct: future finance charges	**(5,462)**	(6,611)	**(5,462)**	(6,611)
Total payable within one to five years	**17,179**	18,157	**17,179**	18,157
In more than five years				
Minimum lease payments	**21,896**	28,033	**21,896**	28,033
Deduct: future finance charges	**(1,320)**	(2,472)	**(1,320)**	(2,472)
Total payable in more than five years	**20,576**	25,561	**20,576**	25,561
Total finance leases recognised on the Statement of Financial Position	**42,022**	48,725	**42,022**	48,725

Finance leases exist in relation to certain buildings and major equipment assets. The leases are non-cancellable and for fixed terms ranging from 17 to 25 years. CSIRO guarantees the residual values of all assets leased. There are no contingent rentals. The interest rate implicit in the leases averaged 4% per annum (2015: 5% per annum). The lease liabilities are secured by the lease assets.

Accounting Policy

Accounting policies for leases is contained in Note 1.1.

Note 2.4B: Deposits				
Deposits represent monies held on behalf of the following third parties:				
Goyder Institute of Water Research	**3,253**	4,072	**3,253**	4,072
Others	**2,545**	1,487	**3,595**	2,537
Total deposits	**5,798**	5,559	**6,848**	6,609

3. Funding

This section identifies CSIRO's funding structure.

3.1. Cash Flow Reconciliation

	Consolidated		CSIRO	
	2016	2015	**2016**	2015
	$'000	$'000	**$'000**	$'000
Reconciliation of cash and cash equivalents as per statement of financial position to cash flow statement				
Cash and cash equivalents as per Cash Flow Statement and Statement of Financial Position	**302,096**	267,129	**176,827**	182,331
Reconciliation of net cost of services to net cash from operating activities				
Net cost of services	**(818,379)**	(779,787)	**(806,910)**	(759,515)
Revenue from Government	**750,281**	745,268	**750,281**	745,268
Share of net operating surplus/(deficit) of joint venture accounted for using the equity method	**(10)**	(300)	**(10)**	(300)
Adjustments for non-cash items				
Depreciation and amortisation	**168,878**	146,094	**168,431**	146,041
Net write-down and impairment of assets	**3,878**	14,791	**3,878**	14,791
Gain on recognition of asset	**-**	(6,722)	**-**	(6,722)
Gain on revaluation of investment properties	**(929)**	-	**(929)**	-
(Gains)/loss from sale of property, plant and equipment	**3,352**	891	**3,362**	891
(Gains)/loss from sale of equity investments and intellectual property	**-**	14	**-**	14
Share of net operating deficit of joint venture accounted for using the equity method	**10**	300	**10**	300
Movements in assets and liabilities				
Assets				
(Increase)/decrease in trade and other receivables	**18,651**	3,313	**13,583**	3,519
(Increase)/decrease in inventories	**(99)**	(55)	**(99)**	(55)
(Increase)/decrease in other non-financial assets	**4,996**	(22,384)	**3,824**	(22,397)
(Increase)/decrease in GST receivable	**3,966**	(5,468)	**4,147**	(5,410)
Liabilities				
Increase/(decrease) in employee liabilities	**31,779**	(58,153)	**30,576**	(58,243)
Increase/(decrease) in supplier payables	**(52,005)**	31,871	**(50,404)**	31,318
Increase/(decrease) in other payables	**(29,891)**	(6,324)	**(18,051)**	(9,774)
Increase/(decrease) in deposits-liabilities	**239**	992	**239**	2,042
Increase / (decrease) in provision for remediation	**29,703**	-	**29,703**	-
Net cash from operating activities	**114,420**	64,341	**131,631**	81,768

Accounting Policy

Cash and cash equivalents

Cash and cash equivalents includes cash on hand and demand deposits in bank accounts with an original maturity of six months or less that are readily convertible to known amounts of cash and subject to insignificant risk of change in value. Cash is recognised at its nominal amount. The total cash held includes deposits held on behalf of third parties (as disclosed in Note 2.4B).

4. People and Relationships

This section describes a range of employment and post employment benefits provided to our people and our relationship with other key people.

4.1. Employee Provisions

	Consolidated		CSIRO	
	2016	2015	**2016**	2015
	$'000	$'000	**$'000**	$'000
Note 4.1A: Employee Provisions				
Annual leave	**58,143**	55,788	**55,068**	55,698
Long service leave	**145,952**	130,296	**143,498**	130,296
Severance pay	**6,655**	5,434	**5,121**	5,434
Redundancies	**27,984**	9,667	**27,984**	9,667
Total employee provisions	**238,734**	201,185	**231,671**	201,095
Employee provisions are expected to be settled in				
No more than 12 months	**73,218**	47,104	**66,155**	47,104
More than 12 months	**165,516**	154,081	**165,516**	153,991
Total employee provisions	**238,734**	201,185	**231,671**	201,095

Accounting Policy

Liabilities for short-term employee benefits (as defined in AASB 119 *Employee Benefits*) and termination benefits due within twelve months of the end of the reporting period are measured at their nominal amounts. The nominal amount is calculated with regard to the rate expected to be paid on settlement of the liability.

Other long-term employee benefit liabilities are measured at the present value of the estimated future cash outflows to be made in respect of services provided by employees up to the reporting date.

Leave

The liability for employee benefits includes provisions for annual leave, long service leave and severance payments. No provision has been made for sick leave as all sick leave is non-vesting and the average sick leave taken in future years by employees is estimated to be less than the annual entitlement for sick leave.

The leave liabilities are calculated on the basis of employees' remuneration at the estimated salary rates that will apply at the time the leave is taken, including the employer superannuation contribution rates to the extent that the leave is likely to be taken during service rather than paid out on termination.

The liability at 30 June for long service leave and annual leave has been determined by the short hand method and reference to the work of the Australian Government Actuary (AGA). The estimate of the present value of the liability takes into account attrition rates and pay increases through promotion and inflation.

Separation and Redundancy

Provision is made for separation and redundancy benefit payments. A CSIRO plan of termination is binding when the following criteria are met:

- actions required to complete the plan indicate that it is unlikely that significant changes to the plan will be made;
- the plan identifies the number of employees whose employment is to be terminated; and
- the plan established the termination benefits that employees will receive.

Superannuation

Employees of CSIRO are members of the Commonwealth Superannuation Scheme (CSS), the Public Sector Superannuation Scheme (PSS), or the PSS accumulation plan (PSSap). The CSS and PSS are defined benefit schemes for the Australian Government. The PSSap is a defined contribution scheme.

The liability for defined benefits is recognised in the financial statements of the Australian Government and is settled by the Australian Government in due course. This liability is reported by the Department of Finance as an administered item.

CSIRO makes employer contributions to the employee superannuation schemes at rates determined by an actuary to be sufficient to meet the cost to the Government of the superannuation entitlements of the Group's employees. CSIRO accounts for the contributions as if they were contributions to defined contribution plans.

The liability for superannuation recognised as at 30 June represents outstanding contributions for the financial year.

4.2. Senior Management Personnel Remuneration

	Consolidated		CSIRO	
	2016	2015	**2016**	2015
	$'000	$'000	**$'000**	$'000
Short-term employee benefits				
Salary	**6,309**	5,023	**5,568**	5,023
Performance bonuses	**590**	1,504	**590**	1,504
Additional allowances	**281**	310	**280**	310
Total short-term employee benefits	**7,180**	6,837	**6,438**	6,837
Post-employment benefits				
Superannuation	**746**	685	**714**	685
Total post-employment benefits	**746**	685	**714**	685
Other long-term employee benefits				
Annual leave accrued	**424**	384	**396**	384
Long-service leave accrued	**281**	150	**281**	150
Total other long-term benefits	**705**	534	**677**	534
Termination benefits				
Termination benefits	**413**	-	**-**	-
Total termination benefits	**413**	-	**-**	-
Total senior executive remuneration expenses	**9,044**	8,056	**7,829**	8,056

The total number of senior management personnel that are included in the above table for CSIRO is 20 (2015: 22) and for the Group is 23 (2015:22). The increase in the staff numbers and associated costs for the Group in 2016 is due to the first time inclusion of NICTA.

This note has been prepared on an accrual basis for substantive and long term acting senior management personnel during the period.

4.3. Remuneration of Auditors

	Consolidated		CSIRO	
	2016	2015	**2016**	2015
	$	$	**$**	$
Amounts received or due and receivable by the Group's auditors for:				
Audit of the financial statements[1]	**404,983**	271,681	**199,000**	227,000
Other non-audit related[2]	**92,703**	41,063	**-**	24,596
	497,686	312,744	**199,000**	251,596

[1] The Group's auditor is the Australian National Audit Office (ANAO) who has appointed RSM to assist with the assignment in 2015-16 (KPMG in 2014-15). The Fundacion is audited by Ernst & Young. NICTA was audited for part of the year by Ernst & Young.

[2] These services are performed by the audit firm directly. No non-audit work was undertaken by RSM for CSIRO (2015: KPMG services included taxation, governance services and provision of financial reporting software). Ernst & Young provided other assurance services to NICTA during the current period.

4.4. Remuneration of Board Members

	Consolidated		CSIRO	
	2016	2015	**2016**	2015
	$	$	**$**	$
Remuneration and superannuation benefits received or due and receivable by full-time and part-time Board Members, excluding the Chief Executive Officer were:				
Remuneration	**837,488**	599,865	**553,915**	599,865
Payments to superannuation funds	**72,400**	49,166	**49,587**	49,166
Total remuneration	**909,888**	649,031	**603,502**	649,031

The remuneration of the Chief Executive Officer, who is also a Board Member of the Group is reported under Note 4.2 Senior Executive Remuneration. The total number of Board members that are included in the above table for CSIRO is 13 (2015: 9) due to changes in Board personnel during the year. For the Group the total number of Board members was 27 (2015: 9). The increase in the Board personnel and remuneration for the Group in 2016 is due to the first time inclusion of NICTA.

4.5. Meetings of the Board and Board Committees

During the financial year 2015-16, 8 Board meetings (2 out of session), 5 Board Audit & Risk Committee meetings and 4 Board People, Health & Safety Committee meetings were held. Specific Board members are members of the Committees, however as Board members they are able to attend any Committee meeting. The number of meetings attended by each of the Board members was as follows:

Board member	**CSIRO Board**		**CSIRO Board Audit & Risk Committee**		**CSIRO Board People, Health & Safety Committee**	
	Number eligible to attend as a member	Number attended	Number eligible to attend as a member	Number attended	Number eligible to attend as a member	Number attended
M Allan	1	1	-	-	-	1
J Bennett	3	3	3	3	-	1
E Cornish	5	5	1	2	-	1
E Doyle	4	4	4	4	2	2
S In't Veld	8	8	5	4	4	3
D Knox*	-	-	-	-	-	-
T Monro	4	4	-	1	1	1
H Ranck	8	8	-	2	4	4
P Riddles	8	7	5	5	4	4
D Thodey	5	5	-	2	-	2
B Watson	6	6	2	2	-	2
L Marshall	8	7	-	3	-	3

* Mr D Knox was appointed to the Board on 5 May 2016 with his duties commencing 25 July 2016. Consequently no meetings were attended during 2015-16.

4.6. Related Party Disclosures

(a) Controlled Entities

SIEF was established under the *Science and Industry Endowment Act 1926*. The principal activity of the SIEF Trust is to provide assistance to persons engaged in scientific research and in training of students in scientific research. The SIEF Trustee is the CSIRO Chief Executive and SIEF is a wholly controlled entity. The SIEF's separate financial statements are reported in the CSIRO Annual Report.

WLAN is a small proprietary company limited by shares, which are solely held by CSIRO. The principal activity of WLAN is to provide services to CSIRO. WLAN was established in 2005.

The Fundación was established in October 2013. The Fundación is a controlled entity governed by a Board in accordance with the Constitution of the Fundación. The Fundación is working with industry and leading Chilean Universities to develop cutting-edge technologies to reduce the environmental impact of mining and increase productivity.

NICTA is Australia's ICT Research Centre of Excellence and undertakes internationally recognised research in partnership with industry, government and researchers to create national benefit and wealth for Australia. NICTA is the parent entity of NICTA IPR Pty Ltd and a small number of minor proprietary limited companies that exist to hold intellectual property and commercialise research. CSIRO obtained full control of NICTA on 28 August 2015, when the members of the NICTA Board resolved to adopt a revised company constitution which provided CSIRO with effective control over NICTA.

The General Partner Co Pty Ltd and CSIRO Financial Services Pty Ltd are newly established entities that were set up as part of establishing the CSIRO Innovation Fund. Their purpose is to manage and operate the Fund. AFOF is an incorporated limited partnership formed under the Partnership Act 1892 (NSW) and has applied to Innovation Australia for conditional registration as an Australian Venture Capital Fund of Funds. CSIRO has sole control of these entities.

(b) Board Members

The Board Members of the Group during the financial year were:

D Thodey (Chairman) (appointed 15 October 2015; commenced duties 19 November 2015)
S In't Veld (Deputy Chairman from 22 April 2016)
L Marshall (Chief Executive)
M Allan (appointed 5 May 2016)
J Bennett (term completed 24 October 2015)
E Cornish (appointed 26 November 2015)
E Doyle (term completed 14 February 2016)
D Knox (appointed 5 May 2016)
T Monro (appointed 25 February 2016)
H Ranck (reappointed 5 May 2016)
P Riddles
B Watson (appointed 14 September 2015)

The aggregate remuneration of Board Members is disclosed in Note 4.4.

(c) Board Members' interest in contracts

Since 1 July 2015 no Board Member of CSIRO has received or become entitled to receive a benefit, other than a benefit included in the aggregate amount of remuneration received or due and receivable shown in Note 4.4 by reason of a contract made by CSIRO with the Board Member or with a firm of which the Board Member is a member or with a company in which the Board Member has a substantial financial interest.

This information relates to the period 1 July 2015 to 30 June 2016.

(d) Other transactions of Board Members – related entities

Dr M Allan is the Chair of the Next Generation Manufacturing Investment Programme Advisory Committee, Apple and Pear Australia Limited, the Grains and Legumes Nutrition Council, Charles Sturt University, and Meat and Livestock Australia where she is also Chair of the Remuneration Committee. Dr Allan is also Director of Innovation and Science Australia, Food and Agribusiness Growth Centre, Nuffield Australia and Grain Growers, where she is also the Chair of the Audit & Risk Committee. Dr Allan is also a Member of the Cooperative Research Centres Advisory Committee. During 2015-16 Dr Allan ceased to be a Director of Cooperative Research Centres Hearing. All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions and there is no personal benefit to the CSIRO Board Member.

Ms J Bennett is a non-Executive Director of the Australian Broadcasting Corporation, Nuffield Australia and Food Innovation Australia Ltd. During 2015/16 Ms Bennett ceased to be a Director of the Australian Farm Institute, Tasmanian Ports Corporation, The Van Diemen's Land Company and Tasmanian Land Co. During 2015-16, Ms Bennett was appointed an Executive Director of TasFoods Ltd, Nichols Poultry Pty Ltd and Shima Wasabi Ltd. All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions and there is no personal benefit to the CSIRO Board Member.

Professor E Cornish is a Director of South Barnoolut Pty Ltd. She is a Board Member of: the Monash (Suzhou) Consulting Company Limited, Museums Board of Victoria, the Indian Institute of Technology Bombay-Monash Research Academy, and Climate Works Australia Board. Professor Cornish is also a Member of the following: the ARC Advisory Council, NHMRC Health Innovation Advisory Committee, and the Expert Working Group for National Research Infrastructure Roadmap. All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions and there is no personal benefit to the CSIRO Board Member.

Dr E Doyle is Chair of the Hunter Valley Research Foundation. She is a Non-Executive Director of the GPT Group of companies, Boral Ltd, Knights Rugby League Pty Ltd and various private companies. Dr Doyle is also a Conjoint Professor at the University of Newcastle, Graduate School of Business and a member of O'Connell Street Associates. During the 2015-16 year, Dr Doyle was appointed as Non-Executive Director of Oil Search and ceased as Non-Executive Director of Bradken Limited. All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions and there is no personal benefit to the CSIRO Board Member.

Ms S In't Veld is a Director of Asciano Limited, a non-Executive Director of the DUET Group and a member of the CSIRO Energy Strategic Advisory Committee. Ms In't Veld is Nominee Director for Sunsuper and Group Super (Commonwealth Bank) for Perth Airport. During 2015-16, Ms In't Veld was appointed as a Board Member of the National Broadband Network (NBN), and a member of the Takeovers Panel. During 2015-16 she ceased to be an Advisory Council Member of SMART Infrastructure, a non-Executive Director of the Juniper Uniting Church Community and as a council member of AICD (WA). All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions and there is no personal benefit to the CSIRO Board Member.

Mr D Knox is Chair of the CSIRO Energy Advisory Committee, a Director of Migration Council Australia and a Member of the Commonwealth Science Council and the Royal Institution of Australia Council. David also sits on the boards of the Adelaide Botanic Gardens and State Herbarium and the Adelaide Festival. All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions and there is no personal benefit to the CSIRO Board Member.

Dr L Marshall is Trustee of the Science and Industry Endowment Fund. Dr Marshall is also a beneficiary of Southern Cross Venture Partners Trusco Pty Ltd Third Party Trust, Southern Cross Venture Partners Management Pty Ltd Third Party Trust and Blackbird Venture Capital Fund Third Party Trust. All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions and there is no personal benefit to the CSIRO Board Member.

Professor T Monro is the Vice President of the Australian Academy of Technological Science and Engineering (ATSE) and Deputy Vice Chancellor and Vice President: Research and Innovation, University of South Australia. She is Chair of the Deputy Vice Chancellor Research Group of the Australian Technology Network of Universities and a Patron of the National Youth Science Forum (NYSF). Professor Monro is also a Director of Red Chip Photonics and a Member of the Commonwealth Science Council, the Economic Development Board of South Australia, the Science | Creativity | Education Studio Advisory Board, University of South Australia and the National Committee for Physics. During 2015-16, Professor Monro ceased to be a Member of the Riverbank Authority, South Australia. All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions and there is no personal benefit to the CSIRO Board Member.

Mr H Ranck is Chair of Elders Limited, Director of Innotegic Pty Ltd and Iluka Resources, and a fellow of the Australian Institute of Company Directors. During 2015-16, he ceased to be a member of the Sydney University Senate Committee on Risk and Safety. All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions and there is no personal benefit to the CSIRO Board Member.

Dr P Riddles is Founder and Director of ViciBio Pty Ltd and a Director of the Hear and Say Centre for Deaf Children and the National Stem Cell Foundation of Australia. He is the Chairman of the Griffith Enterprise Advisory Board and a Fellow of the California Technology Council. During 2015-16, Dr Riddles was appointed a Member of the Entrepreneurs' Program Committee of Innovation Australia and ceased to be Chair of the Wound Management Innovation CRC. All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions and there is no personal benefit to the CSIRO Board Member.

Mr D Thodey is Chair of Jobs for NSW Fund and during 2015-16, he was appointed Special Advisor to Square Peg Capital. During 2015-16 he stood down as Chair and Board Member of GSM Association, Public Policy Committee, Deputy Chair of the International Business Leaders' Advisory Council (IBLAC) and Co-Chair of the Infrastructure and Investment Taskforce of the Australian B20 leadership group. All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions and there is no personal benefit to the CSIRO Board Member.

Mr B Watson is a Board Member and Shareholder of Georgica Associates Pty Ltd and Six Park Investment Management Pty Ltd. Mr Watson is also a Board Member of MeeMeep Pty Ltd and Victorian International Container Terminal Ltd. During 2015-16 Mr Watson ceased to be a member of the Melbourne Grammar School Foundation Board and Berry Street Victoria. All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions and there is no personal benefit to the CSIRO Board Member.

5. Managing Uncertainties

This section analyses how CSIRO manages financial risk within its operating environment.

5.1. Contingent Assets and Liabilities

	Consolidated		CSIRO	
	2016	2015	**2016**	2015
	$'000	$'000	**$'000**	$'000
Quantifiable Contingencies				
Contingent assets				
Insurance claims	**2,323**	-	**2,323**	-
Bank guarantees received from suppliers	**38,353**	57,997	**38,353**	57,997
Total contingent assets	**40,676**	57,997	**40,676**	57,997
Contingent liabilities				
Estimated legal claims[1]	**-**	(300)	**-**	(300)
Total contingent liabilities	**-**	(300)	**-**	(300)
Total net contingent asset/(liability)	**40,676**	57,697	**40,676**	57,697

Depending on the materiality of risks involved with certain commercial transactions, CSIRO has requested bank guarantees where necessary to mitigate such risks, notably where substantial advance payments were made.

[1]Estimated legal claims arising from employment, motor vehicle accidents, commercial and patent disputes. The Group has denied liability and is defending the claims. The estimate is based on precedent in such cases.

Unquantifiable contingencies

CSIRO is currently involved in one legal proceeding in the US relating to CSIRO's US patent for its wireless local area network (WLAN) invention, which it owns and has licensed broadly. In this proceeding, an amount was awarded for damages by the trial court but the proceeding went through an appeal process relating primarily to the appropriate method for calculating patent damages. The outcome of the appeal process is that the matter has been returned to the trial court for further determination. It is conceivable that any decision of the trial court could become the subject of a further appeal. The final amount of the damages award that will be determined by the US courts is presently unknown.

Accounting Policy

Contingent liabilities and contingent assets are not recognised in the Statement of Financial Position. They may arise from uncertainty as to the existence of a liability or asset, or represent a liability or asset in respect of which the amount cannot be reliably measured. Contingent assets are disclosed when settlement is probable but not virtually certain and contingent liabilities are disclosed when settlement is greater than remote.

5.2. Financial Instruments

	Consolidated		CSIRO	
	2016	2015	**2016**	2015
	$'000	$'000	**$'000**	$'000
Note 5.2A: Categories of financial instruments				
Financial Assets				
Available for sale financial assets				
Investments	**21,386**	12,601	**49,446**	12,601
Loans and receivables				
Cash at bank	**139,127**	15,398	**76,827**	9,331
Term deposits	**162,969**	251,731	**100,000**	173,000
Receivable for goods and services	**44,683**	43,891	**44,805**	43,985
Other receivables	**7,670**	20,041	**2,244**	16,569
Carrying amount of financial assets	**375,835**	343,662	**273,322**	255,486
Financial Liabilities				
Finance lease liabilities	**42,022**	48,725	**42,022**	48,725
Trade creditors	**62,176**	111,505	**60,135**	110,539
Research revenue received in advance	**99,558**	99,089	**99,558**	99,089
Deposits	**5,798**	5,559	**6,848**	6,609
Other creditors	**28,262**	47,788	**22,666**	41,186
Carrying amount of financial liabilities	**237,816**	312,666	**231,229**	306,148

Accounting Policy

Financial Assets

CSIRO classifies its financial assets in the following categories: available for sale financial assets and loans and receivables. The classification depends on the nature and the purpose of financial assets and is determined at the time of initial recognition. Financial assets are recognised and derecognised upon trade date.

Available-for-Sale Financial Assets

Available-for-sale financial assets are non-derivatives that are either designated in this category or not classified in any of the other categories. Available-for-sale financial assets are recorded at fair value. Gains and losses arising from changes in fair value are recognised directly in the reserves (equity) with the exception of impairment losses. Interest is calculated using the effective interest method and foreign exchange gains and losses on monetary assets are recognised directly in profit or loss. Where the asset is disposed of or is determined to be impaired, part (or all) of the cumulative gain or loss previously recognised in the reserve is included in the operating result for the period.

Effective Interest Method

The effective interest method is a method of calculating the amortised cost of a financial asset and of allocating interest income over the relevant period. The effective interest rate is the rate that exactly discounts estimated future cash receipts through the expected life of the financial asset or, where appropriate, a shorter period.

Income is recognised on an effective interest rate basis, except for financial assets that are recognised at fair value through profit and loss.

Fair value of Investments in Listed Companies

The fair value of investments in listed companies has been determined by reference to their closing bid price at the reporting date.

Fair value of Investments in Unlisted Companies

For investments in unlisted companies where there is no readily available market pricing for the equity instruments, the fair value has been determined by applying valuation techniques in line with the generally accepted valuation guidelines 'International Private Equity and Venture Capital Valuation (IPEV) Guidelines'.

Where recent transactions for the unlisted companies' equity have taken place, these equity transaction prices are used to value CSIRO's investment.

For unlisted companies that have not had any recent equity transactions, other IPEV valuation techniques are used such as discounted cash flows and share of net assets.

In addition, independent valuations are performed as at reporting date for unlisted companies that are considered to have a material impact on CSIRO's investment portfolio.

Investments in special purpose entities are either valued at cost or share of net realisable assets since a reliable estimate of fair value cannot be established. These entities have been set up primarily to gain access to research facilities/networks, or to provide services to owners. Hence, there is no 'active market' for these equity investments. CSIRO is a long-term shareholder and is unlikely to dispose of its interest in these investments.

Loans and Receivables

Trade receivables, loans and other receivables that have fixed or determinable payments that are not quoted in an active market, are classified as 'loans and receivables'. Loans and receivables are measured at amortised cost using the effective interest method less impairment. Interest is recognised by applying the effective interest rate. All trade and other receivables are expected to be recovered in no more than 12 months.

Impairment of Financial Assets

Financial assets are assessed for impairment at the end of each reporting period.

Financial assets held at amortised cost- Where there is objective evidence that an impairment loss has been incurred for loans and receivables, the amount of the loss is measured as the difference between the asset's carrying amount and the present value of estimated future cash flows discounted at the asset's original effective interest rate. The carrying amount is reduced by way of an allowance account. The loss is recognised in the Statement of Comprehensive Income.

Available-for-sale financial assets– Where there is objective evidence that an impairment loss on an available-for-sale financial asset has been incurred, the amount of the difference between its cost, less principal repayments and amortisation, and its current fair value, less any impairment loss previously recognised in expenses, is transferred from equity to the Statement of Comprehensive Income.

Available-for-sale financial assets (held at cost)- Where there is objective evidence that an impairment loss has been incurred, the amount of the impairment loss is the difference between the carrying amount of the asset and the present value of the estimated future cash flows discounted at the current market rate for similar assets.

Financial Liabilities

Financial liabilities are recognised and derecognised upon trade date. Supplier and other payables are recognised at amortised cost. Liabilities are recognised to the extent that the goods or services have been received (and irrespective of having been invoiced).

	Consolidated		CSIRO	
	2016	2015	**2016**	2015
	$'000	$'000	**$'000**	$'000
Note 5.2B: Net income and expense from financial assets				
Cash at bank and term deposits				
Interest revenue	**9,296**	12,946	**6,457**	9,707
Net gain from financial assets	**9,296**	12,946	**6,457**	9,707

Note 5.2C: Net income and expense from financial liabilities				
Finance leases				
Interest expense	**2,201**	2,535	**2,178**	2,521
Net loss from financial liabilities	**2,201**	2,535	**2,178**	2,521

Note 5.2D: Fair value of financial instruments

A comparison between the fair value and carrying amount of the Group's financial assets and liabilities is not disclosed because the Group considers that the carrying amounts reported in the Statement of Financial Position are a reasonable approximation of the fair value of these financial assets and liabilities.

Note 5.2E: Credit Risk

The maximum exposure to credit risk is the risk that arises from potential default of a debtor. This amount is equal to the total amount of trade and other receivables of $52.0m million (2015 $63.7 million). The Group has assessed the risk of the default on payment and has allocated $0.4 million (2015 $0.3 million) to an allowance for impairment account.

The Group manages its credit risk by undertaking background and credit checks prior to allowing a debtor relationship. In addition, the Group has policies and procedures that guide employees to apply debt recovery techniques. The Group holds no collateral to mitigate against credit risk.

Credit risk of financial instruments not past due or individually determined as impaired - Consolidated

	Not past due nor impaired 2016 $'000	Not past due nor impaired 2015 $'000	**Past due or impaired 2016 $'000**	Past due or impaired 2015 $'000
Cash at bank	**139,127**	15,398	**-**	-
Term deposits	**162,969**	251,731	**-**	-
Receivables for goods and services	**35,519**	36,986	**9,164**	6,905
Other receivables	**7,670**	20,041	**-**	-
Investments	**21,386**	12,601	**-**	-
Total	**366,671**	336,757	**9,164**	6,905

Credit risk of financial instruments not past due or individually determined as impaired - CSIRO

Cash at bank	**76,827**	9,331	**-**	-
Term deposits	**100,000**	173,000	**-**	-
Receivables for goods and services	**35,935**	37,080	**8,870**	6,905
Other receivables	**2,244**	16,569	**-**	-
Investments	**49,446**	12,601	**-**	-
Total	**264,452**	248,581	**8,870**	6,905

Ageing of financial assets that were past due but not impaired for 2016 - Consolidated

	0 to 30 days $'000	**31 to 60 days $'000**	**61 to 90 days $'000**	**90+ days $'000**	**Total $'000**
Receivables for goods and services	**4,135**	**3,498**	**889**	**642**	**9,164**
Total	**4,135**	**3,498**	**889**	**642**	**9,164**

Ageing of financial assets that were past due but not impaired for 2015 - Consolidated

Receivables for goods and services	4,213	1,529	564	599	6,905
Total	4,213	1,529	564	599	6,905

Ageing of financial assets that were past due but not impaired for 2016 - CSIRO

	0 to 30 days $'000	**31 to 60 days $'000**	**61 to 90 days $'000**	**90+ days $'000**	**Total $'000**
Receivables for goods and services	**4,111**	**3,498**	**889**	**372**	**8,870**
Total	**4,111**	**3,498**	**889**	**372**	**8,870**

Ageing of financial assets that were past due but not impaired for 2015 - CSIRO

Receivables for goods and services	4,213	1,529	564	599	6,905
Total	4,213	1,529	564	599	6,905

Note 5.2G: Market risk

The Group holds basic financial instruments that do not expose the Group to certain market risks except for equity price risk for its 'available for sale' equity investments. See Note 2.1C.

Interest rate risk

The only interest-bearing items on the Statement of Financial Position are finance leases. They all bear interest at a fixed interest rate and will not fluctuate due to changes in the market interest rate.

Equity price risk

Equity price risk arises from changes in market prices of listed equity investments that the Group has designated as 'available for sale' financial instruments. See Note 2.1C.

Sensitivity analysis

The Group's listed equity investments are listed on the Australian Stock Exchange (ASX). For such instruments classified as 'available for sale', a 10% increase in the ASX All Ordinary Index at the reporting date would have increased equity by $ 0.4 million (2015: $0.4 million). An equal change in the opposite direction would have decreased equity by $0.4 million (2015: $0.4 million). The analysis is performed on the same basis for 2015.

Currency risk

In accordance with Australian Government policy, the Group is prohibited from entering into foreign currency hedges.

The Group's exposure to foreign exchange risk on sales and purchases that are denominated in currencies other than the Australian dollar is not considered material. At any point in time the Group's foreign currency risk exposure is not material.

5.3. Fair value measurements

Fair value measurements at the end of the reporting period

	2016 $'000	2015 $'000	Category (Level 1, 2 or 3)	Valuation technique	Inputs used
Financial assets					
Available for sale financial assets					
- Listed	**4,023**	3,970	**1**	N/A	N/A
- Unlisted	**7,363**	8,631	**3**	Share of net assets; Latest equity or unit transaction price; Contract value	Net assets; Percentage shareholding; Equity or unit transaction price; Contract value
- Other investments	**10,000**	-	**3**	Share of net assets; Latest equity or unit transaction price; Contract value	Net assets; Percentage shareholding; Equity or unit transaction price; Contract value
Total financial assets	**21,386**	12,601			
Non-financial assets					
Land	**384,674**	382,413	**2**	Active and liquid market approach	Market value of similar properties; Dollar rate per square metre; Derived escalation rate on similar land sales
Buildings	**1,220,662**	1,221,887	**3**	Depreciated replacement cost approach	Escalation rate on construction cost change; Market value of similar properties
Plant and equipment	**580,878**	597,147	**3**	Depreciated replacement cost approach	Observable inputs such as the market value of similar P&E
Investment Properties	**50,220**	49,292	**2**	Market approach and capitalisation	Market value of similar properties; Dollar rate per m2
Properties Held For Sale	**5,200**	5,200	**1**	Market approach and capitalisation	Market value of similar properties
Heritage and cultural	**4,206**	4,206	**3**	Depreciated replacement cost approach	Market value of similar properties; Escalation rate for building cost premium
Total non-financial assets	**2,245,842**	2,260,145			
Total fair value measurements (assets)	**2,267,228**	2,272,746			

1. The above disclosure represents the consolidated financial position of the Group.

Note 5.3B: Reconciliation for recurring Level 3 fair value measurements

There have been no transfers between levels for non-financial assets

Recurring Level 3 fair value measurements - reconciliation for assets

	Non-financial assets				Financial assets
	Buildings	Property, plant and equipment	Heritage and Cultural	Total Non-Financial	Total Financial
	2016	2016	2016	2016	2016
	$'000	$'000	$'000	$'000	$'000
Opening balance	**1,221,887**	**597,147**	**4,206**	**1,823,240**	**8,631**
Total gains/(losses) in net cost of services[1]	**(90,334)**	**(72,059)**	**-**	**(162,393)**	**(3,088)**
Transfers	**3,120**	**(5,333)**	**-**	**(2,213)**	**(908)**
Additions	**85,013**	**67,719**	**-**	**152,732**	**12,831**
Disposals	**(513)**	**(3,259)**	**-**	**(3,772)**	**-**
Revaluations	**1,489**	**(3,337)**	**-**	**(1,848)**	**(103)**
Closing balance	**1,220,662**	**580,878**	**4,206**	**1,805,746**	**17,363**

1. These gains/(losses) recognised in the net cost of services are presented in the Statement of Comprehensive Income under 'Depreciation and amortisation' and 'Write-down and Impairment of assets'.

Significant Accounting Judgements and Estimates

In the process of applying the accounting policies listed in this note, CSIRO has made the following judgements that have the most significant impact on the amounts recorded in the financial statements:

- The fair value of properties classified as 'properties held for sale' has been taken to be the market value (level 1 inputs), and for 'investment properties' has been taken to be the market value (level 2 inputs), of similar properties as determined by an independent valuer;
- The fair value of land which will continue to be used for research activities, and buildings held for specialised purposes and where there is no readily available market price has been taken to be Fair Value- Highest and Best Use (level 3 inputs), as determined by an independent valuer;
- The fair value of plant and equipment has been taken to be Fair Value – Highest and Best Use (level 3 inputs) as they mainly comprise of specialised research equipment. Fair value is determined by an independent valuer; and
- The fair value of listed companies is assessed at market value (level 1 inputs); whereas unlisted companies and commercial vehicles are assessed at fair value using the best information available (level 1 and 3 inputs). For investments in unlisted companies where there is no readily available market pricing, the fair value has been determined by applying valuation techniques in line with the generally accepted valuation guidelines 'International Private Equity and Venture Capital Valuation Guidelines (IPEV).' Where recent transactions for the unlisted companies' equity have taken place, these equity transaction prices are used to value CSIRO's investment. For unlisted companies that have not had any recent equity transactions, other IPEV valuation techniques are used such as discounted cash flows and share of net assets. Investments in special purpose entities are either valued at cost of share of net realisable assets since a reliable estimate of fair value cannot be established. These entities have been set up primarily to gain access to research facilities/networks, or to provide services to owners. Hence, there is not 'active market' for these equity investments.

No accounting assumptions and estimates have been identified that have a significant risk of causing a material adjustment to the carrying amounts of assets and liabilities within the next reporting period.

6. Other information

6.1. Cooperative Research Centres (CRCs)

All CRCs have been classified as joint operations as the purpose is for the pursuit of collaborative scientific research where participants share in the scientific outcomes and outputs of the CRCs. In the event that CRC research results in a move to commercialisation, a separate legal entity is established and the CSIRO's share of the new entity is treated either as subsidiary, joint venture or associate in the Statement of Financial Position as appropriate.

CSIRO's total cash and in-kind contribution (e.g. staff and use of assets) to CRCs from its own resources was $9.1 million for the year (2015: $12.5 million). Contributions made by CSIRO are expensed as incurred and these are included in the Statement of Comprehensive Income.

No contingent liabilities were reported by the CRCs in which CSIRO is a participant.

CSIRO is a participant in the following CRCs as at 30 June 2016.

Name of CRC	Expected Termination Date
Antarctic Climate and Ecosystems CRC	30/06/19
Australian Poultry CRC	30/06/17
Australasian Invasive Animals CRC	30/06/17
Automotive Australia 2020 CRC	30/06/17
CRC for Cancer Therapeutics	30/06/20
CRC Alertness Safety and Productivity	30/06/20
CRC for Contaminated Assessment and Remediation of the Environment (CRC for CARE)	30/06/20
CRC for Low Carbon Living	30/06/19
CRC for Mental Health	30/06/18
CRC for Optimising Resource Extraction	30/06/22
CRC for Polymers	30/06/17
Deep Exploration Technologies CRC	30/06/18
National Plant Biosecurity CRC	30/06/18
Rail Manufacturing CRC	30/06/21
Remote Economic Participation CRC	30/06/17

There was one CRC that terminated and/or CSIROs participation concluded as at 30 June 2016.

Bushfire and Natural Hazards CRC	31/12/15

Accounting Policy

Joint Operations – Cooperative Research Centres (CRCs)

The proportionate interests in CRCs regarded as joint operations are disclosed in the financial statements under appropriate headings. Their primary source of funding is from the Australian Government and funding is progressively drawn down over the life of the CRCs and distributed to participants, including CSIRO and universities, for research and development purposes. CSIRO's contributions to the CRCs are expensed as incurred and funds received from CRCs are recognised as revenue to the extent that work has been performed in the Statement of Comprehensive Income. CSIRO has been a participant in 16 CRCs during the financial year.

6.2. Monies Held in Trust

	2016	2015
	$'000	$'000
Monies held in trust represented by cash, deposits and investments for the benefit of the Group which are not included in the Statement of Financial Position are:		
The Sir Ian McLennan Achievement for Industry Award - established to award outstanding contributions by the Group's scientists and engineers to national development.	**353**	356
The Elwood and Hannah Zimmerman Trust Fund - established to fund weevil research and the curation of the Australian National Insect Collection (ANIC) weevil collection.	**4,905**	5,260
The Schlinger Trust - established to research the taxonomy, biosystematics, general biology and biogeography of Australasian Diptera conducted by the Australian National Insect Collection.	**2,364**	2,426
Total monies held in trust as at 30 June	**7,622**	8,042

Summary of movements:	McLennan $'000	Zimmerman $'000	Schlinger $'000	Total $'000
Balance as at 1 July 2015	**356**	**5,260**	**2,426**	**8,042**
Adjustments	**(15)**	**-**	**-**	**(15)**
Interest and distribution	**12**	**49**	**80**	**141**
Expenditure	**-**	**(404)**	**(142)**	**(546)**
Balance as at 30 June 2016	**353**	**4,905**	**2,364**	**7,622**

6.3. Collections

CSIRO is the custodian of several collections used for scientific research. These collections have been established over time and document an extensive range of Australian flora and fauna species. The collections are irreplaceable, bear scientific and historical value and are not reliably measurable in monetary terms. Therefore, CSIRO has not recognised them as an asset in its financial statements.

The main collections held by CSIRO are:

- Australian National Herbarium (ANH) – With a focus on the Australian flora and that of neighbouring regions such as New Guinea and the Pacific, the ANH has over 1 million herbarium, with additional holdings at the Australian Tropical Herbarium (ATH) in Cairns, Queensland. The ANH collections include the Dadswell Memorial Wood Collection and comprehensive holdings of a number of groups, including cryptogams, eucalypts and orchids.

- Australian National Insect Collection (ANIC) – Specialising in Australian terrestrial invertebrates, ANIC houses over 12 million and is the world's largest collection of Australian insects, as well as groups such as mites, spiders, earthworms, nematodes and centipedes. ANIC is an important research collection used by CSIRO researchers, university staff, and students, and scientists from Australian and international research organisations.

- Australian National Wildlife Collection (ANWC) – Specialising in terrestrial vertebrates, ANWC contains specimens of most species of Australian mammals, birds, reptiles, and amphibians. It is particularly rich in specimens of birds from New Guinea. ANWC is a valuable asset for biologists engaged in biodiversity research. Its research library holds 60,000 recordings of wildlife sounds, more than a thousand tissue samples, and the egg collections from more than 300 bird species.

- Australian National Fish Collection (ANFC) – Specialising in marine fishes, the ANFC contains almost 150,000 specimens representing more than 3,000 species from the Indo-Pacific region. It is an invaluable resource for biodiversity and biogeographic research on Australian and Indo-Pacific fishes. Its major strengths are sharks, rays, and deep-water fishes. It contains the largest collection of images, radiographs and taxonomic reprints of Australian fishes.

- Australian Tree Seed Centre (ATSC) – The ATSC is managed as a collection and research centre for Australian native tree species. For over 50 years the centre has been collecting, researching and supplying quality, fully documented tree seed to both domestic and overseas customers. Collections of seed are sourced from wild populations and genetically improved seed from our domestication and improvement programs.

- Australian National Algae Culture Collection (ANACC) – The ANACC consists of more than 300 microalgae species and is a resource for research on algal diversity, distribution, richness, and taxonomic relationships, including those of economic importance and environmental concern. Aligned with the collection is the National Algae Supply Service, which provides microalgae strains as starter cultures to industry, research, organisations and educational institutions in over 70 countries.

6.4. Reporting of Outcome

CSIRO's outputs contribute to a single outcome (refer to Overview section).

	Consolidated		CSIRO	
	2016	2015	**2016**	2015
	$'000	$'000	**$'000**	$'000
Total expenses[1]	**1,348,235**	1,263,479	**1,270,635**	1,246,316
Total other own-source income	**529,846**	483,392	**463,715**	486,501
Net cost of outcome delivery	**818,389**	780,087	**806,920**	759,815

[1] Total expenses adjusted for the share of the net operating surplus/(deficit) of the joint venture accounted for using the equity method.

7. Budgetary Reports and Explanations of Major Variances

The following provides a comparison of the original budget as presented in the 2015-16 Portfolio Budget Statements to the actual outcome reported for 2015-16. The intention of this variance analysis is to provide the reader with information relevant to assessing the performance of CSIRO, including the accountability for the resources entrusted to it.

Statement of Comprehensive Income
for the period ended 30 June 2016

	Actual	Consolidated Original Budget	Variance
	2016	**2016**	2016
	$'000	**$'000**	$'000
NET COST OF SERVICES			
Expenses			
Employee benefits	**730,863**	**665,358**	65,505
Suppliers	**438,848**	**442,816**	(3,968)
Depreciation and amortisation	**168,878**	**166,680**	2,198
Finance costs	**2,201**	**2,245**	(44)
Write-down and impairment of assets	**4,083**	**-**	4,083
Foreign exchange losses	**-**	**-**	-
Losses from asset sales	**3,352**	**-**	3,352
Total expenses	**1,348,225**	**1,277,099**	71,126
Own-Source Income			
Own-source revenue			
Sale of goods and rendering of services	**420,607**	**403,008**	17,599
Interest	**9,296**	**7,161**	2,135
Rental income	**9,409**	**2,940**	6,469
Royalties and licence fees	**59,832**	**28,862**	30,970
Other revenues	**29,480**	**20,195**	9,285
Total own-source revenue	**528,624**	**462,166**	66,458
Gains			
Net gain from sales of assets	**-**	**-**	-
Foreign exchange gains	**293**	**-**	293
Gain on revaluation of investment properties	**929**	**-**	929
Total gains	**1,222**	**-**	1,222
Total own-source income	**529,846**	**462,166**	67,680
Net cost of services	**(818,379)**	**(814,933)**	(3,446)
Revenue from Government	**750,281**	**749,681**	600
Share of net operating surplus/(deficit) of joint venture accounted for using equity method	**(10)**	**-**	(10)
Surplus on continuing operation	**750,271**	**749,681**	590
Surplus/(Deficit) attributable to the Australian Government	**(68,108)**	**(65,252)**	(2,856)
OTHER COMPREHENSIVE INCOME			
Items not subject to subsequent reclassification to net cost of services			
Increase/(decrease) in asset revaluation reserves	**(1,848)**	**-**	(1,848)
Items subject to subsequent reclassification to net cost of services			
Increase/(decrease) in other reserves	**(959)**	**-**	(959)
Total other comprehensive income	**(2,807)**	**-**	(2,807)
Total comprehensive income/(loss) attributable to the Australian Government	**(70,915)**	**(65,252)**	(5,663)

Statement of Financial Position
as at 30 June 2016

	Actual	Consolidated Original Budget	Variance
	2016	**2016**	2016
	$'000	**$'000**	$'000
ASSETS			
Financial Assets			
Cash and cash equivalents	**302,096**	**204,177**	97,919
Trade and other receivables	**57,859**	**75,653**	(17,794)
Investments accounted for using the equity method	**-**	**309**	(309)
Other investments	**21,386**	**14,621**	6,765
Total financial assets	**381,341**	**294,760**	86,581
Non-Financial Assets			
Land and buildings	**1,605,336**	**1,574,941**	30,395
Plant and equipment	**580,878**	**591,929**	(11,051)
Heritage and cultural	**4,206**	**-**	4,206
Intangibles	**20,687**	**20,369**	318
Investment properties	**50,222**	**48,288**	1,934
Inventories	**1,334**	**1,180**	154
Other non-financial assets	**45,868**	**47,924**	(2,056)
Total non-financial assets	**2,308,531**	**2,284,631**	23,900
Properties held for sale	**5,200**	**-**	5,200
Total assets	**2,695,072**	**2,579,391**	115,681
LIABILITIES			
Payables			
Suppliers	**62,176**	**53,907**	8,269
Other payables	**127,820**	**129,512**	(1,692)
Total payables	**189,996**	**183,419**	6,577
Interest Bearing Liabilities			
Leases	**42,022**	**53,475**	(11,453)
Deposits	**5,798**	**4,567**	1,231
Total Interest bearing liabilities	**47,820**	**58,042**	(10,222)
Provisions			
Employee provisions	**238,734**	**204,086**	34,648
Provision for remediation	**29,703**	**-**	29,703
Total provisions	**268,437**	**204,086**	64,351
Total liabilities	**506,253**	**445,547**	60,706
Net assets	**2,188,819**	**2,133,844**	54,975
EQUITY			
Contributed equity	**270,954**	**272,520**	(1,566)
Asset revaluation reserves	**1,387,548**	**1,348,820**	38,728
Other reserves	**(1,704)**	**-**	(1,704)
Retained surplus	**532,021**	**512,504**	19,517
Total equity	**2,188,819**	**2,133,844**	54,975

Statement of Changes in Equity

for the period ended 30 June 2016

	Retained earnings			Asset revaluation reserve			Other reserves			Contributed equity/capital			Total equity		
	Actual	Budget Estimate		Actual	Budget Estimate		Actual	Budget Estimate		Actual	Budget Estimate		Actual	Budget Estimate	
		Original	Variance		Original	Variance		Original	Variance		Original	Variance		Original	Variance
	2016	**2016**	2016	**2016**	**2016**	2016	**2016**	**2016**	2016	**2016**	**2016**	2016	**2016**	**2016**	2016
	$'000	**$'000**	$'000	**$'000**	**$'000**	$'000	**$'000**	**$'000**	$'000	**$'000**	**$'000**	$'000	**$'000**	**$'000**	$'000
Opening balance	**578,333**	**577,756**	577	**1,389,396**	**1,348,820**	40,576	**(745)**	**-**	(745)	**270,954**	**272,520**	(1,566)	**2,237,938**	**2,199,096**	38,842
Comprehensive income															
Other comprehensive income	**-**	**-**	-	**(1,848)**	**-**	(1,848)	**(959)**	**-**	(959)	**-**	**-**	-	**(2,807)**	**-**	(2,807)
Surplus/(deficit) for the period	**(68,108)**	**(65,252)**	(2,856)	**-**	**-**	-	**-**	**-**	-	**-**	**-**	-	**(68,108)**	**(65,252)**	(2,856)
Total comprehensive income	**(68,108)**	**(65,252)**	(2,856)	**(1,848)**	**-**	(1,848)	**(959)**	**-**	(959)	**-**	**-**	-	**(70,915)**	**(65,252)**	(5,663)
Other Movements (NICTA Transfer)	**21,796**		21,796			-			-	**-**		-	**21,796**	**-**	21,796
Contributions by owners															
Equity injection	**-**	**-**	-	**-**	**-**	-	**-**	**-**	-	**-**		-	**-**	**-**	-
Contributions by owners – other	**-**	**-**	-	**-**	**-**	-	**-**	**-**	-	**-**		-	**-**	**-**	-
Closing balance	**532,021**	**512,504**	19,517	**1,387,548**	**1,348,820**	38,728	**(1,704)**	**-**	(1,704)	**270,954**	**272,520**	(1,566)	**2,188,819**	**2,133,844**	54,975

Cash Flow Statement

for the period ended 30 June 2016

	Actual	Consolidated Original Budget	Variance
	2016	**2016**	2016
	$'000	**$'000**	$'000
OPERATING ACTIVITIES			
Cash received			
Receipts from Government	**750,281**	**749,681**	600
Goods and services	**569,472**	**442,142**	127,330
Interest	**10,172**	**7,422**	2,750
Net GST received	**30,603**	**4,745**	25,858
Deposits	**-**	**-**	-
Other	**-**	**54,537**	(54,537)
Total cash received	**1,360,528**	**1,258,527**	102,001
Cash used			
Employees	**717,786**	**676,170**	41,616
Suppliers	**526,043**	**460,853**	65,190
Finance costs	**2,201**	**-**	2,201
Deposits	**78**	**-**	78
Net GST paid	**-**	**-**	-
Other	**-**	**(2,280)**	2,280
Total cash used	**1,246,108**	**1,134,743**	111,365
Net cash from operating activities	**114,420**	**123,784**	(9,364)
INVESTING ACTIVITIES			
Cash received			
Proceeds from sales of property, plant and equipment	**464**	**-**	464
Proceeds from sales of equity investments and intellectual property	**-**	**-**	-
Total cash received	**464**	**-**	464
Cash used			
Purchase of property, plant and equipment	**102,839**	**115,045**	(12,206)
Equity investments	**848**	**-**	848
Other selling costs	**43**	**-**	43
Total cash used	**103,730**	**115,045**	(11,315)
Net cash from (used by) investing activities	**(103,266)**	**(115,045)**	11,779
FINANCING ACTIVITIES			
Cash received			
Contributed equity	**-**	**-**	-
Other		**-**	-
Total cash received	**-**	**-**	-
Cash used			
Payment to the Commonwealth	**-**	**-**	-
Finance leases	**6,703**	**-**	6,703
Total cash used	**6,703**	**-**	6,703
Net cash from financing activities	**(6,703)**	**-**	(6,703)
Net increase (decrease) in cash held	**4,451**	**8,739**	(4,288)
Cash and cash equivalents at the beginning of the reporting period	**267,129**	**195,439**	71,690
Transition of opening balance of NICTA cash and cash equivalents	**30,516**	**-**	30,516
Cash and cash equivalents at the end of the reporting period	**302,096**	**204,178**	(97,918)

Explanation of Major Variances

Australian Accounting Standard AASB 1055 *Budgetary Reporting* requires variance explanations of major variances between the original budget as presented in the 2014-15 Portfolio Budget Statements and the actual outcome as reported in these financial statements. CSIRO considers that major variances are those greater than 10% of the original estimate and that are relevant to an assessment of the discharge of accountability and to an analysis of the performance of an entity. Variances below this threshold are not included unless considered significant by their nature.

It should be noted that the original budget was prepared before the 2014-15 actual figures could be known. As a consequence the opening balance of the 2015-16 Statement of Financial Position needed to be estimated and in some cases, variances between 2015-16 actuals and budget numbers can be, at least in part, attributed to unanticipated movements in the prior period figures. Variances attributable to factors which would not reasonably have been identifiable at the time of the budget preparation, such as the revaluation of plant and equipment and investment properties and impairment of assets, have not been included as part of the explanation.

On 28 August 2015, CSIRO took effective control of NICTA. As this occurred after preparation of the original budget, NICTA was not accounted for in the CSIRO Group budget.

The Budget is not audited.

Statement of Comprehensive Income

The integration of NICTA accounted for additional own-source revenue of $65.3m and expenses of $68.2m which were not budgeted.

In addition to the impacts of NICTA, CSIRO's supplier expenditure was $34.4m below budget which was in line with a drop of $36.0m in revenues from the sale of goods and services. This was due to tightening external market conditions in some sectors and the implementation of the strategic reprioritisation program. Employee benefits expenditure was affected by the unbudgeted redundancy provision raised due to the strategic prioritisation program ($28.0m).

Actual royalties and licensing revenues was higher than expected due to additional licensing revenues of $31.5m not foreseen at the time of preparing the budget.

Statement of Financial Position

NICTA total assets amounted to $41.8m and total liabilities $12.4m.

CSIRO's investment portfolio increased in line with CSIRO's commercial strategic objectives, with CSIRO providing funds to Uniseed Management Pty Ltd for the purpose of establishing a new pre-seed and seed fund that is expected to invest in early stage technology development. This was recognised as an investment asset in the 2016 actuals (budgeted as an other non-financial asset).

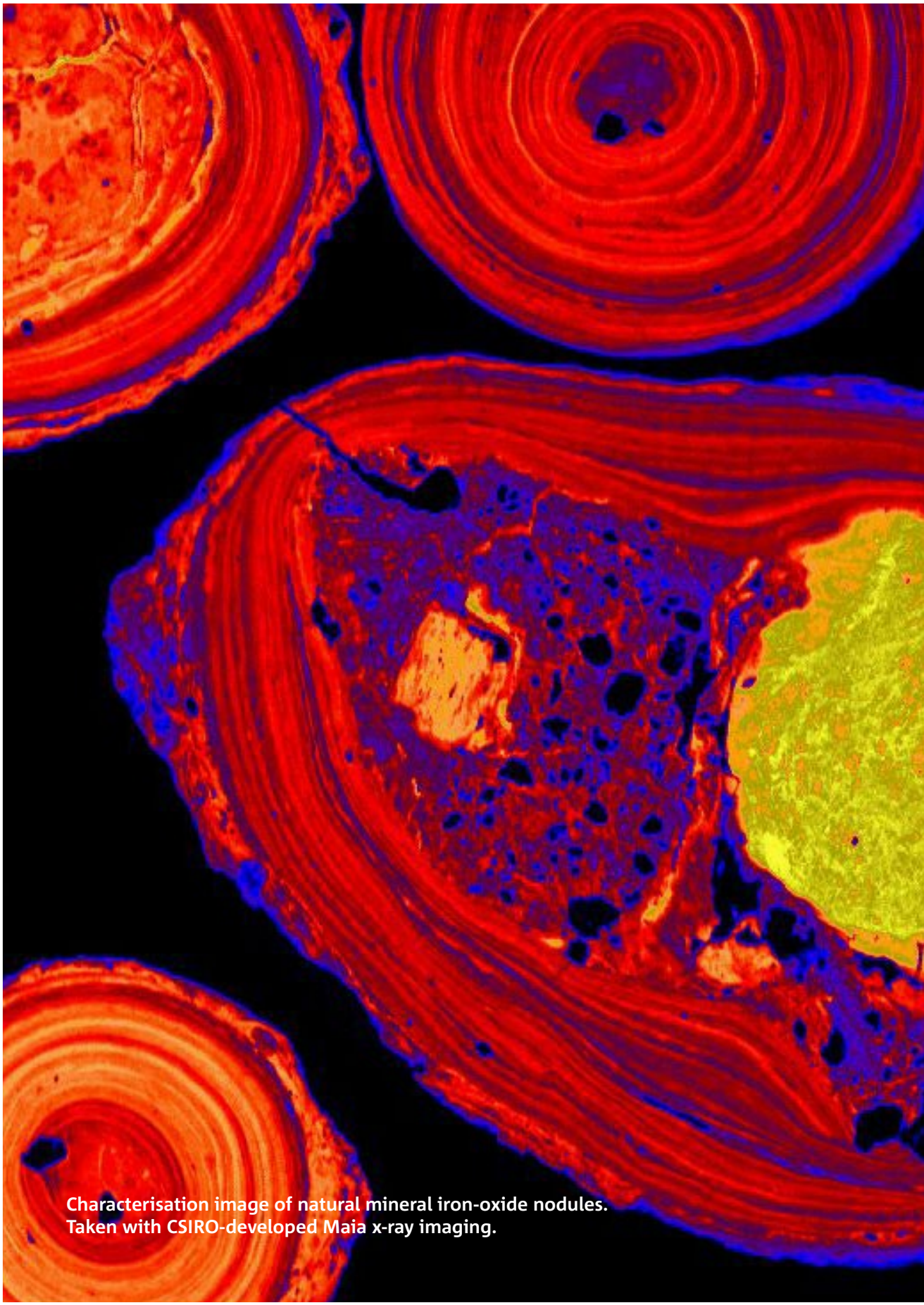
A provision of $29.7m has been raised in 2016 for the clean-up of waste material at a remote facility, as outlined in the Overview Note. These costs were not foreseen at the time of preparing the budget.

Employee provisions were higher than expected, with an unbudgeted provision for redundancies raised due to strategic reprioritisation ($28.0m). Additionally, bond rate movements during the year resulted in an unbudgeted impact of $11.0m to the recorded net present value of leave liabilities. Neither of these items were able to be foreseen at the time of developing the budget.

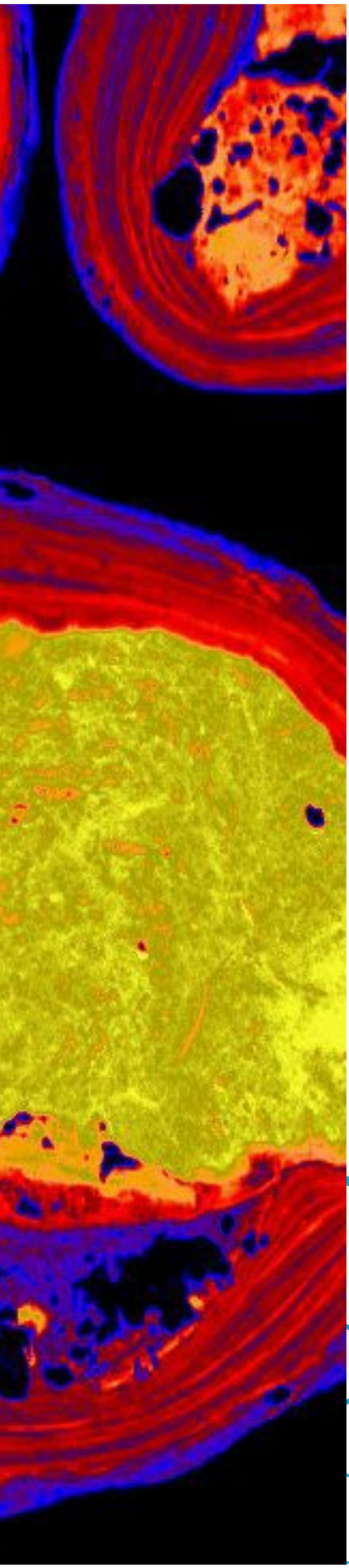
The budgeted variance to cash was largely due to the brought forward opening position of cash in the budget ($195.4m) against the actual opening balance ($267.1m). The NICTA opening balance of cash was $30.5m.

Cash Flow Statement

Variances relating to cash flows occur because of the factors detailed under Income Statement and Balance Sheet.



Characterisation image of natural mineral iron-oxide nodules.
Taken with CSIRO-developed Maia x-ray imaging.



Part 5
Appendices

Appendix 1: Service charter

CSIRO's service charter describes the standards of service we aim to deliver to our customers and our commitment to ensuring that these standards are maintained.

In summary:

- We believe our customers and partners are essential to our success.
- We maintain relevance in our work through input from the public, government, industry and the research community.
- We communicate with our customers in a courteous, helpful and professional manner.
- We respect our customers' confidentiality.
- We evaluate our services to ensure the highest standards.

Our full service charter is available at: www.csiro.au/Service-Charter

CSIRO welcomes your feedback on our performance. Please contact the CSIRO officer with whom you have been dealing or CSIRO Enquiries, who can direct your feedback to the relevant person:

Private Bag 10, Clayton South VIC 3169
t 1300 363 400
e csiroenquiries@csiro.au

Appendix 2: Administrative law

FREEDOM OF INFORMATION

The *Freedom of Information Act 1982* (FOI Act) provides the public with a general right of access to documents held by Australian Government agencies, including CSIRO. The general right is limited by exceptions to protect essential public interests, and the privacy or business affairs of those who give information to the agency. In the reporting year to 30 June 2016, CSIRO received 42 requests for information under the FOI Act.

General information about CSIRO FOI procedures, including and how to make an FOI request, can be found at: www.csiro.au/en/About/Access-to-information/Freedom-of-Information.

Part V of the FOI Act confers a right to request CSIRO to amend a document to which lawful access has been granted, where the applicant claims that information in the document:

- relates to his or her personal affairs
- is incomplete, incorrect, out of date or misleading
- has been used, is being used, or is available for use by the agency or Minister for an administrative purpose.

In the reporting year to 30 June 2016, CSIRO received no requests for amendments of personal information under the FOI Act.

INFORMATION PUBLICATION SCHEME

CSIRO is required to publish information to the public as part of the Information Publication Scheme (IPS). This requirement is in Part II of the FOI Act and has replaced the former requirement to publish a section 8 statement in an annual report. CSIRO displays on its website a plan showing what information it publishes in accordance with the IPS requirements.

Members of the public may obtain access to scientific and technical publications from CSIRO Publishing (www.publish.csiro.au) and the ePublish Repository (https://publications.csiro.au); research data used by CSIRO is routinely published on CSIRO data access portal (https://data.csiro.au/dap/browse).

ARCHIVES, PRIVACY AND ADMINISTRATIVE DECISIONS

CSIRO maintains an archives collection which includes records dating from 1926, when the Council for Science and Industrial Research, the predecessor of CSIRO, was established. Certain CSIRO records are held by Australian Archives. Disposal arrangements for CSIRO records are made in accordance with the provisions of the *Archives Act 1983*. Access to records over 20 years old is provided in accordance with that Act.

The *Privacy Act 1988* provides for Australian Privacy Principles. During 2015–16, the Office of the Australian Information Commissioner undertook no investigations under section 36 of the *Privacy Act 1988* in relation to CSIRO.

The *Administrative Decisions (Judicial Review) Act 1977* (ADJR Act) enables a person aggrieved by certain classes of administrative decisions made by Australian Government agencies, including CSIRO, to obtain reasons for or to challenge those decisions. During 2015–16, CSIRO received no challenges or requests for statements of reasons under the ADJR Act.

CONTACT

All enquiries under the above legislation (including FOI requests) should be directed to:

FOI and Privacy Officer, CSIRO
GPO Box 1700
Canberra ACT 2601
t 02 6276 6431
e FOI@csiro.au

PUBLIC INTEREST DISCLOSURE

The *Public Interest Disclosure Act 2013* (PID Act) came into effect on 15 January 2014. Internal procedures have been developed and implemented to enable compliance through a Public Interest Disclosure (PID) Scheme. The PID Scheme promotes integrity and accountability by encouraging the disclosure of information about suspected wrongdoing, protecting people who make disclosures and ensuring CSIRO takes appropriate action. CSIRO has contributed to the Commonwealth Ombudsman's annual report on the PID, as required in Section 76(3) of the PID Act. In 2015–2016 CSIRO considered 10 matters under s26 of the PID Act to determine whether they met the criteria for a public interest disclosure. Four of these matters were assessed as meeting the criteria for an internal public interest disclosure.

Appendix 3: Consultancy services

CSIRO engages consultants where it lacks specialist expertise or when independent research, review or assessment is required. Consultants are typically engaged to investigate or diagnose a defined issue or problem; carry out defined reviews or evaluations; or provide independent advice, information or creative solutions to assist in CSIRO's decision-making.

Before engaging consultants, CSIRO takes into account the skills and resources required for the task, the skills available internally and the cost-effectiveness of engaging external expertise. The decision to engage a consultant is made in accordance with the Commonwealth Procurement Rules (CPRs), CSIRO's procurement policy and other relevant internal policies.

CSIRO's policy on selection and engagement of consultants is based on the principles of[33]:

- value for money
- open and effective competition
- ethics and fair dealing
- accountability and reporting
- national competitiveness and industry development
- support for other Australian government policies.

Tables 5.1, 5.2 and 5.3 summarise the consultancies let and the annual spend, the reason for the consultancy and the procurement method. All values include goods and services tax.

TABLE 5.1: ANNUAL SPEND ON CONSULTANCIES

YEAR	SPENT ($)	LET ($) (ESTIMATED WHOLE OF LIFE)
2011–12	1,621,697	1,096,277
2012–13	1,104,000	1,417,754
2013–14	5,294,552	5,796,633
2014–15	630,870	737,617
2015–16	373,751	853,957
TOTAL	**9,024,870**	**9,902,238**

33 These principles are included within CSIRO's Procurement Policy and Procedures.

TABLE 5.2: SUMMARY BY REASON CODE

CATEGORY CODE	REASON FOR CONSULTANCY	NUMBER OF CONSULTANCIES	VALUE ($)
IS	Need for independent study/evaluation	6	617,924
PA	Need for professional assistance to manage and facilitate change and its consequence	0	0
SS	Specialist skills were not otherwise available	5	236,033
TOTAL		**11**	**853,957**

TABLE 5.3: SUMMARY BY PROCUREMENT METHOD CODE

CATEGORY CODE	PROCUREMENT METHOD	NUMBER OF CONSULTANCIES	VALUE ($)
OT	Tenders sought from the marketplace through Open Approach (Request for Proposal, Request for Tender, Expressions of Interest).	0	0
PM	An existing panel member – this category includes standing offers, common use arrangements and approved supplier panels.	3	532,433
ST	Tenders being sought from suppliers who have pre-qualified through some form of previous competitive process.	0	0
RQ	Purchasing was undertaken in accordance with Division 1 of the CPRs and procurement did not require application of Division 2 of the CPRs.	8	321,524
EX	Exemption applied that saw CSIRO undertake the procurement as a Limited Tender as defined in Division 2 of the CPRs.	0	0
TOTAL		**11**	**853,957**

Appendix 4: Science and Industry Endowment Fund Annual Report 2015–16

TRUSTEE'S REPORT

Over the last year in my role as Trustee of SIEF, I have witnessed a broad range of innovative science research tackling the nation's challenges. I am proud to be a part of SIEF's long history, which began in 1926 and has since played a vital role in supporting the development of Australian science and scientists. SIEF has supported a wide variety of science projects, including funding the collation of scientific documents from Sir Douglas Mawson's Antarctic adventures through to research that seeks to mimic butterfly wings for new compact technology.

This year, a paper about the history of the Science and Industry Endowment Fund was published in the *Historical Records of Australian Science*. Authored by Professor Tom Spurling and Susan Smith, the article describes the significant role SIEF has played in supporting pre-eminent Australian scientists over its 90-year history.

SIEF was rejuvenated by the gift of $150 million from CSIRO, as a result of the fast WLAN patented technology litigation in 2009. These Gift funds have continued the Fund's rich history of supporting scientific excellence.

Experimental Development Program

This year has seen the start of a new program in the SIEF portfolio – the SIEF Experimental Development Program (EDP). The EDP is designed to address a significant gap in current funding options available for progressing experimental research and technology development to a stage suitable for attracting commercial investment and market uptake, and to accelerate entrepreneurial activities. The EDP plays an important role in the overall SIEF portfolio, complementing current SIEF programs and activities.

The first EDP-supported research activity, an aquaculture project investigating antivirals for Black Tiger Prawns, has recently commenced. The project is looking for the best way to reduce viral load in prawn parents to stop transmission to their offspring, producing healthy prawn larvae for commercial culture that are virus-free.

This project will allow CSIRO's Brisbane-based team to assess the ability of RNA interference antivirals to reduce virus transmission. Prawn hatchlings will be reared under commercially comparable tank and pond conditions at the Bribie Island Research Centre from egg to adult, in conjunction with the Australian Prawn Farmers Association. The hatchlings will have their health, survival and growth performance assessed along the way.

The SIEF and industry support (Fisheries Research & Development Corporation funding on behalf of the Australian Government) is helping the team overcome the final R&D hurdle. The outcomes of this pilot commercialisation-scale experiment will provide the Australian prawn industry with the confidence required for commercial uptake of the antivirals, potentially adding $2.2 million of value annually to their $80 million industry.

Breeding the black tiger prawn is getting a boost from the Science and Industry Endowment Fund.

STEM+ Business Fellowship program

Another exciting, new SIEF initiative is the STEM+ Business Fellowship Program.

The STEM+ Business Fellowship Program aims to build deeper connections and collaborations between researchers and SMEs, accelerating the adoption of new ideas and technology. The program will give early-career researchers practical, on-ground experience in a workplace and an opportunity to build relationships with industry – creating and sustaining a cohort of researchers who are industry-savvy.

SIEF has enlisted the CSIRO SME Connect team to facilitate, on behalf of the Trustee, this program across the national innovation system.

SIEF supporting leading researcher

Professor Graham Farquhar from the Australian National University (ANU) won the 2015 Prime Minister's Prize for Science for his work on photosynthesis. His research in the area has led to the creation of better water-efficient crops, and his models of plant biophysics have furthered the understanding of plant cells.

Professor Farquhar leads the SIEF-funded research project 'Forests for the Future: making the most of a high carbon dioxide (CO_2) world', a collaboration between ANU, Western Sydney University and CSIRO.

While the rise in atmospheric CO_2 presents a global challenge, it also offers opportunities to increase forest production and bio-sequestration. A consequence of this rapid rise in CO_2 is that photosynthesis has been increased, generating increased carbon sequestration and plant production on a global scale.

Professor Farquhar and his team have proposed a novel strategy that rapidly identifies tree species that exhibit a strong, positive growth response to elevated CO_2, and the genetic attributes underlying this response.

The outcomes of the work will help provide an alternative to the currently very expensive and labour-intensive procedures that have so far limited commercial application from the forest industry for to better choices to achieve greater economic impact. The environmental impact of Professor Farquhar's work is an increase in plantation forests that grow well despite the effects of rising CO_2 levels, aiding in sequestration of CO_2 and an increase in the greening of Australia.

Professor Farquhar (r) leads the SIEF-funded research project 'Forests for the Future: making the most of a high CO_2 world'.

SIEF advisory bodies

Advisory Council

Prof Alan Robson (Chair)
Nigel Poole
Dr Peter Riddles
Dr Ezio Rizzardo
Prof Margaret Sheil
Prof Tom Spurling

Expert Panel

Prof Tom Spurling (Chair)
Dr Oliver Mayo
Dr Trevor Powell
Dr Ezio Rizzardo
Prof Elaine Sadler

Undergraduate Degree Panel

Prof Margaret Sheil (Chair)
Dr Terry Lyons
Prof David Symington

EDP Review Panels

Dr Peter Riddles (Chair)

In addition to the advisory bodies, a large number of reviewers continue to generously contribute their time and expertise, for which I am very grateful. Though the 2009 funding injection from CSIRO is coming to a close, it is remarkable the breadth and depth of science that has been supported through the SIEF. Some projects are now coming to the conclusion of their SIEF funding, but much of this research activity will continue, firmly established on the solid foundation provided by the initial SIEF funding.

Dr Larry Marshall
SIEF Trustee

Australian National
Audit Office

INDEPENDENT AUDITOR'S REPORT

To the Trustee of the Science and Industry Endowment Fund

I have audited the accompanying annual financial report of the Science and Industry Endowment Fund, which comprises the Statement of Financial Position as at 30 June 2016, the Statement of Comprehensive Income, Statement of Changes in Equity and Statement of Cash Flows for the year then ended, notes to and forming part of the financial report, and the Statement by the Trustee and the Chief Finance Officer of the Commonwealth Scientific and Industrial Research Organisation.

Opinion

In my opinion, the financial report of the Science and Industry Endowment Fund:

(a) comply with Australian Accounting Standards, including the Australian Accounting Interpretations; and

(b) present fairly the financial position of the Science and Industry Endowment Fund as at 30 June 2016 and its financial performance and cash flows for the year then ended.

Trustee's Responsibility for the Financial Report

The Trustee of the Science and Industry Endowment Fund is responsible for the preparation and fair presentation of annual financial report that comply with Australian Accounting Standards (including Australian Accounting Interpretations). The Trustee is also responsible for such internal control as is necessary to enable the preparation and fair presentation of the financial report that are free from material misstatement, whether due to fraud or error.

Auditor's Responsibility

My responsibility is to express an opinion on the financial report based on my audit. I have conducted my audit in accordance with the Australian National Audit Office Auditing Standards, which incorporate the Australian Auditing Standards. These Auditing Standards require that I comply with relevant ethical requirements relating to audit engagements and plan and perform the audit to obtain reasonable assurance about whether the financial report is free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial report. The procedures selected depend on the auditor's judgement, including the assessment of the risks of material misstatement of the financial report, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the fund's preparation of the financial report that gives a true and fair view in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the

GPO Box 707 CANBERRA ACT 2601
19 National Circuit BARTON ACT
Phone (02) 6203 7300 Fax (02) 6203 7777

fund's internal control. An audit also includes evaluating the appropriateness of the accounting policies used and the reasonableness of accounting estimates made by the Trustee, as well as evaluating the overall presentation of the financial report.

I believe that the audit evidence I have obtained is sufficient and appropriate to provide a basis for my audit opinion.

Independence

In conducting my audit, I have followed the independence requirements of the Australian National Audit Office, which incorporate the requirements of the Australian accounting profession.

Australian National Audit Office

Brandon Jarrett
Executive Director

Delegate of the Auditor-General

Canberra
9 August 2016

SCIENCE AND INDUSTRY ENDOWMENT FUND

STATEMENT BY TRUSTEE AND CHIEF FINANCE OFFICER OF CSIRO AS SERVICE PROVIDER TO THE SCIENCE AND INDUSTRY ENDOWMENT FUND

In our opinion, the attached financial report for the year ended 30 June 2016 has been prepared based on properly maintained financial records and in accordance with Australian Accounting Standards and other mandatory financial reporting requirements in Australia, and give a true and fair view of the financial position of the Science and Industry Endowment Fund as at 30 June 2016 and of its performance for the year then ended.

In our opinion, at the date of this statement, there are reasonable grounds to believe that the Science and Industry Endowment Fund will be able to pay its debts as and when they become due and payable.

Larry Marshall

Trustee of the Science and Industry Endowment Fund

9 August 2016

Hazel Bennett

Chief Finance Officer of CSIRO as service provider to the Science and Industry Endowment Fund

9 August 2016

SCIENCE AND INDUSTRY ENDOWMENT FUND
STATEMENT OF COMPREHENSIVE INCOME
For the period ended 30 June 2016

	Notes	2016	2015
		$	$
EXPENSES			
Scientific research grants	1	**14,833,647**	23,771,122
Service fee under Services Agreement with CSIRO		**424,789**	309,047
Consulting fees		**60,000**	-
Audit fees		**15,000**	9,600
Advertising and approval fees	2	**5,343**	5,400
Other fees		**35**	63
Total expenses		**15,338,814**	24,095,232
LESS:			
REVENUE			
Scientific grant program refunds		**78,359**	3,732
Interest	3	**2,240,969**	3,239,016
Resources received free of charge	2	**5,343**	5,400
Total revenue		**2,324,671**	3,248,148
Net deficit		**(13,014,143)**	(20,847,084)
Other comprehensive income		**-**	-
Total comprehensive loss		**(13,014,143)**	(20,847,084)

The above statement should be read in conjunction with the accompanying notes.

SCIENCE AND INDUSTRY ENDOWMENT FUND
STATEMENT OF FINANCIAL POSITION
For the period ended 30 June 2016

	Notes	2016	2015
		$	$
ASSETS			
Cash	4	**67,135,320**	80,624,791
Interest receivable	5	**450,752**	747,456
GST receivable		**412,589**	601,407
Other receivables	5	**40,480**	-
Total Assets		**68,039,141**	81,973,654
LIABILITIES			
Payables			
Grant payable		**-**	939,796
Other creditors		**124,865**	103,641
Accrued expenses	6	**34,517**	36,315
Total payables		**159,382**	1,079,752
Total liabilities		**159,382**	1,079,752
Net assets		**67,879,759**	80,893,902
EQUITY			
Contributed equity		**200,000**	200,000
Retained surplus		**67,679,759**	80,693,902

The above statement should be read in conjunction with the accompanying notes.

SCIENCE AND INDUSTRY ENDOWMENT FUND

STATEMENT OF CHANGES IN EQUITY

For the period ended 30 June 2016

	Retained Surplus		Contributed Equity		Total Equity	
	2016	2015	**2016**	2015	**2016**	2015
	$	$	**$**	$	**$**	$
Opening Balance	**80,693,902**	101,540,986	**200,000**	200,000	**80,893,902**	101,740,986
Net deficit	**(13,014,143)**	(20,847,084)	**-**	-	**(13,014,143)**	(20,847,084)
Closing Balance	**67,679,759**	80,693,902	**200,000**	200,000	**67,879,759**	80,893,902

The above statement should be read in conjunction with the accompanying notes

SCIENCE AND INDUSTRY ENDOWMENT FUND

CASH FLOW STATEMENT

For the period ended 30 June 2016

	Notes	2016	2015
		$	$
OPERATING ACTIVITIES			
Cash received			
Scientific research grant refunds		**37,879**	22,915
Interest received		**2,537,673**	3,234,122
Net GST received		**1,708,280**	2,379,153
Total cash received		**4,283,832**	5,636,190
Cash used			
Payments to grantees		**17,250,665**	27,048,088
Other payments		**522,603**	469,220
Bank fees paid		**35**	63
Total cash used		**17,773,303**	27,517,371
Net cash provided/(used) by operating activities	7	**(13,489,471)**	(21,881,181)
Net increase/(decrease) in cash held		(13,489,471)	(21,881,181)
Cash at the beginning of the reporting period		80,624,791	102,505,972
Cash at the end of the reporting period		**67,135,320**	80,624,791

The above statement should be read in conjunction with the accompanying notes

SCIENCE AND INDUSTRY ENDOWMENT FUND

NOTES TO AND FORMING PART OF THE FINANCIAL REPORT

For the period ended 30 June 2016

Overview

The Science and Industry Endowment Fund (referred to as the Fund) was established under the *Science and Industry Endowment Act 1926* with the Trustee of the Fund being the CSIRO Chief Executive and is a not-for-profit entity. An appropriation of 100 000 pounds was received at the time the Fund was established. The principal activity of the Fund is to provide assistance to persons engaged in scientific research and in the training of students in scientific research.

In October 2009 the Minister for Innovation, Industry, Science and Research announced a gift of $150 million to be donated by CSIRO to the Fund. The gift is intended to be used for scientific research for the purposes of assisting Australian industry, furthering the interests of the Australian community or contributing to the achievement of Australian national objectives. The gift was made subject to the terms of a Deed of Gift between the Trustee and CSIRO dated 15 October 2009. The maximum amount to be disbursed from the Gift Fund in any one financial year does not exceed $25 million (GST exclusive). The total cash payments made in 2015-16 under the Deed of Gift was $16,145,685.

Basis of Preparation of the Financial Statements

The financial statements for the Fund are general purpose financial statements and are required by section 10 of the *Science and Industry Endowment Act 1926.* They have been prepared in accordance with Australian Accounting Standards, Australian Accounting Interpretations, and other authoritative pronouncements of the Australian Accounting Standards Board.

The financial statements have been prepared on an accrual basis and are in accordance with the historical cost convention. No allowance is made for the effect of changing prices on the results or the financial position.

Assets and liabilities are recognised in the Statement of Financial Position when, and only when, it is probable that future economic benefits will flow and the amounts of the assets or liabilities can be reliably measured.

Revenues and expenses are recognised in the Statement of Comprehensive Income when, and only when, the flow or consumption or loss of economic benefits has occurred and can be reliably measured.

The financial report is presented in Australian Dollars and values are rounded to the nearest dollar unless otherwise specified.

Significant Accounting Judgements and Estimates and New Accounting Standards

No accounting assumptions or estimates have been identified that have a significant impact on the amounts recorded in the financial statements.

The Fund has reviewed new standards, revised standards and interpretations/amending standards issued prior to the signing of the financial statements and considers that none of these have had a material impact. There are no new or revised pronouncements issued by the Australian Accounting Standards Board prior to the finalisation of financial statements that are expected to have a material financial impact on the Fund in future reporting periods.

Events after the Reporting Period

At the time of completion of this note, the Trustee is not aware of any significant events occurring after the reporting date that could impact on the financial report.

Taxation

The Fund is exempt from all forms of taxation except the GST.

SCIENCE AND INDUSTRY ENDOWMENT FUND

NOTES TO AND FORMING PART OF THE FINANCIAL REPORT

For the period ended 30 June 2016

Note 1 Scientific research grants

	2016 $	2015 $
CREST Program awards	**17,417**	26,515
Macquarie University Joint Chair In Wireless Communication	**277,256**	266,593
Scholarships and Fellowships	**1,436,630**	2,501,755
Research Infrastructure Investment	**3,325,000**	5,885,000
Special Research Program	**1,000,000**	3,600,000
Research Project Grants	**8,577,344**	11,491,259
Experimental Development Program	**200,000**	-
Total	**14,833,647**	23,771,122

The Fund is a subsidiary entity of the Commonwealth Scientific and Industrial Research Organisation (CSIRO). For the 2015-16 financial year, the Fund has recognised $6m in grant expenses as transferred directly to CSIRO to support scientific research and infrastructure projects within CSIRO and/or collaborative projects with external organisations (2014-15: $9m).

Note 2 Estimated value of resources provided free of charge by CSIRO are as follows

Advertising and approval fees	**5,343**	5,400
Total	**5,343**	5,400

Services received free of charge are recognised as gains when and only when a fair value can be reliably determined and the services would have been purchased if they had not been donated. Use of these resources is recognised as an expense.

Note 3 Revenue

Interest revenue is recognised using the effective interest method as set out in AASB 139 *Financial Instruments: Recognition and Measurement.*

Note 4 Cash

Cash at bank	**4,166,070**	1,893,620
Term deposits	**62,969,250**	78,731,171
Total	**67,135,320**	80,624,791

Cash and cash equivalents includes cash on hand and demand deposits in bank accounts with an original maturity of twelve months or less that are readily convertible to known amounts of cash and subject to insignificant risk of change in value. Cash is recognised at its nominal amount.

Note 5 Receivables

Interest receivable	**450,752**	747,456
Other receivables	**40,480**	-
Total receivables (gross)	**491,232**	747,456

All receivables are not overdue.

SCIENCE AND INDUSTRY ENDOWMENT FUND
NOTES TO AND FORMING PART OF THE FINANCIAL REPORT
For the period ended 30 June 2016

		2016 $	2015 $
Note 6	**Accrued expenses**		
	CREST Program awards	**19,517**	26,715
	Audit fee	**15,000**	9,600
	Total	**34,517**	36,315
Note 7	**Cash flow reconciliation**		
	Reconciliation of operating surplus to net cash from/(used by) operating activities:		
	Operating surplus/(deficit)	**(13,014,143)**	(20,847,084)
	Changes in assets and liabilities		
	(Increase)/decrease in receivables	**445,042**	(10,474)
	Increase/(decrease) in payables	**(920,370)**	(1,023,623)
	Net cash from/(used by) operating activities	**(13,489,471)**	(21,881,181)
Note 8	**Schedule of commitments**		
	BY TYPE		
	Grants payable	**31,044,259**	47,313,739
	GST receivable	**(2,813,478)**	(4,281,613)
	Total net commitments by type	**28,230,781**	43,032,126
	BY MATURITY		
	Grant commitments payable		
	One year or less	**17,814,547**	18,529,980
	From one to five years	**13,229,712**	28,783,759
	Total grants payable	**31,044,259**	47,313,739
	GST commitments receivable		
	One year or less	**(1,612,232)**	(1,673,635)
	From one to five years	**(1,201,247)**	(2,607,978)
	Total commitments receivable	**(2,813,478)**	(4,281,613)
	Net commitments by maturity	**28,230,781**	43,032,126

Note 9 Contingent assets and liabilities

No contingent assets or liabilities existed as at 30 June 2016 (2015: nil).

Note 10 Financial instruments

The Fund's financial assets are cash and interest receivable on cash. The net value is equivalent to the carrying amount. Financial liabilities are supplier and grant payables. Due to the nature of SIEFs operations and its large cash holdings it is not exposed to credit risk, liquidity risk or market risk.

Interest rate risk
The Fund maintains an operating bank account and short term deposits which are subject to short term interest rates. Funds are maintained in term deposits for short periods. In 2015-16 the average return on cash and short term deposits was 3.00% (2015: 3.43%).

Appendix 5: Full list of CSIRO locations

At 30 June 2016, CSIRO had 59 locations across Australia and overseas.

AUSTRALIAN CAPITAL TERRITORY

- Acton
- Black Mountain
- Canberra City
- Crace
- Ginninderra
- Tidbinbilla
- Yarralumla

NEW SOUTH WALES

- Armidale
- Australian Technology Park
- Griffith
- Kensington
- Mopra
- Myall Vale
- Narrabri
- Newcastle
- Parkes
- Sydney
  - Lindfield
  - Lucas Heights
  - Marsfield
  - North Ryde

QUEENSLAND

- Atherton
- Bribie Island
- Brisbane
  - Coopers Plains
  - Dutton Park
  - Herston
  - Pullenvale
  - Spring Hill
  - St Lucia
- Cairns
- Gatton
- Toowoomba
- Townsville
  - Townsville Australian Tropical Science and Innovation Precinct
  - Woodstock
- Weipa

NORTHERN TERRITORY

- Alice Springs
- Darwin

SOUTH AUSTRALIA

- Adelaide
  - Kintore Avenue
  - South Australian Health and Medical Research Institute
  - Waite Campus

TASMANIA

- Hobart
- Sandy Bay

VICTORIA

- Geelong
  - Australian Animal Health Laboratory
  - Belmont
  - Waurn Ponds
- Irymple
- Melbourne
  - Aspendale
  - Clayton
  - Parkville
  - West Melbourne
- Werribee
  - Sneydes Road
  - South Road
- Wodonga

WESTERN AUSTRALIA

- Geraldton
- Murchison
- Perth
  - Floreat
  - Kensington
  - Waterford

INTERNATIONAL

- France
  - Montpellier
- Chile
  - Santiago

Nathan White continues CSIRO's 70-year contribution to Australia's fire safety at our new laboratory in Clayton.

Part 6
Indexes

Acronyms

AAHL	Australian Animal Health Laboratory
AAS	Australian Academy of Science
ADJR Act	*Administrative Decisions (Judicial Review) Act 1977*
AEC	Animal research ethics committees
ALA	Atlas of Living Australia
ANACC	Australian National Algae Culture Collection
ANAO	Australian National Audit Office
ANASS	Australian National Algae Supply Service
ANFC	Australian National Fish Collection
ANH	Australian National Herbarium
ANIC	Australian National Insect Collection
ANU	Australian National University
ANWC	Australian National Wildlife Collection
APS	Australian Public Service
ARISA	Applied Research and Innovation Systems in Agriculture
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
ASKAP	Australian square kilometre array pathfinder
ASL	Average staffing level
ASX	Australian Securities Exchange
ATNF	Australia Telescope National Facility
ATSC	Australian Tree Seed Centre
BCSIR	Bangladesh Council of Scientific and Industrial Research
BETA	Boolardy Engineering Test Array
BOM	Bureau of Meteorology
CAPSTAN	Collaborative Australian postgraduate sea training
CAS	Chinese Academy of Sciences
CDSCC	Canberra Deep Space Communication Complex
CNRS	Le Centre National de la Recherche Scientifique (The National Centre for Scientific Research)
CO_2	Carbon dioxide
CO_2-e	Carbon dioxide equivalent
CPRs	Commonwealth procurement rules
CRC	Cooperative research centre
CREST	CREativity in Science and Technology
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAWR	Department of Agriculture and Water Resources
DELWP	Department of Environment, Land, Water and Planning
DET CRC	Deep exploration technologies cooperative research centre
ECR	Early-career researcher
EDP	SIEF Experimental Development Program
ET	CSIRO Executive Team
FOI Act	*Freedom of Information Act 1982*
FMD	Foot-and-mouth disease
FSP	Future science platform
FTE	Full-time equivalent
GMR	Guardian mentor remote
HSE	Health safety and environment
ICT	Information and communication technology
IMAS	Institute for Marine and Antarctic Studies
IP	Intellectual property
ISO	International Organization for Standardization
KPIs	Key performance indicators
LBA	Long baseline array
LOMIC	Microbial Oceanography Laboratory, France

MERS	Middle Eastern respiratory syndrome
MNF	Marine National Facility
MOU	Memorandum of understanding
MTC	Major Transactions Committee
MWA	Murchison wideband array
NCRIS	National Collaborative Research Infrastructure Strategy
NPS	Net promoter score
NPV	Net present value
NRCA	National Research Collections Australia
OIE	World Organisation for Animal Health
PBS	Portfolio Budget Statements
PBSP	Powerline bushfire safety program
PCT	Patent cooperation treaty
PGPA Act	*Public Governance, Performance and Accountability Act 2013*
PID Act	*Public Interest Disclosure Act 2013*
PV	Photovoltaic
R&D	Research and development
REFCL	Rapid earth fault current limiter
RIFR	Recordable injury frequency rate
RMIT	Royal Melbourne Institute of Technology
SAGE	Science in Australia Gender Equity
SARS	Severe acute respiratory syndrome
SICOM	*Science, Strategy, Impact and Investment Committee*
SIEF	Science and Industry Endowment Fund
SIR Act	*Science and Industry Research Act 1949*
SME	Small-to-medium enterprise
SMiS	Scientists and Mathematicians in Schools
STEM	Science, technology, engineering and mathematics
TraNSIT	Transport network strategic investment tool
VAV	Variable air volume
WHO	World Health Organization
WHS Act	*Work Health and Safety Act 2011*
WLAN	Wireless local area network

Glossary

Average staffing level: The number of full-time equivalent employees receiving salary or wages by the organisation averaged over the financial year.

Books and chapters: Includes monographs, complete or individual chapters, usually published by a commercial publisher.

Blue water: The open sea; deep water.

Conference papers: Includes published conference papers and edited proceedings.

Ecosystem services: The important benefits for human beings that arise from healthily functioning ecosystems, notably production of oxygen, soil genesis, and water detoxification.

Granted patents: Once a patent application has been examined and satisfies various patentability criteria, it becomes a granted patent. It remains a granted patent until the end of the patent period (normally 20 years), provided renewal fees are paid.

Inventions: This is the number of inventions where one or more patent/applications are current. Accordingly, an invention might include a granted patent that is near the end of its life (for example, 20 years), or it might include a provisional patent application that has only recently been filed. Further, one invention might relate to a patent application in one country only, or it might relate to over 20 patents/applications in different countries covering the one invention.

Journal articles: Includes journal articles and other items published as part of a journal (for example, an editorial or book review).

Live patent cases: A live patent case is where either a patent application or a granted patent exists. It does not include cases that have lapsed, expired or been withdrawn. Applications may include provisional applications, Patent Cooperation Treaty (PCT) applications and applications pending in Australia or foreign jurisdictions.

Maser: A device that produces and amplifies electromagnetic radiation mainly in the microwave region of the spectrum.

Magnetic field: The magnetic effect of electric currents and magnetic materials. The magnetic field at any given point is specified by both a direction and a magnitude.

New inventions: This is the number of new inventions where an application (normally an Australian provisional application) is filed for the first time to protect that invention. A major implication of filing the provisional application is that it provides the applicant with an internationally recognised priority date. A small percentage of CSIRO's new inventions are filed as United States provisional applications.

PCT applications: International PCT applications are a 'temporary' phase in any international patenting process and these have a life span of 18 months. This type of application is very common in major international corporations and is used by CSIRO when it considers its invention may have wide commercial application. In view of the 18-month time span, it is reasonable to approximate that two-thirds of the reported number were filed in the previous 12-month period.

Pulsar: A rotating neutron star that emits a focused beam of electromagnetic radiation.

Recordable Injury Frequency Rate: This is calculated as the sum of Lost Time Injuries per million hours worked plus Medical Treatment Injuries per million hours worked.

Resection: The medical term for surgically removing part or all of a tissue, structure or organ.

Science excellence: An assessment of the competitiveness of CSIRO's research capabilities. It recognises CSIRO's science (for example, total citations) and excellence (for example, citation rates). It tends to be output-oriented and includes lagging metrics relating to research publication performance (bibliometrics), esteem measures, such as awards, and expert-peer reviews.

Scope 1, 2 and 3 greenhouse gas emissions: Greenhouse gas emissions are organised into scopes to avoid double-counting emissions and indicate those that organisations can control (Scope 1) versus those that they can influence (Scope 3). Scope 1 are emissions from sources that are owned or controlled by the organisation. Scope 2 are emissions from the consumption of purchased electricity, steam, or other sources of energy generated upstream from the organisation. Scope 3 are emissions that are a consequence of the operations of an organisation, but are not directly owned or controlled by the organisation.

Sponsored students: Students are deemed to be sponsored if they receive a full or partial scholarship paid from CSIRO funds to pursue a research project leading to a PhD or Honours/Master's degree. This excludes CSIRO employees, whose study expenses are considered to be training and development.

Supervised students: Students are deemed to be supervised if they have a CSIRO staff member appointed officially by the university as the supervisor for their research project. Normally, CSIRO staff are joint supervisors in conjunction with a university academic.

Technical reports: Includes individually authored chapters as well as whole reports that are subject to peer review and usually publicly released.

Technological output: An assessment of the organisation's excellence in delivering relevant research results to its users. This involves working on the right problems, doing projects well and excellence in transferring our research results. One metric for this, given this context, is CSIRO's patenting activity, as this provides an understanding of its technological output and potential impact.

Telehealth: The use of electronic information and telecommunications technologies to support long-distance clinical health care, patient and professional health-related education, public health and health administration.

Type specimen: The specimen that was originally used to name a species or subspecies or that was later designated as the basis for that name.

Wide-field phased-array feeds: Radio telescopes use specialised cameras, called receivers, to detect and amplify radio waves from space. Receivers with a larger field-of-view are called wide-field. 'Phased array feed' receivers are made up of 188 individual receivers, positioned in a chequerboard-like arrangement. Alongside the receivers are low-noise amplifiers, which greatly enhance the weak radio wave signals received.

X-ray binaries: Binary star systems contain two stars that orbit around their common centre of mass. A special class of binary stars is the X-ray binaries, so-called because they emit X-rays.

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Compliance index: statutory reporting requirements

The index below shows compliance with information requirements contained in section 46 of the *Public Governance and Accountability Act 2013* (PGPA Act), *Public Governance, Performance and Accountability Amendment (Corporate Commonwealth Entity Annual Reporting) Rule 2016* and the *Science and Industry Research Act 1949* (SIR Act).

This annual report complies with parliamentary standards of presentation and printing, and uses plain English and clear design.

REQUIREMENT	SOURCE	PAGE
Public Governance, Performance and Accountability Act 2013		
The accountable authority of the entity must prepare and give an annual report to the entity's responsible Minister, for presentation to the Parliament, on the entity's activities during the period, by 15 October; or the end of any further period granted under subsection 34C(5) of the Acts Interpretation Act 1901. The annual report must comply with any requirements prescribed by the PGPA Rule.	Section 46	1–174
Includes a copy of the annual performance statements in the entity's annual report that is tabled in the Parliament. The annual performance statements must: (a) provide information about the entity's performance in achieving its purposes (b) comply with any requirements prescribed by the rules.	Section 39 (1) and (2)	13–65
Includes a copy of the annual financial statements and the Auditor-General's report must be included in the Commonwealth entity's annual report that is tabled in the Parliament. The annual financial statements and the audit report must comply, and must state whether, in the accountable authority's and the Auditor-General's opinion respectively, whether, they: (a) comply with the accounting standards and any other requirements prescribed by the rules (b) present fairly the entity's financial position, financial performance and cash flows. If the financial statements do not comply, the accountable authority of the entity must add the information and explanations required to present fairly those matters. Similarly, for the audit report, the Auditor-General must state the reasons, quantify the financial effect and state the amount if possible.	Section 42(1)(b) and 43(4)	90–139
Public Governance, Performance and Accountability Amendment (Corporate Commonwealth Entity Annual Reporting) Rule 2016		
The annual report must be approved and signed by the accountable authority, and include details of how and when approval was given. It must state that the accountable authority is responsible for preparing and delivering the annual report in accordance with the section 46 of the PGPA Act.	Section 17BB	ii
The annual report complies with the guidelines for presenting documents to the Parliament.	Section 17BC	175
The annual report uses plain English and clear design.	Section 17BD	175

REQUIREMENT	SOURCE	PAGE
The annual report must specify the entity's enabling legislation, including a summary of the entity's objects and functions and the purposes of the entity as included in the entity's corporate plan.	Section 17BE (a)-(b)	14
The responsible Minister is specified.	Section 17BE (c)	68
The annual report provides details of: • any direction issued by any Minister under an Act or instrument during the period • any government policy orders that applied to the entity under section 22 of the PGPA Act • particulars of non-compliance with any of the above directions or orders.	Section 17BE (d)-(f)	68
The annual report must include the annual performance statements for the entity for the period in accordance with paragraph 39(1)(b) of the Act and section 16F of this rule.	Section 17BE (g)	13–65
The annual report must include a statement of any significant issue reported to the responsible Minister under paragraph 19(1)(e) of the Act that relates to non-compliance with the finance law in relation to the entity. If such a statement is included, the annual report must include an outline of the action that has been taken to remedy non-compliance.	Section 17BE (h)-(i)	68
Information about directors is provided, including names, qualifications, experience, attendance at Board meetings and whether the director is an executive or non-executive member.	Section 17BE (j)	121–124
The annual report provides an outline of: • the organisational structure (including subsidiaries) • the location of major activities and facilities and provides a statement on governance practices, including details on – board committees and their responsibilities – education and performance review processes for directors – ethics and risk management policies.	Section 17BE (k)-(m)	10–11 8–9, 159, 69–73
The annual report discloses the decision-making process undertaken by the accountable authority for making a decision if: • the decision is to approve the entity paying for a good or service from another Commonwealth entity or a company, or providing a grant to another Commonwealth entity or a company; and • the entity, and the other Commonwealth entity or the company, are related entities; and • the value of the transaction, or if there is more than one transaction, the aggregate value of those transactions, is more than $10 000 (inclusive of GST); If the annual report includes any of the above information: • if there is only one transaction—the value of the transaction must be included; and • if there is more than one transaction—the number of transactions and the aggregate of value of the transactions must be included.	Section 17BE (n)-(o)	70

REQUIREMENT	SOURCE	PAGE
The annual report details any key activities and changes that affected the operations or structure, which may include: • significant events, such as forming or participating in the formation of a company, partnership etc. • operational and financial results • key changes to its status of affairs or principal activities • amendments to enabling legislation or any other legislation directly relevant to its operation.	Section 17BE (p)	 69 7 ii 68
The annual report includes particulars of: • judicial reviews and decisions of tribunals that have had or may have a significant effect on its operations • reports about the authority made by the Auditor-General (other than one made under section 43 of the PGPA Act), a Parliamentary committee, the Commonwealth Ombudsman, or the Office of the Australian Information Commissioner.	Section 17BE (q)-(r)	 73 73, 143
The annual report includes an explanation if information is missing from a subsidiary that is required to be included in the annual report and states the effect of not having the information in the annual report.	Section 17BE (s)	n/a
The annual report includes details of any indemnity that applied during the period given to an officer against a liability, including premiums paid, or agreed to be paid, for insurance against the officer's liability for legal costs.	Section 17BE (t)	71
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Contacts

LOCATION

CSIRO Corporate Centre
Clunies Ross Street, Black Mountain ACT 2601

POSTAL ADDRESS

GPO Box 1700, Canberra ACT 2601

GENERAL CORRESPONDENCE AND ENQUIRIES

General correspondence and enquiries to CSIRO should be addressed to:

CSIRO ENQUIRIES

Private Bag 10, Clayton South VIC 3169

t 1300 363 400
+61 3 9545 2176
f +61 3 9545 2175
e csiroenquiries@csiro.au
w www.csiro.au

CSIRO Enquiries provides a single point of contact for industry, teachers and students, the research community and the general public. With a mandate to provide information, guidance and referrals, CSIRO Enquiries responds to more than 30,000 enquiries it receives each year. It also supports our outreach activities as custodians of an extensive stakeholder database, and provides outbound e-communication services and online event RSVPs.

MEDIA ENQUIRIES

Huw Morgan
Media Manager, CSIRO Media
GPO Box 1700, Canberra ACT 2601

e huw.morgan@csiro.au
t +61 417 834 547
f +61 8 8303 8857

FEEDBACK

CSIRO welcomes your feedback on our performance. Please contact the CSIRO officer with whom you have been dealing or CSIRO Enquiries, who can direct your feedback to the relevant person:

e csiroenquiries@csiro.au

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