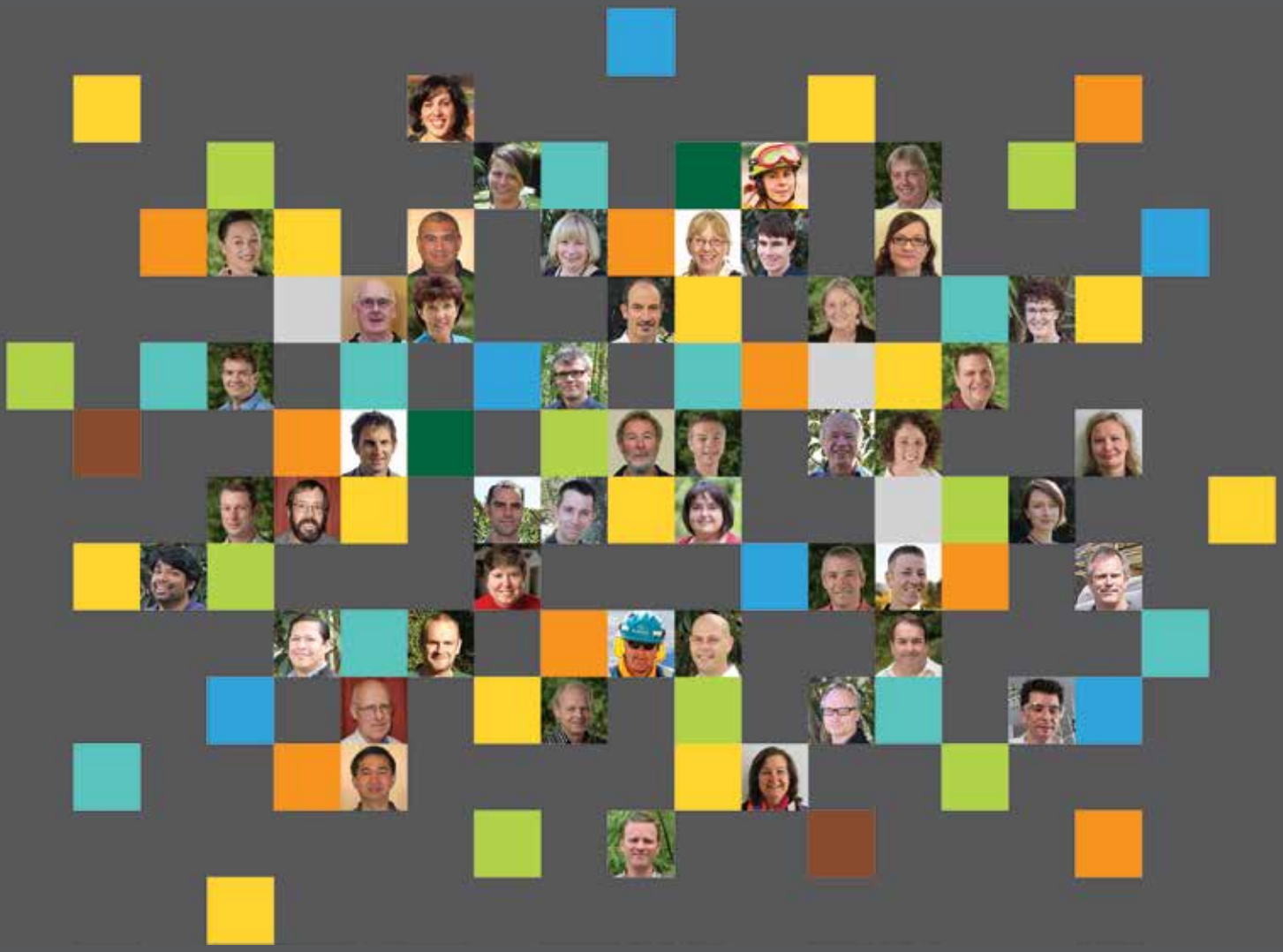
SCION

FORESTS ▪ PRODUCTS ▪ INNOVATION



2016 Annual Report

Reports and Financial Statements

FORESTS ▪ PRODUCTS ▪ INNOVATION

2016 Annual Report
Reports and Financial Statements

Presented to the House of Representatives pursuant to section 44 of the Public Finance Act 1989.

Our Annual Report is presented in two parts - Highlights (Part A) and Reports and Financial Statements (Part B). Together both documents fulfil our annual reporting responsibilities under the Crown Research Institutes Act 1992.

Highlights is an illustrated document containing the Chair and Chief Executive report, descriptions of our research performance, collaborations, work with Māori, and outreach summary.

Our Annual Report is also available in digital format at www.scionresearch.com/annualreports

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The Scion logo

Our new logo has been refreshed so that it better aligns with our business strategy and organisational values.

The logo portrays a dynamic sense of innovation and creativity, harmony and collaboration between us and our partners and customers. At a more subtle level the logo represents the emergence of a stylised shoot (scion). The logo shape also depicts the concepts of circular economies and the bioeconomy. The colour palette is taken from nature.

Our name Scion encompasses how we are growing biobased opportunities for sustainable solutions from our core forest science capabilities.

CONTENTS

GOOD EMPLOYER AND EQUAL OPPORTUNITIES

Scion is committed to being a Good Employer and promoter of Equal Employment Opportunities (EEO) as demonstrated through our day-to-day practice and ongoing compliance with Human Rights Commission requirements.

Our organisational values build a culture that supports empowerment, diversity, inclusion, innovation and accountability. We believe these attributes create an environment that allows the Good Employer principles to thrive.

We deliver on the Good Employer obligations through our Board Good Employer Policy and Equal Employment Policy, along with our management policies, programmes and practices. Progress on the seven Good Employer key elements over the 2015/2016 financial year are presented below.

Good Employer Key Element	**2015/2016 Achievements**
Leadership, accountability and culture	• Quarterly leadership development programme continued including guest speakers Sir Mark Solomon and Mike Sang. • 10 new members joined the Future Leaders cohort in 2015/2016. • Continued embedding of Scion values in leadership practice, recognition and company processes. • Progress against the 2015 Climate Survey action areas included increased staff communication and design of a corporate services tool kit. • L&D Programme delivered to all employees including Essentials of Collaboration, Resilience Training and Getting Organised. • Māori Focus Cohort engaged with collaborative initiatives in support of delivering Scion's Māori Plan.
Recruitment, selection and induction	• Participated in Rotorua Career Expo with 5 local secondary students winning a day as a Scientist at Scion. • Utilised diverse media to attract candidates and created an excellent candidate database to achieve our time to fill goal. • Unlocking Curious Minds funding used to showcase biotechnology to 100 local primary school students. • Induction Programme revamped and training delivered to all leaders and support staff who champion this process. • Kiwi day hosted for new international staff and their whanau.
Employee development, promotion and exit	• New performance management 'ACE' grid implemented with positive response from staff. • 7 employees supported with further tertiary education. • Reduced turnover rate of 7.1%. • 11 employees promoted through the Scion Job Progression process.
Flexibility and work design	• One in four employees worked part time. • Policies and employment agreements updated following amendments to the Employment Relations Act, Health and Safety at Work Act and the Harmful Digital Communications Act. • All staff attended training on cyber security – highly relevant for work and home. • 20 employees approved for changes in hours to accommodate lifestyle choices. • 13 employees accessed parental leave; three employees received *ex-gratia* payment upon return from parental leave and one employee accessed extended leave without pay.
Remuneration, recognition and conditions	• Maintained regular Partnership for Quality meetings with PSA Union. • Scion's Roger Newman Award for Science Excellence awarded to Stefan Hill. • 86 employees accessed sick and bereavement leave beyond the legislative allowance.
Harassment and bullying prevention	• Training and Problem Resolution and Unacceptable Behaviour Policy aligned to promote self-resolution and access to support options. • Positive 8.56% EAP usage compared to national average of 8.20%. This includes a higher than national average of usage by male staff at 46% vs 34%.

Safe and healthy environment	• Health monitoring implemented for staff exposed to hazards – 169 in Rotorua and 17 in Christchurch. No corrective actions required. • Influenza vaccinations increased to 106 people. • Scion Board of Directors engaged an external auditor, Barrister Simon Mount, to review Scion's H&S practices. • Occupational hygienist engaged to review better practice, PPE and working conditions. • Completed preparation for new legislation and regulations, including H&S representative training.

1. Leadership, accountability and culture

Scion recognises that excellent leadership, real accountability and a high performance culture are vital to grow the quality and impact of Scion's science and achieve our strategic goals.

Over the past 12 months we continued to develop our organisational leadership capability, primarily through two targeted programmes. The first focused on our senior leadership group comprising CEO, executive managers and senior managers and aimed to expand a leadership mindset and provide a forum to address organisational challenges. Highlights included a Customer & Market Shaping programme run by the University of Auckland and presentations by Sir Mark Solomon, Kaiwhakahaere of Te Runanga o Ngai Tahu, and Mike Sang, Chief Executive for Ngāi Tahu Holdings Ltd, who shared their leadership insights and business perspectives.

The second initiative, our Future Leader programme, sought to expand leadership and accountability into tier four and beyond. The 35 members of this cohort are high achievers with a potential to move into senior leadership roles. They receive investment in the form of training, organisational opportunities and coaching in order to strengthen our leadership depth and allow for succession planning.

Promotion of our organisational values continued with recognition of values-aligned behaviours through reward and recognition programmes. These included a quarterly CEO award, annual Scion Awards, values-branded thank you cards and café vouchers. We believe such recognition positively impacts our culture.

Our biennial climate survey, conducted in February 2015, provided insights into our culture. Over the past 12 months we reviewed and implemented recommendations arising from this, which included reviews of our annual performance management assessment (ACE) and corporate services, the creation of an information tool kit and increased communication via our staff intranet, all staff forums and leadership meetings.

2. Recruitment, selection and induction

Scion recruitment and selection practices are free from discrimination and support our EEO Policy to ensure the best person is recruited for the job. We reject the use of terms that may be seen as discriminatory in our advertising, and our recruitment panels are informed on the principles of the Human Rights Act 1993, particularly the 13 areas of discrimination. We ensure that any specific needs of candidates are met in the recruitment process.

We continued to diversify recruiting methods by using print media, online job sites, social media, industry specific media and the Science New Zealand careers website to ensure a wide range of people had access to Scion opportunities.

Scion's induction programme is an essential element in successfully 'settling in' employees, particularly international employees and those new to Rotorua. A self-directed Induction Passport engages new employees with all key personnel, processes and policies. Induction also includes attendance at a Whakatau, hosted by the Executive Management Team. Welcoming our new employees within this context demonstrates respect of Te Arawa and for some of our employees offers their first experience of tikanga Māori.

Initiatives to attract students into science careers included our Biotransformation Team using Unlocking Curious Minds funding to engage students with science. In this example, over 100 local primary school children spent time in our science labs learning about biotechnology and extracted DNA from strawberries. We had a prominent position at the Rotorua Careers Expo and five secondary students won a day as a 'Scientist at Scion'. International interns were hosted throughout the year, and over summer we temporarily employed 19 New Zealand university students.

3. Employee development, promotion and exit

Our employee development strategy is based on clear goals, fair assessment and access to continued learning and development opportunities. Staff use our performance management tool, known as ACE, to plan their annual work,

development and safety goals. Following feedback from staff, and in consultation with our leadership and Public Service Association (PSA) union delegates, the ACE assessment grid was reviewed. A new framework was implemented and feedback was positive; namely, that the grid better incorporated the Scion values and was easier to apply.

All employees had access to development opportunities through their ACE and our organisational learning and development programme. During the year, training for the Future Leader cohort and our tier four leaders was a priority.

Scion offers staff a unique process for career progression. A Progression Panel allows staff to apply through a peer-review process to advance to a higher job band. The panel consists of a diverse group of employees, including a PSA union delegate, two general managers and an external remuneration consultant. Eleven employees were promoted via the Progression Panel process.

Employee turnover dropped to 7.1%, the lowest rate in five years. Exit interviews and surveys were completed with exiting employees to identify opportunities for improvement. The exit survey results reflected a positive experience at Scion, recording a 90% satisfaction with Scion's commitment to organisational values, 95% satisfaction in Scion's commitment to Health and Safety and 75% satisfaction with fairness and equity. Reasons for leaving were voluntary 74%, involuntary 13% and retired 13%. Employees indicated they were leaving for family reasons 15%, new career 40%, not a good fit 15%, moving overseas 15% or retirement 15%.

Scion's Education Assistance Policy supported staff with their studies. Two staff members submitted their PhDs, one staff member commenced PhD study, three staff members continued their PhD studies and one staff member completed a Post Graduate Diploma in Business Management.

4. Flexibility and work design

We value diversity and staff wellbeing and recognise that being a flexible employer, through working hours or location, enhances staff engagement. One in four employees worked less than the traditional 40-hour working week, and 20 employees (15 females and five males) altered their working hours to achieve their desired lifestyle balance.

This work-life balance ethos was also demonstrated by high numbers of staff who biked, ran or walked in the forest neighbouring the Rotorua campus during the day.

Access to meaningful work requires us to consider more than flexibility of hours and location, and so a Diversity Works stocktake was undertaken to assess Scion against external diversity and inclusion standards. With the assistance of a diversity advisor an action plan was created to address recommendations for implementation in the coming year. A staff member was assisted to connect with the New Zealand Blind Foundation in order to review workspace needs and implement any required improvements.

Parental leave (paid and unpaid) was taken by 13 employees (seven females and six males) and *ex-gratia* payments of six weeks wages to made to three employees (one female and two males) six months after their return to work. One female employee was granted extended leave without pay (greater than one month).

5. Remuneration, recognition and conditions

Our remuneration is based on job bands and remuneration ranges sourced from external market surveys produced by Hay Group. Annually we work with the PSA union and the Scion Board of Directors to set our remuneration budget. We then determine in negotiation with the PSA union how this budget will be applied across all staff in the annual remuneration round. In 2015/2016, as traditionally, we applied a performance-based increase or bonus.

We believe that our remuneration process is free from discrimination. We monitored for potential gender equity issues through an annual review of our remuneration, promotion and performance assessments conducted by an independent consultant.

Scion worked closely with the PSA union under a Partnership for Quality Programme. This forum was used to discuss topics such as morale, H&S, operating environment and matters potentially affecting Scion employees.

Additional support was provided to 86 employees for bereavement and/or sick leave beyond legislative entitlements, with a total of 76 staff accessing additional sick leave. One employee accessed the long-term illness benefit and the income protection insurance policy available to all staff as a part of their remuneration package.

A highlight of the Scion Annual Awards was the Roger Newman Award for Science Excellence presented to Stefan Hill, Research Leader Advanced Chemical Characterisation, for his outstanding commitment to science excellence through diverse engagements and collaborations.

Employees were also recognised at team meetings, on the staff intranet and via the *Scion Connections* newsletter. Team managers had a budget that allowed them to celebrate success within their teams.

We completed the regular review and renewal of our EEO and Good Employer initiatives and policies. Input into the Learning and Development calendar was invited from the organisation, and leaders and the PSA union delegates also had input into policy reviews.

6. Harassment and bullying prevention

Scion encourages a self-resolution approach to relationship problems at work to empower employees, promote efficiency and support an effective workplace. To achieve this we have up-skilled staff with complementary training including Essentials of Collaboration, Resilience and Safe Behaviour workshops.

We promoted our Problem Resolution and Unacceptable Behaviour in the Workplace Policy and the Worksafe Guidelines for 'Preventing and Responding to Workplace Bullying'. Our culture and values endorsed the benefit of prompt and respectful feedback, access to Employee Assistance Programme (EAP) and one-on-one behavioural coaching as methods to ensure a healthy workplace that discourages negative behaviours before they start.

Our hazard register includes bullying and we take any complaints of bullying or harassment seriously, acting immediately to investigate any concerns.

Employees at Scion can access EAP for support around personal or workplace matters. During the year, 36 employees accessed EAP, which reflected a positive usage rate of 8.56% compared to the national average of 8.20%. Our Christchurch staff have indicated a preference for an onsite presence through local provider, Workplace Support.

7. Safe and healthy environment

Scion continued to advocate a culture that promotes employee wellbeing and contribution to a safe H&S environment. This commitment saw us learning the language of the new Health and Safety at Work Act 2015 and completing the H&S Committee representative training that arose from the associated regulations.

Our Health Monitoring Programme was adjusted and undertaken with a new provider. A base line assessment of new staff was continued and monitoring was implemented for staff exposed to hazards: 169 staff in Rotorua and 17 in Christchurch. This initiative made staff feel cared for and the results reflected our good practices in the use of personal protective equipment.

As with all of the good employer principles, regular review and adjustment is needed to ensure best practice. In 2015, the Scion Board of Directors engaged an external barrister to review our H&S policies and procedures. The findings were positive and showed our leadership is engaged with the concept that 'a better New Zealand is a safer New Zealand.'

An occupational hygienist conducted a review of our laboratories, which included monitoring for exposure to noise and dust. The review revealed no concerns with respect to chemical residues, confirmed our excellent PPE and provided recommendations on housekeeping practices that we look forward to implementing in the coming year.

The year ended with one serious harm incident, 20 incidents (compared to 34 the previous year), and 37 near misses reported (compared to 52 the previous year). During 2015-16, 106 staff (an increase on last year) received a company-paid influenza vaccination.

Work Place Profile at 30 June 2016

Total staff	Total permanent employees 280 – 53% male and 47% female
FTEs	Full time equivalent employees total 280.44
Disability	2.5% of employees are recorded as disclosing a disability
Age	24% of employees are in the under 40 years age group, 27% are in the 40 to 49 years age group and 49% in the 50 years and over age group
Māori	Māori represent 9.3% of permanent employees
Nationality	21% of employees are recorded as disclosing a nationality other than New Zealander or Māori, and represent 29 nationalities
Pacific Islander	No employees are recorded as disclosing a Pacific Island nationality

ENVIRONMENTAL PERFORMANCE

Scion is committed to monitoring and improving its environmental performance. On-going data collection enables us to measure our performance against the environmental indicators set out in our Environmental Performance Policy. In line with this commitment, Scion joined the Enviro-Mark programme in 2011, and we expect Enviro-Mark Silver Certification for the Rotorua site early in 2016-17.

Two staff-driven initiatives started in 2015-16:

- The first was to reduce the number of rubbish bin liners that go to landfill and the other, to reduce the amount of water used by laboratory equipment. While it is too early to show the impact of these initiatives it is wonderful that more staff are actively involved in implementing their sustainability ideas.
- Single-use waste in the café has also been reduced by encouraging staff to use cups and plates rather than disposable cups and plastic containers. Disposal of single-use plastic lunch containers has the potential to drop by more than half, based on the current uptake of this initiative.

Environmental impacts per year	11/12	12/13	13/14	14/15	15/16
Total employees for all sites	294	298	284	286	323
FTEs for Rotorua site only	276	274	259	260	256
Total energy (kWh/FTE) Rotorua site only	31,548	34,659	33,878	35,535	36,493
Total tCO_2eq/FTE (on an "all sites" basis)	6.5	7.7	6.9	8.1	7.8
Organics diverted (kg/FTE) Rotorua site only	5	6	7	7	7
Paper recycled (m^3/FTE) Rotorua site only	0.2	0.2	0.2	0.2	0.2
Cardboard recycled (m^3/FTE) Rotorua site only	.04	.05	.05	.05	.05
Waste to Landfill (m^3/FTE) Rotorua site only	9	6	5	5	5
Water usage (L/FTE) Rotorua site only				280,315	305,798

Our on-site recycling programme continued with food waste, plastic and glass bottles, aluminium and steel cans and scrap metal diverted from landfill. Recycling of building demolition materials continued this year as older buildings were removed. The vermicomposting worms were relocated to the nursery this year following demolition of the building that had been shielding them from the sun. The worm farm is now being established in a safe place with additional trees for shading.

The increase in energy usage per FTE stemmed mainly from a reduction in FTEs at the Rotorua site. The electricity usage during the year was only 2082 kWh (0.05%) more than last year, and the gas usage was only 382 GJ (1.9%) more than last year. Carbon dioxide equivalent (CO_2eq) emissions per FTE decreased owing to decreases in international air travel in comparison with the 2014-15 year. During the year, international air travel overall for Scion decreased by 426,861 km.

Water usage increased because of increases in the time that water-using laboratory equipment operated and also owing to the introduction of water-based frost protection in the nursery. We are targeting a reduction in water use in the coming year with the introduction of water-saving devices in the laboratory and increased monitoring of high water-use areas.

CORE FUNDING INVESTMENT

Intermediate Outcome 1 Maximise the value and profitability of commercial forests and their ecosystem services			
Alignment to Statement of Core Purpose	**Alignment to Sector Priorities**	**Investment as per the SCI 2015-16**	**Investment Actual**
Improve the value and productivity of the New Zealand forestry sector	New Zealand Forest Owners Association and New Zealand Farm Forestry Association	$3.1 million	$3.1 million

Radiata pine development

Radiata pine represents 90% of New Zealand's commercial forest estate. Ensuring that New Zealand has an on-going supply of improved plant material to enhance its productivity, health and the quality of the wood is of critical importance to our $5 billion export industry. Scion has allocated core funding to ensure that New Zealand has 'state of the art' genetic and propagation technologies providing the best of plant material for the future: specifically, to sustain a platform focused on genetic gain, and identifying and delivering plant material that is resistant to forest diseases.

Radiata pine breeding and sequencing

The continuing focus of this programme is to develop genomic selection for key commercial species, where genetic gain can be delivered twice as fast as via quantitative breeding alone. Industry has noted "Shortening the breeding and deployment timeline by 50% has a major financial impact and can result in three-fold increases in NPV"[1].

In collaboration with Rapid Genomics LLC (Florida, contracted by Radiata Pine Breeding Company Limited (RPBC)), we successfully genotyped (i.e. created DNA fingerprints) 1500 radiata pine trees that are the first tranche of an elite training population. This is the first demonstration of the potential for genomic selection in radiata pine. In parallel, we successfully estimated the first genomic breeding values (GeBV) for non-key traits. This will increase industry's confidence in deployment selections using GeBV-based breeding selections. Most recently, industry demonstrated its confidence and excitement over genomics through the Forest Owners Association's request for research proposals for increased funding in genetics and genomics (presented to FOA on 4 May).

Capability gained through this programme is also being applied to other plantation tree species, e.g. in the Specialty Wood Products Partnership (SWPP) programme (see also IO 2).

Using our core funding, we collaborated with AgResearch to extend our capability in restriction enzyme genotyping-by-sequencing (GBS). We tested the same *Eucalyptus nitens* trees that we have already genotyped using the existing SNP technology to see if the AgResearch technology is applicable. Work is continuing, because at this stage, it appears that GBS will be appropriate, but the reliability and repeatability is not the same as with a SNP Chip. Understanding the efficiencies of the different genotyping systems and testing them on relevant species will help us to implement genomics effectively for the New Zealand forest industry.

Radiata pine deployment

Supported in-part by core funding, a secondment with RPBC continued. A collaboration with the University of Wollongong enabled us to develop breeding values and genetic parameters for *Dothistroma* resistance demonstrating very little genotype by environment interaction. Submission of a publication to an international journal will occur in 2016-17.

Biotechnology approaches to forest productivity

Scion has taken a leading role in the application of biotechnology for forestry in New Zealand. Biotechnology approaches such as genetic modification (GM) and new breeding technologies, such as gene editing, have the potential to make step changes in production forestry through improvements that increase productivity. It can also address some important social licence to operate issues such as reducing the incidence of wildings and could be applied in the future to achieve disease resistance. Scion's approach is to evaluate the option for use of such

[1] Dr John Butcher, CEO, Radiata Pine Breeding Company Limited

technologies, by generating and providing robust science to inform commercial forestry companies, the public and to support policy development. Importantly, Scion is making a substantial contribution to international science in conifer biotechnology and leverages that knowledge for New Zealand's benefit (see also IO6).

Core funding support of this project underpinned the development of new lines of biotech trees that have been planted out in the field trial during 2015-16. These lines have been developed to cut the environmental cost of processing wood fibre. Additional new lines predicted to grow more quickly, developed through tissue culture in 2014-15, were grown in the GM glasshouse during 2015-16. These will be ready for planting out in the field trial during 2016-17 and will allow testing of the performance of the biotech trees compared with unmodified controls.

Core funding underpinned the facilities and clonal collections held in cryopreservation that are used in Scion's development and testing of biotech trees. Scion continued to improve tissue culture pipelines and techniques to apply this technology in a New Zealand plantation forestry context.

Ecosystem services

Scion continued to build national capability and leadership in ecosystem services, bringing in a wider economics perspective and experience in agriculture and climate change impact and adaption. We also extended our leadership in the international arena. For example, the validation of Scion's spatial economic model (Forest investment Finder (FIF)) was presented at the New Frontiers of Forest Economics conference in Beijing, in August 2015, and was recently published in the journal *Forest Policy and Economics*. Post conference, Scion was invited to be part of a four-year international collaborative research programme, PES-FOR-WATER (Payments for Environmental Services for Water), led by Forest Research UK. The team made over 12 presentations on the use of FIF at various fora.

Publishing a study of the synergistic effects of forest and dairy industries has further helped to inform policy development and led to a renewed focus on forestry as a low-input alternative land use for nitrogen-sensitive catchments. A computable general equilibrium model has been developed for use in studies of the impact of various economic and environmental policies, as well as management interventions, on the broader economic performance of the industry and contribution to the national economy.

The fifth annual forest ecosystem services forum brought a sharper focus to the topic with a more diverse range of stakeholders attending than in earlier years. Presentations from a range of international and national experts described the implementation of various schemes to increase the provision of forest ecosystem services. The presentations and workshop session highlighted that more robust information and education around the importance of ecosystem services is required to support their wider adoption in policy decisions. Efforts to do so would benefit from a universal economic model framework for valuing ecosystem services in order to increase their visibility in policy and investment decision making. This and previous forums have served to highlight Scion's emerging capability in this core activity and led to participation in a number of the National Science Challenges, and strengthened interactions with other land-use sectors. Scion is now working with other sector stakeholders to expand the study of the flow of ecosystem services between neighbouring land uses.

Informatics in forestry

Modern technology, such as using 'big-data' approaches, remote sensing and the use of unmanned aerial vehicles (UAVs), at last is enabling the precision forestry aspiration to be realised. Scion is using core funding to validate many of these tools and identify how they can be applied to develop the next generation of forest management systems. During the past year, we validated UAVs for our forestry sector and can show they are a reliable source of remote sensing data collection. The industry is starting to adopt the technology and increase its investment in this particular research area as we explore the ranges of sensors and data processes required to extract maximum value from this technology. We have also investigated new data science techniques to help the industry deal with the challenges of 'big data'. These techniques have been applied to a range of data types including remotely sensed data, bioinformatics data, and tree growth models. An ongoing requirement for new skills, technologies and techniques in this area within the New Zealand forestry sector means this research will continue in 2016-17.

Excellent progress was made on a phenotyping platform and the associated LiDAR algorithms that locate and identify individual-trees within a forest. A single genetics trial data analyses was completed, with its utility for individual elite-tree selection for breeding purposes demonstrated to industry through technical presentations at Scion's Forest Genetics IUFRO conference (March 2016) and the Growing Confidence in Forestry's Future conference (May 2016). Data structures for whole forest analysis have been developed and initial whole forest phenotypic data has started to be extracted. Assembly of the data for the phenotyping platform is being jointly undertaken with the RPBC.

The national forestry Permanent Sample Plot (PSP) database and collection

The Scion PSP system continues to underpin research programmes of national importance and attracted international attention resulting in an invitation to participate in a workshop exploring the development of a similar system in Australia, which does not have a national system for recording forest growth trends. The value of experimental plots stored in the PSP system is becoming increasingly apparent. In particular, the silviculture breeds and special purpose breeds trials will underpin further study of the interaction of genetics, silviculture and environment on growth, yield and wood properties that is being undertaken with additional funding support from the Forest Growers Levy Trust. These trials, and the trial data contained within the system, are an invaluable resource for Scion researchers and industry stakeholders alike. New trials are constantly being established, and new data lodged in the system, therefore the benefits are enduring. In 2015-16, the focus was on the silviculture traits trials established between 2002 and 2004. These trials contain seedlots bred for three different traits (growth and form, high density and long internode) managed under different silvicultural regimes on different sites. With the support of core funding, all the silvicultural treatments have now been applied at all trial installations, and a complete dataset of growth measurements has been collected up to mid-rotation.

The PSP database has been enhanced and is now able to automatically calculate 300 Index and 500 Index from the data collected. Additional financial support for this work was provided by Wenita Forest Products. The inclusion of these automatic calculation routines makes it much easier to understand variations in site productivity.

Intermediate Outcome 2

Increase the profitability of solid wood processing through customer solutions and supply chain innovations

Alignment to Statement of Core Purpose	Alignment to Sector Priorities	Investment as per the SCI 2015-16	Investment Actual
Improve the value and productivity of the New Zealand wood products sector	WoodCo Strategy WPMA Vision 2050	$3.45 million	$3.45 million

The focus for core funding in wood products and processing is to create underpinning knowledge so that the industry can continue to enhance the performance of products that best fit with the needs of high value (and profit) markets. Aims are: to improve the proportion of each log converted to saleable products, such as through understanding wood quality and the increased use of residues; to provide robust technical information to address any licence to operate issues; to support increasing the diversity of the wood products portfolio that New Zealand can offer; and to sustain capability to support current and evolving industry needs and to trouble shoot industry problems. The key outcomes for 2015-16 are:

High-performance wood products

Scion has continued development of high performance wood products (such as very durable and stable wood) with results from scaling up of two technologies using radiata pine. These have been evaluated on conventionally dried timber and wood produced from our novel patented dewatering process. We are currently exploring commercialisation of these modification technologies on conventionally dried timber. Further novel approaches to protect and enhance a range of wood species are being explored at laboratory-scale, such as thermal modification of non-radiata species and water proofing approaches. These modifications will enable production of cost-effective wood products for high-value wood products markets such as outdoor applications.

Extension to drying and stabilising other wood species

Many of the highest value international markets are demanding naturally durable wood, e.g. some eucalypt species. The challenge with such high-value timbers, including many of New Zealand's indigenous species, is drying them in a way that provides high timber recovery and enhances wood material properties such as stability. Building from Scion's experimental knowledge of the effect of supercritical CO_2 on key wood/water relationships, and the effect of mechanical stress, we have been able to successfully predict the softening effect of CO_2 on wood material by means of predictive modelling. The results allow us to determine the effect of process parameters on dewatering efficiency, and moisture related distortion, for a wide range of scenarios, as well as providing an engineering scale-up design tool for larger plants.

This year we have shown that for a range of hard-to-dry species, using supercritical CO_2 as a pre-drying process ahead of more conventional kiln drying can reduce the development of shrinkage and internal checking. This work is supported by novel drying research with an industry partnership focussing on eucalypts, Douglas-fir and cypresses. These potential drying solutions could be applicable to some indigenous species such as tōtara and beech; and is part of a programme with Ministry for Primary Industries (MPI), Northland Inc, Tane's Tree Trust and iwi in developing greater economic returns from planted tōtara.

Wood preservation treatment options

We continued to develop options to address an important market issue, e.g. wood treatment options that avoid the use of highly toxic chemicals such as copper-chrome-arsenic (CCA) formulations. New Zealand's dominant commercial species radiata pine is non-durable, substantially restricting any applications exposed to the outside environment. Scion has developed a bio-based chemical option that can be delivered into the wood in water emulsions. Initial evaluation suggests this will meet the challenging demand for above-ground applications. Six long-term durability trials were set up in 2014-15 in New Zealand and Hawaii. In 2015-16, all outdoor durability trials (decking, cladding, joinery, and framing) were assessed and showed no signs of decay after 12-24 months' exposure. This work is critical to providing certainty over product performance. Currently attempts are also underway to optimise treatment schedules with a view to producing a low uptake process that could reduce the need for, and/or extent of, secondary drying processes and hence also reduce treatment costs.

New wood product value chains from non-radiata pine exotic species

Douglas-fir, eucalypts and cypresses collectively represent about 10% of the New Zealand commercial forest plantation. They are better suited to some sites than radiata pine and provide special material properties such as stiffness and natural durability, which are highly sought after in some national and international markets. The stakeholder group for these species is typically smaller commercial companies or farm foresters seeking to exploit niche markets and/or address special site needs such as riparian planting. Scion has aligned core funding to the application of new genetic technologies to these non-radiata pine species. This higher-risk science complements the Forest Growers Levy Trust investment in the MBIE Specialty Wood Products Partnership Programme.

During 2015-16 the major thrust was phenotyping *Eucalyptus nitens* to inform production of the next generation of plant material, and providing a branching and density model for Douglas-fir to include in Forecaster (the industry standard decision support tool) for better prediction of future yields. The major outcome was to support industry in building a substantial programme across the value chain focusing on developing high-value products for these three species. Although the underpinning work was initiated in July 2014, it was not until July 2015 that the programme was officially launched with a total commitment from industry and MBIE of $1.4 million per annum over seven years. The target for this programme is to see new exports of high-value products of at least $300 million per annum by 2030 underpinned by expanded forest planting of these species.

New wood product species - indigenous forests and wood products

Indigenous forests have the potential to provide multiple values to New Zealand. Although mostly associated with conservation estates, the volume in small planted woodlots is also extensive although their exploitation for economic value is very small. Scion, in conjunction with MPI, Northland Inc. and Tane's Tree Trust, has shown that tōtara in Northland could generate over $100 million of economic outcomes in that region alone. Such use of indigenous woods complements its contribution to the environment and to social and cultural outcomes. Commercial use will increase the resilience of the species, thus ensuring it is a part of the New Zealand landscape for many generations to come. Work in 2015-16 has continued to provide new information and resources for key stakeholders (e.g. MPI, Northland Inc, Tane's Tree Trust) in the development of the indigenous forest resources, particularly in the Northland region. These include a new trial comparing three provenances of kauri, collection and analysis of tōtara cores to study wood density and heartwood formation and levels of durability. A key focus during the year was on developing a better understanding of the wood properties of tōtara, particularly the age at which heartwood is formed. This will support future efforts to establish a wood products industry based around this species.

Core funding supported interaction with New Caledonia to examine shared research interests for *Agathis* species, with the view to developing an ongoing research programme with other Pacific Island partners. As a result of this interaction, funding is being sought through the Asia Pacific Network for Global Change to host a workshop on *Agathis* species focusing on economic opportunities and conservation of genetic resources.

To underpin the vision of an indigenous forest industry, a research programme proposal ($10m over 5 years) was submitted to MBIE in March. The long title is "Reinvigorating indigenous forest economies by synergising western

science and Mātauranga Māori"; short title is "Tane o Te Wananga: delivering prosperity". The proposal has passed through MBIE's stage-gate for Science Excellence and is currently under assessment for the Benefit and Impact stage-gates. The proposal acknowledges that pathways to an indigenous forestry vision are already being created in tōtara, kauri, and mānuka; but that current approaches are risky. The competing demands of kaitiakitanga, economics, and sustainable forest resilience means that the future of indigenous forestry hangs in the balance. Continuation on this uncertain path will ensure the indigenous forestry vision is not achievable, and worse, that investment is based on assumptions about the biology (genetics) of indigenous tree species and the cultural values we place upon them. The proposal aims to de-risk investment by addressing those assumptions. We propose a scientific first by bringing together Western science and Mātauranga Māori (knowledge) to develop a holistic, genetic and cultural framework that combines kaitiakitanga, economics and sustainable forest resilience. This will result in a robust breeding platform incorporating wider mana whenua aspirations (a kaupapa) to ensure a sustainable future for indigenous forestry.

Core funding in indigenous species propagation has enabled co-development of propagation techniques for a range of indigenous plants now being commercialised for four species (tōtara, rimu, kahikatea and miro) with an industry partner. In September 2016, a new native tree and plant nursery will be opened at Minginui. The nursery will showcase the commercial vegetative propagation technique that was jointly developed between Scion and Ngāti Whare Holdings Ltd, arising through Scion's core funding and Preseed Accelerator Funding.

Many iwi, farmers, regional councils and conservation groups are actively investing in re-forestation of land with indigenous trees for cultural purposes and to protect land and waterways. The challenge has been the ability to provide vast quantities of quality plants in short time frames. The propagation technique developed has seeded multiple opportunities for Ngāti Whare and Scion as they work in partnership to maximise benefits for New Zealand. This development addresses that need and also provide assurance over the progeny of the plant material to ensure that plants indigenous to a region are being replicated in that region. The Minginui nursery is important for Ngāti Whare and also New Zealand by (1) bringing employment into this socially and economically challenged area, (2) providing material for the planned restoration planting of 600 ha in Whirinaki forest, and (3) creating new opportunities to generate income for the area.

Better home and building decision making

Currently in New Zealand, many decisions regarding home and buildings are made by designers and developers who focus on the cosmetics and functions of houses. This drives a 'code minimum' approach that does not always produce energy efficient and healthy homes. Design of performing, affordable, neighbourhood-integrated and suitable-for-all-ages homes requires a variety of information that currently is not easy to access. If this information can be presented to residents of homes in an appropriate way, they will be better able to make informed home design decisions encompassing energy/operation, transportation and capital costs while providing a healthy living environment. In 2015-16 we collated a wide range of background material on the current building design and built environment planning decision tools, including international research initiatives, existing tools, and software. A great deal of information is available, some is easily accessible, some only accessible to design professionals, some freely available, some at cost. This information, however, is not accessible to home owners in an appropriate format. We recommend building a decision tool and exploring options/partners to develop it further. The work is supporting development of Scion's interface and partnership with the National Science Challenge "Better buildings, towns and cities".

Value chain optimisation

The forest industry operates across a value chain that includes such components as growing, haulage, processing, shipping, marketing and ending with the final customer. Less tangible activities include managing risk, international financial transactions and biosecurity impacts, addressing market trends and so on. Value chains are a complex series of highly inter-related activities.

Optimising the complex forest industry value chain will reduce costs (e.g. more efficient shipping, products getting to sub-optimal markets). More importantly, it can play a major role in increasing value capture to improve forecasting of prices and markets and address the New Zealand forest industry's biggest challenge, which is to increase confidence to invest at each part of the value chain. Such investment will increase the amount of the forest cut that is processed within New Zealand and help to maximise production of high-margin products. Value chain applications in other industries have shown substantial gains, e.g. auto manufacturing and textile industries, but there has been little application in the forest industry, particularly at a pan sector level.

To strengthen capability, Scion collaborated with Supply Chain Management academics at Massey University with different collaboration regimes between industry players in the export log market. A market research visit to China

also revealed interesting information concerning Chinese processors' attitudes towards logs that originate from New Zealand. Scion uses core funding to develop a new methodology for producing quarterly log market outlooks. This activity is keeping value chain specialists in touch with industry trends and often results in deeper conversations and small follow-up projects. Scion hosted a Value Chain Optimisation workshop in November 2015 with 65 attendees. Core funding was used to invest in software and develop skills in discrete event simulation modelling, and this lead investment has made significant impacts in the industry. Two commercial projects were carried out to investigate alternative supply chain logistics configurations and at least one timber mill also purchased the software and is developing internal capabilities to help them with operational planning.

The WoodScape tool, developed with assistance of core funding, enables companies to identify options and intervention points that, if overcome, will increase confidence for companies to invest in new wood processing options in New Zealand.

Intermediate Outcome 3 Expand opportunities in the wood fibre, pulp, biopolymer, packaging and biochemical industries			
Alignment to Statement of Core Purpose	**Alignment to Sector Priorities**	**Investment as per the SCI 2015-16**	**Investment Actual**
Improve the value and productivity of the New Zealand wood products sector and bio-material industries	WoodCo Strategy, WPMA Vision 2050, Packaging Council strategy, packaging industry, polymer, pulp and paper and biobased/renewable chemicals	$5.7 million	$5.7 million

High-value products from biomass

Scion continued to invest in its programme targeting the conversion of woody biomass and other sustainably derived feedstocks into valuable plastics/polymers (bioplastics) and ultimately into biobased products. Biobased products are often mentioned in the context of circular economies and the bioeconomy - two concepts that enable and complete each other. The bioeconomy becomes a perfect illustration of circularity when it builds on sustainably sourced and produced biomass for the production of fuel, chemicals and other sustainable products. Converting biobased feedstocks into higher value products creates multiple beneficial outcomes for New Zealand. Firstly it increases the intrinsic value of the biomass feedstock (e.g trees), secondly it creates new high-value biomaterials and bioproducts manufacturing industries for a large and growing international market, and, thirdly it provides biomaterials and bioproducts that add value to New Zealand's other export industries, such as high-value food.

Scion's focus is on de-risking new technologies and creating bioproducts from New Zealand forest-produced materials through development of prototypes and pilot plant scale processing, expanding options for manufacturing and new exports. Scion also explores fundamental problems in bringing these materials to market. An important part of the programme is interaction with industry and the ultimate end users. A key recognition of Scion's national and international role in developing bioproducts combined with sustainable manufacturing technologies are recently established strategic relationships with VTT (Finland) and VITO (Belgium).

Core funding supported staff in building collaborations relating to packaging, biorefineries, nanotechnology and 3D printing. During 2015-16 Scion improved the production of different forms of polyhydroxyalkanoate (PHA) through fermentation using organic chemicals such as sugar produced directly from pine wood. An important outcome was our ability to further process the PHA bioplastic using our industrial extrusion processing capability to make new bioplastic composites. These composites applied a circular economy philosophy by including the whole cell biomass and wood processing residues in the composite material. This enables application development of the PHAs using whole cell biomass without the need for purification. An important outcome was the establishment of a reliable source of fermentation-derived polymers to support evaluation of the materials and product applications.

Other programmes at Scion focused on utilisation and product development of bio-derived polymers include proof-of concept production of thermo-formable composites using the biomass that incorporates the PHA, and successful evaluation of these products in some applications and verifying their recyclability. Scion's activities in

this area are closely aligned with targets of the recently established National Science Challenge "Science for technological innovation". New Zealand has the potential to sell customised products, equipment and materials based on New Zealand's biological resources and distributed manufacturing – invigorating existing manufacturing companies and establishing new companies that are fuelling the growing global green sector. We see a big opportunity for New Zealand in the application of biopolymers – natural products, to create new engineered products, such as new plastic-like materials suitable for 3D printing into engineering components and furniture.

Converting 'wastes' into high-value products

Hemicellulose fragments are part of the pulp and paper by-product streams. This project is developing an invention to remove fibre fragments from liquid waste streams and thus produce a very high fibre rich solution that is then able to be used to develop a range of products from composites to chemicals. Alternatively some hemicelluloses may be deliberately removed, leaving a fibre that may perform better in particular applications. Scion has developed a technique to remove resins from pulp and paper waste streams. The technique has been scaled up and laboratory and evaluation trials are underway. Scion's new supercritical plant (1L capacity) has been upgraded for continuous extraction. Early results from DAF sludge (solid residue from the dissolved air flotation process) show promise with further improvements to the plant identified to increase extraction efficiency.

Further work has evaluated the removal of copper-chrome-arsenic (CCA) from woodchips. CCA contaminated waste is a major disposal issue for New Zealand. This year, one promising option used the Ligar technology, where chemical/metal-specific polymers are used to remove, and segregate, the CCA elements for re-use. Early experiments have shown that this technology can effectively remove a high percentage of the chromium, copper and arsenic from a CCA-rich extract stream.

Scion's break-through technology to deconstruct the organic component of waste streams (TERAX™) is a continuing focus. Core funding was used to broaden the application of the platform technology. Specifically a concept for the processing of the organic fraction of municipal organic wastes using the TERAX™ technology has been developed. The ability to reduce landfill by conversion of the organic component into high-value products is potentially a very large economic and environmental opportunity for New Zealand.

Enhancing the resilience of fibre processing industries and fibre composites manufacturing

Core funding was used to develop high-value new generation biocomposites. Finding ways to lightweight materials, such as glass fibre, while maintaining performance and benefitting at end of life are a global challenge. Scion has developed a world-leading approach to integrating polymers and wood-fibre to produce a high performing product able to be developed into complex three dimensional shapes with an excellent sustainability foot print and yet able to be processed in standard industrial manufacturing equipment. This is licensed for manufacture in several countries. During 2015-16, we explored potential improvements to the bonding interface between wood fibres and the polymer matrix in a wood-fibre reinforced composite. WoodForce dice were made using novel additives to improve this interface, and physical testing of the resulting composites demonstrated potential for significant improvements in properties. A large review was completed and accepted into *Materials*, a journal on the use of natural fibres in composites, detailing features of natural fibres and their impact on composites and binding of fibres. These perspectives will feed into the research on fibre properties for new designer trees.

High-value products from lignin

Lignin, about a quarter of the composition of wood, is currently seen as a low-value product arising from wood processing and is burnt for its energy content. Intrinsically it has the potential to directly substitute for petrochemicals. The challenge is to be able to isolate lignin in a useful form and overcome processing challenges typically associated with the high level of variability of materials arising from plant sources. Applications include lignin fibres that can be converted to carbon fibres, or used in polymer blends, for moulded or extruded products and in developing industrial resins for applications ranging from coatings to adhesives. Overcoming processing challenges could lead to high-value industries in New Zealand turning our forests into feedstocks for biorefineries. The production of lignin residues as a by-product of a biorefinery producing wood sugars from radiata has allowed us to add lignin into composite products containing the bioplastic PHA.

Scion's work in deconstructing lignin to produce lignin derivatives formed by hydrogenolysis is continued through an international collaboration with VITO. This approach aims to develop new opportunities for lignin oligomers in multiple industrial uses. A field trial continued during 2015-16 to test, to proof-of-concept, that GM trees with modified lignin will grow well outdoors. The trial will allow us to work out whether the expected improvement in pulping efficiencies (and hence costs and the generation of new biochemicals) can be achieved when the plants are harvested at a later date.

Packaging

Packaging is essential for successful product sales and is a critical element in New Zealand's $60 billion dollar export industry. It is needed to contain and protect the product while communicating essential information and the brand story. Packaging is also an export product in itself and contributes 1.8% of New Zealand's GPD. Globally there is a need for new innovations, which can improve packaging quality, reliability, sustainability and traceability. Conducting research in this space will enable even more value to be gained from this sector.

To support both the wider export sector and the packaging manufacturing sector Scion has established a broad packaging capability that is able to develop new innovations. In the past year, Scion continued to use core funding to develop new technologies, specialised equipment and capability in:

- fibre based packaging including measuring performance in chilled supply chains;
- printing and ink development including printed electronics;
- plastics processing including the development of biobased gas barrier; and
- global requirements to ensure materials are safe for food contact.

This work provides New Zealand-centric solutions giving firms a competitive advantage in materials, product support and new intellectual property. The packaging core funding investment in 2015-16 delivered the following outcomes:

Scion's specially designed cool room (the WHITE room) to accurately control temperature and cycle humidity is fully operational and used by national and global partners for box testing. The cool room is the only facility of its kind in New Zealand, and one of very few globally, providing truly independent test evaluation capability for New Zealand and international firms. More and more industries are focusing on compliance and quality and traceability.

As companies expand their businesses internationally, more regulatory mandates put commercial pressures and expectations on businesses. Regulatory mandates rely on traceability to manage quality, recalls, liability, counterfeit parts, inefficiencies in manufacturing and cost savings. Through an ongoing collaboration with AgResearch and Plant & Food Research we have investigated several technologies enabling packaging to provide product traceability. This work included trials of both near field communication (NFC) tags and isotope testing of papers from different parts of the world (New Zealand, Australia, and Sweden). Tracing involves identifying a part's origin through records and visibility across the supply chain. For example, material certifications, certificates of origin, and purchase order numbers allow parts to be linked back to their sources in the supply chain. Traceability shows the authentication of products.

Scion's moisture barrier coating research has progressed further into commercialisation. A patent for the most recently invented formulation is ready for filing. Three publications, to be published in the coming months, summarise the technology behind Scion's moisture barrier coatings. Additional pre-commercialisation funds (PSAF) were secured and enabled a complementary performance trial of coatings applied on MDF, structural timber, and GIB plasterboard. Preliminary discussions were held with New Zealand and international companies to understand their interest in our coating technologies.

Overall Scion's packaging research has been communicated widely in industry through visits and presentations at conferences and workshops.

Intermediate Outcome 4 Increase New Zealand's energy security through the use of forest biomass, clean technologies and industrial symbiosis			
Alignment to Statement of Core Purpose	**Alignment to Sector Priorities**	**Investment as per the SCI 2015-16**	**Investment Actual**
Increase renewable energy production and energy security by growing New Zealand's ability to produce sustainable bioenergy and liquid biofuel products	New Zealand Bio-energy Strategy WoodCo strategy WPMA Vision 2050.	$2.6 million	$2.6 million

Energy is of critical importance to any economy, particularly its cost, availability and, increasingly, source (renewable or non-renewable). Part of Scion's Core Purpose is to "increase renewable energy production and energy security by growing New Zealand's ability to produce sustainable bioenergy and liquid biofuel products".

The forest industry currently produces about 10% of New Zealand's total energy supply. Expansion of production, increased efficiency and material utilisation (including maximum use of a tree through biorefining approaches) creates substantial direct economic advantage to forest-based industries, and also seeds new manufacturing firms creating benefit to New Zealand. This will increase New Zealand's ability to use renewable energy directly and support the Government's aim to reduce greenhouse gas emissions and reduce sovereign risk through New Zealand's exposure to imported energy sources.

Core funding is focused on providing the underpinning technologies necessary to support the above, identifying the most likely value chains for biofuels implementations and leveraging international research capability for direct New Zealand benefit. Scion continued to contribute to several workshops and exchanges to maintain national and international connections and to support national fora in bioenergy and related fields. This activity involved the Bioenergy Association of New Zealand, Advanced Biofuels Research Network, IEA (International Energy Association) Bioenergy, IRENA (International Renewable Energy Agency)/United Nations Economic and Social Commission for Asia and the Pacific, and an MBIE German exchange.

A senior staff member participated in an expert advisory role for the Royal Society in Climate Change Mitigation, as a board member on BANZ and as a member on the executive committee of IEA Bioenergy. Scion was also interviewed as part of IEA's 5 year review of New Zealand's Energy Strategy. New and strengthened international collaborations were established within the programme. These included Korea Institute of Energy Research, and Fraunhofer Umsicht and Karlsruhe Institute of Technology in Germany. By leveraging off much larger international programmes, Scion has been able to secure access to state-of-the-art knowledge in important areas such as pyrolysis and biochemical conversion of biomass.

Scion's capabilities in biofuels has convinced seven companies, four government agencies and four industry bodies and universities to collaborate in the Biofuels Roadmap project. National linkages with New Zealand universities were also strengthened, particularly via jointly-supervised students with Canterbury, Otago and Waikato Universities. The programme work led to several firms and an iwi investing in the on-going industrial symbiosis programme that started in 2015. The Energy Efficiency and Conservation Agency (EECA) recently joined this programme.

Bioenergy research directly links to our work in developing high-value chemicals from woody biomass. This is part of validating biorefining in New Zealand with the ability to produce high-value products from our forest resources, strengthen existing manufacturing processes and develop new firms. To that end, Scion is developing cost-effective pre-treatment approaches to convert cellulose/hemi-cellulose components into sugar precursors and also capture lignin as a valuable co-product. The focus is to de-risk this technology. Scion has developed a fast pyrolysis unit and established a fluidised bed micro-reactor, which are vital capabilities as we develop our understanding of thermochemical approaches towards biofuel and biochemical production.

Intermediate Outcome 5 Protect and enhance market access and improve risk management in the forest industry including for forest health and preparedness for biosecurity incursions, fire and climate change			
Alignment to Statement of Core Purpose	**Alignment to Sector Priorities**	**Investment as per the SCI 2015-16**	**Investment Actual**
Protect and enhance market access and improve risk management in the forestry industry and enhance New Zealand's opportunity to benefit from forestry based ecosystem services to improve global market position of the industry and the environmental sustainability of forestry production in New Zealand	New Zealand Forest Owners Association, Ministry for Primary Industries	$2.7 million	$2.7 million

Biosecurity

Protecting our forests from biosecurity incursions and fire, sustaining the health of our forests and ensuring phytosanitary related matters do not impact on our export trade are priority areas for the forest industry. Scion's core funding in this area sustains capability of national importance (such as the National Forestry Herbarium), enables development of leading tools and new capabilities, ensures international linkages are sustained and supports future planning. In all these activities, Scion and the forestry industry are strongly connected with substantial industry and government (MPI, Department of Conservation and regional and other authorities) co-funding. Key outcomes for 2015-16 include:

Prevention of new pests

Surveillance of the pathways pests use to enter New Zealand is critical to develop strategies and interventions to minimise pest incursion. Earliest detection, increased probability of eradication, reducing cost without increasing risk to enable greater coverage and increased confidence are critical drivers for New Zealand's border biosecurity approach. Scion updated the costs for all 1,911 area units (parcels of land) in New Zealand for input into a forest biosecurity surveillance optimisation model. Using Bayesian Intelligence models Scion developed a risk map based on infestation rate, volume and movement of vessels, cargo, container, passenger arrivals, used vehicles and other pest pathways for the New Zealand Forest Owners Association (FOA).

This new surveillance system has been developed to the stage where it has been sanctioned as highly appropriate by an Australian surveillance optimisation expert and will be implemented in three regions in September 2016 with the intention of full implementation in early 2017. The system will involve integrating the FOA and MPI surveillance systems into one and addressing some of the operational issues that will arise, i.e. resource allocation, funding, and publicity.

Scion prepared a report that supported a new standard for phytosanitary measures for sea containers that was presented at a special International Plant Protection Convention Commission on Phytosanitary Measures session in Rome in April 2016 and then placed on the IPPC website. For MPI, adoption would allow reallocation of inspection effort from wood packaging to other pathways that are higher risk thereby increasing the probability of intercepting a damaging new pest before it establishes. Unfortunately, only two countries (New Zealand and China) gave immediate support for the new standard. Other countries needed more time to consider and evaluate. A review of global biosecurity undertaken by Scion and colleagues from the University of Pretoria highlighted the urgent need for a global biosecurity strategy for planted forests. The review was published in the prestigious journal *Science* (h-index of 851).

Management of existing diseases and threats

Elimination of red needle cast disease (caused by *Phytophthora pluvialis)* on trees is an important national and industry priority. Phosphite in the form of Foschek is being tested to control this disease, along with copper. An

aerial spray trial was established in February 2016, bringing New Zealand one step closer to a chemical control for red needle cast. Copper is also showing promise as an alternative chemical control agent (efficacy on young pines in pots under controlled conditions appears to persist for at least six months but this needs to be confirmed in the field trial). Scion has evaluated industry relevant radiata pine genotypes for susceptibility to red needle cast with some showing resistance. Laboratory and field tests to screen *Pinus radiata* clones against red needle cast have produced broadly consistent results, showing promise for eventual operational deployment of breeds resistant to the disease.

Significant progress in the analysis of metabolomics data over time has been made. We have some indication of constitutive and induced chemical responses which differ for resistant and susceptible clones. This is an important first step to identifying clones that may be resistant to a number of diseases.

Phytophthora-based functional genomics research allowed publication of genome sequences of six *Phytophthora* species associated with forests in New Zealand. Kauri dieback (*Phytophthora agathadicida*) remains a substantial threat to one of New Zealand's most iconic species. In conjunction with MPI and with several collaborators, we compiled a conceptual plan of research to develop a decision support tool to aid in the management of kauri dieback to achieve the following outcomes: (1) predicting likely spread of *P. agathadicida* and where it might establish, (2) optimising allocation of resources to areas most at risk to new infestation, and (3) identifying management interventions that are most likely to maintain an area of freedom. These three objectives will be delivered in a robust, consistent and defensible manner. In July 2016, the plan was submitted to the Biological Heritage National Science Challenge for consideration.

Scion was invited to host a kauri dieback hui and the relationship with iwi was confirmed with a significant gift of Te Punga (an anchor of relationship with Tangata Whenua Roopu) being presented to researchers.

Aerial spraying is an important way to apply control media for a range of needs. Spray models are critical tools to ensure that spray drift is minimised. The AGDISP™ Spray Model is the model most employed for aerial spraying of forests. However, there is concern that the roughness of the forest canopy is creating turbulence and may be responsible for the AGDISP™ not accurately predicting aerosol spray drift. To validate this, Scion undertook a large field trial using the University of South Carolina's backscatter LiDAR to measure the aerosol droplet cloud drift over a pine plantation. Preliminary results indicate that the AGDISP™ model overestimates spray drift by potentially up to a factor of 10 and underestimates deposition. Improvements to AGDISP™ will be made after further analysis and confirmation of these early numbers. This will benefit control and eradication programmes that have to maintain a high environmental standard of reduced drift while placing enough pesticide in the canopy to meet application objectives.

Market protection

A prototype landscape model of forest insect abundance was developed and presented to the industry group focusing on reducing the use of methyl bromide as a fumigation chemical (STIMBR) and MPI. The Forest Insect Trapping Network (FITN) has continued to collect immense amounts of data from the 32 forest and five port sites throughout New Zealand. The network has processed 924,857 insects of interest since it began in 2013. These data were used recently to support MPI's adoption of new post fumigation exposure periods for Northland. Post fumigation periods during winter have been set at seven days for Northland and 21 days for the rest of the country. These new rules have relied heavily on the FITN and illustrate the power of data in reducing uncertainty and providing confidence to decision makers when they make recommendations.

A major end goal is adoption of a phytosanitary treatment-free winter period. This will save the forest produce export sector direct costs and reduce methyl bromide use. Stakeholders will evaluate the programme in mid-August to decide on what research they will co-fund to allow MPI to negotiate adoption of a fumigation-free period by trading partners. With core funding support over 30 papers were published in journals showing higher year on year impact.

Fire protection

Loss from fire and the increasing risk of fire in New Zealand forests and rural landscape is a serious issue for New Zealand and is expected to increase as temperatures rise and weather becomes more variable owing to climate change. A review of the Nelson/Marlborough forestry operations fire danger codes has been completed, and new guidelines are with forestry and rural fire managers. The first of the area plans in each of the Nelson and Marlborough regions produced using the Strategic Tactical Fire Management Planning (STFMP) process has also been completed, and work has started on the second year area plans. These plans will improve response to fires and should result in reduced loss of property and assets. A series of large experimental burns on blocks of young

wilding lodgepole pines (*Pinus contorta*) were completed in March 2016 at Pukaki Downs Station in the Mackenzie Basin. The burns allowed scientists to quantify fire behaviour in sprayed and unsprayed stands of wildings, and obtain data on fuel loadings, fire spread rates and smoke behaviour. Some of the equipment and techniques have been developed specifically for this project. An early outcome of this work was the successful deployment of newly-developed meteorological gear and fire behaviour sensors.

Herbarium

Core funding enabled the maintenance and growth of the National Forest Herbarium, a nationally significant database and collection under Scion's stewardship. The herbarium continues to acquire new specimens from various sources, including specimens sent for identification, particularly from biosecurity surveys of sites considered at high risk of incursions, and research reference specimens. Targeted collecting each year is focusing on cultivated trees. New distribution records for existing collections were also undertaken. A total of 653 specimens were added to the collection during the year. In addition, 1274 specimens were imaged and 1548 nomenclature edits to species were made.

An interactive identification key for wilding conifers in New Zealand has been developed in collaboration with Landcare Research and Department of Conservation and will be made available as a smartphone app soon. The key contains 10 common wilding pine species plus macrocarpa, European larch and Douglas-fir. Two publications, five popular articles and two identification keys were produced over the year.

Intermediate Outcome 6

Ensure the forest industry's licence to operate (and reputation) through workers' safety and capabilities, verifiable environmental performance, product traceability and modern standards; and, by anticipating long-term change

Alignment to Statement of Core Purpose	Alignment to Sector Priorities	Investment as per the SCI 2015-16	Investment Actual
Protect and enhance market access and improve risk management in the forestry industry	New Zealand Forest Owners Association, Ministry for Primary Industries	$0.2 million	$0.2 million

Safety

Core funding facilitated the critical analysis and synthesis of the current conceptual and methodological approaches to safety, health and wellbeing of people in the New Zealand forestry industry. Our capability is now well aligned with key players in the industry following an extensive ongoing engagement process, and this has also resulted in strong linkages with national programmes in fire research, robotics, social sciences, economics and Māori research.

Core funding is being used in a two-pronged approach to increase the safety of forest workers. Firstly, we used core funding to leverage industry funding to undertake a pilot trial to demonstrate a new method of accident investigation with the goal of transforming how such investigations are undertaken. This new approach focuses on the learnings from the investigation rather attributing blame for the accident. This follows the steps of the USDA Forest Service, which has successfully replaced accident investigation with a process called the Learning Review. Planning is underway to bring the developers of the "Learning Review Process" to New Zealand in September 2016 to participate in industry workshops with the support of the Forest Industry Safety Council.

Secondly, funding has been used to explore new approaches based on neuropsychology that work with, rather than against, the brain's natural mode of functioning to maximise performance, optimise decision-making, accelerate and enhance learning, and improve and sustain cognitive and behavioural performance. Further research will provide us with the understanding necessary to enhance the ability to respond, monitor, anticipate and learn in a high risk environment. One goal that has been identified is the need for an immersion learning environment tool kit for the forest industry due to its unpredictable, high risk, high complexity environments. Such a tool kit would help improve adaptive decision making.

Supporting tāonga species

Scion invested a small amount of core funding to regenerate white ngutukākā, an endangered and important tāonga species. The material Scion propagated was planted in secure locations in New Zealand. This work utilised Scion's leading-edge expertise in nursery propagation.

White ngutukākā (kaka beak/*Clianthus maximus*) took its first step to returning home at a ceremony at Scion in October 2015. The Hon. Maggie Barry, Minister for Conservation, officiated at the event and said "Today marks a significant genetic breakthrough with a variety of white ngutukākā long thought extinct having been propagated at Scion's nursery in Rotorua. This day is very exciting for those involved at Scion, and also for the local Hapu Ngāti Kohatu and Ngāti Hinehika, from the Te Reinga and Erepiti Marae in the Whakapunake range near Wairoa – where this rare variety of the plant originally came from. The Department of Conservation has been working closely with iwi and Scion on ensuring the plant is successfully returned to the area where it once flourished."

White ngutukākā took its second homeward step in May 2016 when the white ngutukākā ma iwi (Ngati Hine Hika / Ngati Kohatu) welcomed over 100 people onto their Te Reinga Marae. Local mayors from Waiora and Gisborne spoke and children from the marae planted about 30 white ngutukākā in a specially prepared garden near the marae. Māori TV captured the emotional event and aired it on the Marae programme. Radio NZ also covered the event and ran a story on its website.

Informing the GM debate

Scion provided input into the national debate on New Zealand policy on genetic modification technologies by presenting to industry and policymakers an authoritative robust scientific perspective on alternative biotechnologies through workshops and seminar presentations. Scion also contributed to judicial hearings in the local government sector and the national and regional debate on biotechnology.

Standards for wood products, packaging and new biobased products

Scion continued to provide independently sourced data for industry that enables review and updating of many of the New Zealand and Australasian standards that incorporate the use of wood to ensure their ongoing ease of use and relevance to modern timber use, design and safety. Together with the Wood Processors and Manufacturers Association, Scion was able to get the New Zealand structural grades included in the Chinese Timber standard GB50005. Progress on the revision of NZ timber design standard NZS3603 has been slow with the amalgamation of Standards NZ into MBIE and in coordinating industry input. A set of standard laminated veneer lumber (LVL) grades have been developed, which will drive the wider uptake of LVL in structures.

CORPORATE GOVERNANCE

Scion's Board of Directors is appointed by its shareholding Ministers, the Minister of Science and Innovation and the Minister of Finance. All members of the Board are independent. The responsibility of the Board is to guide and monitor the business of Scion and its subsidiaries including:

- reviewing and approving Scion's strategy and Statement of Corporate Intent;
- adopting policies of corporate conduct (including risk management and delegations of authority) and ensuring that systems and procedures are in place to carry out those policies;
- adopting annual operating and capital plans, and budgets;
- monitoring performance against key objectives and budgets on a monthly basis;
- ensuring Scion proactively meets all health and safety requirements;
- evaluating the performance of the Chief Executive; and
- reviewing and improving the effectiveness of the Board.

The Board operates in accordance with Scion's Constitution. It has up to seven directors who meet 11 times over the year either in person or by video conference. The Chief Executive and Chief Financial Officer (who is also the Company Secretary) attend all meetings. The Board may retain independent advisers, including independent legal counsel or other experts, as it deems appropriate. The Board's Strategic Advisory Māori Panel (Ngā Rangatira Rōpu) provides input to Scion's Te Papa Tipu (Māori) plan and its effective implementation.

The Board has two standing committees, the Audit and Risk Committee and the Remuneration and Organisation Committee. These meet twice yearly but may meet more regularly if the need arises.

The function of the Audit and Risk Committee is to assist the Board in discharging its responsibilities regarding financial reporting, regulatory conformance and matters of risk management. The committee is the liaison point for internal and external auditors, assesses the performance of financial management (the investment cases for major items of capital expenditure), reviews audit findings, the annual financial statements and interim financial information, and has oversight of the development and review of policies to ensure compliance with statutory responsibilities.

The function of the Remuneration and Organisation Committee is to assist the Board in the establishment and regular review of remuneration and organisation policies and practices, and to assist the Board in discharging its responsibilities relating to the appointment, remuneration setting and review of Scion's Chief Executive. The committee also approves the appointment and remuneration of senior executives and inputs into and monitors achievement of the annual Health and Safety Plan.

Each committee is composed of no less than three members of the Board, appointed by the Board from time to time; and meets at least twice annually and intersessionally as required. While the Chair of the Board is an ex-officio member of each committee and has full voting rights, s/he may not be Chair of the Audit and Risk Committee.

All Directors are entitled to attend all committee meetings. Each committee establishes annual work plans and undertakes an annual review of its objectives and responsibilities, and its terms of reference. Each committee also makes regular reports to the Board.

The Board's risk management policy and procedures involve formal reporting by management of the most significant risks Scion is exposed to, and the Board regularly monitors management of those risks. Over the past 12 months the Board has had a strong focus on strengthening cyber security. There is also regular monitoring and reporting on progress in meeting recommendations made by external auditors, and independent advice such as this year in relation to health and safety.

DIRECTORS' REPORT

Principal Activities

New Zealand Forest Research Institute Limited (trading as Scion) is a company registered under the Companies Act 1993. Our principal activity is to conduct research in accordance with the purpose and principles specified in Sections 4 and 5 of the Crown Research Institutes Act 1992 (the Act). Scion has met all the obligations under the Act for the year ended 30 June 2016.

Scion is a commercially focused science and technology company, delivering solutions to both commercial and Crown clients. While the principal research facility is located in Rotorua our co-location with the School of Forestry at the University of Canterbury provides access to complementary capabilities on the campus and postgraduate students.

Scion has two wholly-owned subsidiaries (Te Papa Tipu Properties Limited and Sala Street Holdings Limited), is a 50% shareholder in Terax 2013 Limited and is a 50% partner in Terax Limited Partnership, and has a 33% shareholding in an associate company Biopolymer Network Limited. Scion is a member of the research consortium WQI Limited with a 5.05% shareholding.

- Te Papa Tipu Properties Limited owns the Group's land assets.
- Sala Street Holdings Limited is a holding company, holding Scion's 50% share of Terax 2013 Limited and Terax Limited Partnership.
- Terax 2013 Limited is the general partner for Terax Limited Partnership.
- Terax Limited Partnership is a limited partnership jointly owned by Scion (through Sala Street Holdings Limited) and Rotorua District Council and has been set up to commercialise a waste minimisation process.
- Biopolymer Network Limited is an incorporated joint venture whose purpose is to create technologies for advancing the utilisation of renewable bio-based materials in industrial applications.
- WQI Limited is a consortium that carries out research focused on wood quality, appearance and stability that can affect the performance of the wood, and to develop effective segregation methods and technologies that allow the industry to gain maximum value from their timber resource. WQI Limited ceased trading on 30 June 2016 and moved into a solvent liquidation process from 1 July 2016.

Summary of Group Financial Results to 30 June 2016

	2016 $000	2015 $000
Operating revenue	49,599	47,340
Surplus before taxation	2,494	3,370
Taxation expense	(657)	(940)
Net surplus attributable to the shareholders	**1,837**	**2,430**
Equity		
Issued and paid up capital	17,516	17,516
Retained earnings	18,808	16,971
Reserve	61	61
Total equity	**36,385**	**34,548**

Scion's strategy focuses on delivering science and technologies in the following key areas:

- Commercial forestry
- Wood products and processing
- Wood fibre, biopolymer and biochemical industries
- Forest industry risk and adaptation
- Licence to operate
- Bioenergy and energy security though forest biomass.

The Statement of Corporate Intent maps out the strategic framework for Scion to achieve outcomes aligned to its Statement of Core Purpose, and the New Zealand Government's overarching objective for Crown Research Institutes to lead the country's economic growth with improved environmental, social and cultural outcomes; in particular increase export earnings to the equivalent of 40% of GDP by 2025.

Scion's science and commercial focus is strongly aligned with the opportunities being presented locally, nationally and globally, and when brought together, will continue to enable Scion to provide leadership on issues of local, national and global significance.

Remuneration and Compensation

Remuneration and compensation included performance awards, superannuation benefits, and KiwiSaver subsidy. Some other benefits were not quantified and are therefore excluded, including staff parking, home telephone, and membership of relevant professional societies.

Bands	Number in Each Band
$450,000 - $459,999	1
$280,000 - $289,999	1
$240,000 - $249,999	1
$220,000 - $229,999	1
$210,000 - $219,999	1
$170,000 - $179,999	2
$160,000 - $169,999	1
$150,000 - $159,999	2
$140,000 - $149,999	4
$130,000 - $139,999	6
$120,000 - $129,999	7
$110,000 - $119,999	11
$100,000 - $109,999	11

During the year ended 30 June 2016, $124,016 was paid to 7 employees in relation to cessation of employment with Scion (2015: $195,901 to 8 employees). Cessation payments included $107,463 of retirement benefits (2015: $87,761).

Dividend

No dividend was recommended for the year ended 30 June 2016 (2015: $0k).

Director Profiles

Mr Anthony (Tony) Nowell CNZM (Chair) is a professional company Director and Founding Director of Valadenz Limited, a trade and export development company. Previously he was the CEO of Zespri International, and positions he held before then included Managing Director of Griffin's Food Limited and Regional Vice President of Sara Lee Asia. Mr Nowell brings extensive experience in corporate management, governance and international trade and development to the Board. He is currently Chair of Wellington Drive Technologies Limited, The Omega Lamb Primary Growth Partnership and the Asia Pacific Food Industry Forum, and is a board member of New Zealand Food Innovation Auckland Limited and Food Standards Australia New Zealand (FSANZ). Mr Nowell represents New Zealand on the APEC Business Advisory Council (ABAC) and the APEC Policy Partnership for Food Security (PPFS). He has previously chaired the New Zealand Food and Grocery Council, the New Zealand Food and Beverage Taskforce, the New Zealand Packaging Accord Governing Board, was Deputy Chair of Leadership New Zealand and recently completed his term as a member of the Export Advisory Board of Business New Zealand.

Mrs Judith Stanway (Deputy Chair), a Fellow of the New Zealand Institute of Accountants, has recently retired as a partner of BDO Rotorua Limited. A former Chair of BDO New Zealand Limited, a New Zealand-wide Chartered Accountancy and Business Advisory firm, Mrs Stanway is also a Fellow of the New Zealand Institute of Directors and a Director of Wharerata Forest Limited, Te Papa Tipu Properties Limited and a number of private companies. She has also chaired the Lakes District Health Board and been a Director of Te Puia. Mrs Stanway lives in Rotorua, has worked with the forestry sector for many years and has wide experience in tourism and with charitable organisations and was a Director of the Charities Commission. Judith was also chosen as 2012 Rotorua Business Person of the Year.

Ms Elizabeth Chambers (Director) is a Chartered Member of the Institute of Directors (New Zealand) and the founder of Carbon Match, New Zealand's first online trading platform for emissions units acceptable under the New Zealand ETS, primarily serving the energy and forestry sectors. Ms Chambers has a strong interest and practical experience in the development and harnessing of environmental markets, building on her background in finance. Her career to date has included time at PwC, Cameron Partners and Climate Change Capital, a London-based carbon fund. She has advised energy majors, forestry companies and landowners in relation to their carbon market exposure. She holds a Masters in Utilities Regulation from the London School of Economics and Political Science, a Bachelor of Arts in German and a Bachelor of Commerce with first class honours in Finance from Victoria University. Ms Chambers resigned on 31 December 2015.

Mr Sheldon Drummond (Director) has worked in the forest and wood processing industry for more than four decades, having held a range of senior company executive roles as well as industry board positions over time. Mr Drummond has forestry as well as wood technology qualifications and from his years of experience in both sectors of the industry has a very detailed knowledge of the forestry and wood products business. As a board member at Scion for the past eight years he brings together the research and industry knowledge to assist Scion's progression for the industry benefit.

Ms Colleen Neville (Waikato-Tainui) (Director) is the Rotorua-based Chief Executive Officer of Te Arawa Group Holdings Limited. She is a chartered accountant and has 17 years' experience in a range of financial roles for national and international companies. Ms Neville has governance experience as a Director of Te Arawa Group Holdings Limited subsidiaries, Te Kakano Whakatipu Limited & Te Ohu Kaimoana Portfolio Management Services Limited, and a trustee for Poutama Trust. She is a former Vice-Chair of Te Reo Irirangi o Te Arawa, former trustee of a large sheep and beef cattle farming trust, and former Director of the Rotorua Public Health Organisation.

Dr Barry O'Neil (Director) is currently Chief Executive of Kiwifruit Vine Health, the organisation leading the response to the bacterial vine disease Psa-V. Dr O'Neil is also a Director of Biosecurity NZ Limited, a company specialising in biosecurity consultancy, and is an independent Director on the Bio-Protection Research Centre based in Lincoln, an independent Director of Horticulture NZ, and is on the governance group of Our Biological Heritage National Science Challenge. He has significant biosecurity and leadership career experience from several years in senior management and leadership roles in government, working in New Zealand and overseas. His experience includes policy and international standard setting and trade negotiations; and operational biosecurity risk-management activities involving the border, surveillance, response and eradication. Dr O'Neil also owns a kiwifruit orchard in Katikati.

Mr Jon Ryder (Director) is currently the Chief Executive Officer of Oji Fibre Solutions (Oji FS) – Pulp, Paper and Packaging and is directly responsible for all activities of these businesses: health safety and environment, EBIT, manufacturing, engineering, sales and marketing and strategic development. Jon has gained over 25 years' experience in the forestry, pulp and paper business. Jon's interest in the industry started from his biochemistry degree from Manchester University and then a PhD from UMIST in Pulp and Paper Manufacturing. His career has spanned international boundaries starting in the United Kingdom in technical and production management of fine coated paper mills, in New Zealand with packaging paper manufacturing at Kinleith and then pulp mill management experience at Tasman. He also managed the pulp and paper mills in Australia as well as sales and marketing functions for Australian Papers. Jon returned to New Zealand in 2012 to take up the challenge of CEO of the business formerly known as Carter Holt Harvey Pulp, Paper and Packaging. The name changed to Oji Fibre Solutions (Oji FS) in November 2015 following the sale of the business on 1 December 2014 to a joint venture between Oji Holdings and Innovation Network Corporation of Japan (INCJ). Mr Ryder commenced on 1 January 2016.

Changes in Directors

Ms Elizabeth Chamber's term concluded on 31 December 2015. Mr Jon Ryder commenced on 1 January 2016.

Directors' Interests

Any business the company has transacted with organisations in which a Director has an association has been carried out on a commercial 'arms-length' basis.

Directors' Remuneration

	Scion 30 June 2016	Te Papa Tipu Properties Ltd 30 June 2016	Terax 2013 Ltd 30 June 2016	Total 30 June 2016
Tony Nowell	58,000			58,000
Judith Stanway[1]	37,500	4,000	8,000	49,500
Elizabeth Chambers	14,250			14,250
Sheldon Drummond	28,500			28,500
Colleen Neville	28,500			28,500
Barry O'Neil[2]	30,500			30,500
Jon Ryder	14,250			14,250
Total	**$240,000**	**$4,000**	**$8,000**	**$252,000**

[1] Chair Audit and Risk Committee

[2] Chair Remuneration and Organisation Committee

Use of Company Information

During the year no notices were received from members of the Board requesting to use Scion information received in their capacity as Directors which would not otherwise have been available to them. Additions to the Interests Register are noted in the profiles above.

The State of the Company's Affairs

A commentary on the year's performance is outlined in the Chair's and Chief Executive's Report and in the opinion of the Directors, the state of the company's affairs continues to be satisfactory and the outlook bright.

Auditor

In accordance with Section 21 of the Crown Research Institutes Act 1992, the Office of the Auditor General is Auditor for the Company and, pursuant to Section 29 of the Public Finance Act 1977, has appointed Ernst & Young to undertake the audit on its behalf.

Directors' Indemnity and Insurance

Scion has insured all Directors and the Directors of its subsidiaries against liabilities to other parties (except to Scion or a related party of Scion) that may arise from their position as Directors. The insurance does not cover liabilities that may arise from criminal actions.

For and on behalf of the Board
Tony Nowell CNZM
Chair

24 August 2016

Statement of Responsibility

The following statement from the Board is made in accordance with Section 155 of the Crown Entities Act 2004:

1. The Board is responsible for the preparation of the annual financial statements and the judgements used in these.

2. The Board is responsible for establishing and maintaining a system of internal control designed to provide reasonable assurance as to the integrity and reliability of the financial reporting.

3. In the opinion of the Board, the annual financial statements for the year ended 30 June 2016 fairly reflect the financial position and operations of the New Zealand Forest Research Institute Limited.

Tony Nowell CNZM
Chair

Judith Stanway
Director

24 August 2016

PERFORMANCE TARGETS

	Actual 2016	Budget 2016	Actual 2015
Efficiency:			
Operating margin	15.1%	13.0%	14.8%
Operating margin per FTE	$26,564	$21,816	$24,283
Risk:			
Quick ratio	2.39:1	1.24:1	1.86:1
Interest coverage	N/A	N/A	N/A
Operating margin volatility	20.9%	16.0%	22.6%
Forecasting risk	1.7%	0.4%	1.5%
Growth/Investment:			
Adjusted return on equity	4.4%	4.7%	7.4%
Revenue growth	4.8%	3.4%	(2.1%)
Capital renewal	0.5x	2.0x	1.1x

Formula for the above calculations can be found at:
http://www.mbie.govt.nz/info-services/science-innovation/research-organisations/crown-research-institutes/cri-toolkit/section-3/#generic-indicators

NON-FINANCIAL INDICATORS

MBIE survey of CRI stakeholders

The CRIs' shareholding Ministers are interested in how the performance of a CRI changes over time, and in how a CRI can improve its performance. Engagement with stakeholders is vital, as that is how we develop and deliver maximum value from our science research. To measure the effectiveness of CRI engagement the Ministry of Business, Innovation & Employment commissioned Colmar Brunton to survey stakeholders on end-user collaboration; research priorities; technology and knowledge transfer; and overall satisfaction.

The CRI stakeholder survey, which was conducted online from 18 May to 20 June 2016, was completed by 277 stakeholders representing a 39 per cent response rate. Within the total sample, 70 stakeholders commented on Scion.

Scion Results

Scion respondents came from a wide variety of sectors. Three in ten were domestic businesses, this is a significantly higher proportion than in 2014.

Setting research priorities

Almost 9 in 10 agreed that Scion understands their research priorities (86%). Just under 7 in 10 (69%) agreed that their priorities are considered by Scion when the CRI sets its own research priorities. The vast majority (90%) agreed that Scion understands their sector's priorities. Three-quarters (75%) agreed that the priorities of their sector are considered when Scion sets its own priorities. Just under 8 in 10 are satisfied with the way Scion sets their priorities (78%). This is not significantly different from 2014, but it is significantly higher than the CRI average.

Interacting with Scion

Consistent with previous years, over 8 in 10 (85%) are satisfied with the overall quality of their experience with Scion. When asked what Scion could do to improve the relationship, the most common suggestions focused on increased interaction with industry (around industry useable outcomes) and increased collaboration. When asked for the main strengths of Scion, stakeholders focused on the technical expertise of the CRI, the staff, and the focus on sector goals and needs.

Knowledge and technology transfer

As in 2014, just under 9 in 10 (85%) are satisfied with accessing knowledge or technology from Scion. The three largest barriers to knowledge and technology transfer with Scion are:

- the costs charged by Scion (56% view this as a barrier – CRI average is 54%).
- intellectual property protection (46% view this as a barrier – CRI average is 32%).
- internal costs in the stakeholder's own organisation (36% view this as a barrier – CRI average is 40%).

Research collaboration

Eighty per cent are satisfied with their experience of being a collaborator with Scion, and over 8 in 10 (84%) have confidence that Scion can put together the most appropriate research teams. Positive comments about collaboration include the time spent up-front by Scion to understand the project and client needs, and the ability to translate findings into practical and usable information. When asked for the main barriers to improved collaboration with Scion, funding was frequently mentioned, as was the cost of services. Beyond this, the ownership of Intellectual Property and the lack of understanding of their services are also seen as barriers.

Indicator	2014 Result %	2016 Result %
Overall stakeholder satisfaction	85	85
Confidence Scion considers sector's priorities	66	75
Confidence Scion an put together most appropriate research teams	88	84
Stakeholder adopted knowledge or technology from Scion in past 3 years	94	94

The survey also was useful in identifying areas where we can improve. The most common suggestions for improving our relationship with stakeholders focussed on increased interaction with industry and increased collaboration. Some other comments reflected suggested improvements around commercialisation, resources and purpose.

Scion 2016 Customer Survey

Towards the end of the financial year Scion interviewed several customers to gain a deeper understanding of their issues and needs. To supplement feedback received from key government stakeholders, customers representing industry end-users across the value chain were invited to take part in this informal survey.

Overall, the organisations interviewed were pleased with the relationship they had with Scion. They commented on improvements made in recent years and encouraged this to continue.

> *The relationship with Scion is good and highly valued.*
>
> *The relationship with Scion is very good. It is easy to access and communicate with both technical and executive staff.*

A strong theme was keeping a focus on them as customers and working with them in an open, collaborative way to really understand their needs and business model.

> *Scion gives sophistication to [our company] and thinks outside the square which is adding considerable value.*

The direct interaction with scientist and other Scion staff was highly appreciated - many interviewees identified and complemented specific staff. They were seen both as sources of expert advice and alternative viewpoints.

> *The Rural Fire Research Team has been very good at adapting research from off shore to the New Zealand context and rolling it out to industry. They are very good at tech transfer and have a high degree of respect with industry.*

The future direction for solid wood manufacturing R&D (including standards and wood durability) was identified as a 'gap' following the end of the research consortium Solid Wood Innovation in June 2016.

This informal survey was valuable, and actions are planned to respond to the issues and opportunities raised.

Non-financial targets

	Indicator name	Measure	Frequency	2016 Target	2016 Actual
CRI generic indicators	End user collaboration	Revenue per FTE ($) from commercial sources	Quarterly	$64,202	$67,034
	Research collaboration	Number of peer-reviewed publications with collaborators	Quarterly	≥80	109
	Technology and knowledge transfer excellence	Commercial (commissioned) reports	Annual	≥200	269
	Science quality	Impact of science publications	Annual	H index 60 Citations 6	71 9
	Financial indicator	Revenue per FTE ($)	Quarterly	$167,271	$174,340

	Indicator name	Measure	Frequency	2016 Target	2016 Actual
CRI generic indicators	Stakeholder engagement	Relevant funding partners and other end users (number and %) that have a high level of confidence that Scion sets research priorities relative to the forest industry and biomaterials sector	Biennial	MBIE survey n>30; 85%	n=61; 75%
		National and international research providers (%) who have a high level of confidence in Scion's ability to assemble the most appropriate research team	Biennial	>85%	84%
		Relevant end-users (%) who have adopted knowledge and/or technology from Scion	Biennial	>90%	94%
Scion strategic indictors	Maori economic development	Partnerships (number (n) and value ($)) established with Māori entities to support economic development through the forest industry	Quarterly	n>5; >$1.0m	n=15 $1.9m
	Accelerated commercialisation	Technologies in Scion's pipeline (number and co-investment ($)); projects that progress to the business case stage (case studies)	Quarterly	25 & $600k; Cases ≥4pa	28 & $625k 5
	Internationalisation	Joint research and technology development programmes and staff exchanges with Scion's international strategic partner organisations	Six monthly	>5 1	>15 1
	People and culture	Staff recruitment and retention (quality and days to fill); leadership development (assessment); good employer (EEO rating); health and safety; and internal staff satisfaction survey (biennial)	Annual and Biennial	Qualitative <50 days; EEO rating; 0 Zero harm	49 days to fill; 7.1% turnover; EEO#1 level; 1 serious harm

Additional indicators introduced in 2016

	Indicator name	Measure	Frequency	2016 Forecast	2016 Actual
CRI generic indicators	Research collaboration	Percentage of peer-reviewed publications with collaborators	Quarterly	**70%**	73%
	Technology and knowledge transfer excellence	Number of commercial/ customer reports per Scientist FTE	Annual	**2.2**	1.9
	Science quality	Mean journal impact factor	Annual	2.6	2.35

Building a better working world

INDEPENDENT AUDITOR'S REPORT

TO THE READERS OF NEW ZEALAND FOREST RESEARCH INSTITUTE LIMITED GROUP'S FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2016

The Auditor-General is the auditor of New Zealand Forest Research Institute Limited. The Auditor-General has appointed me, Susan Jones, using the staff and resources of EY, to carry out the audit of the financial statements of the group, consisting of New Zealand Forest Research Institute Limited and its subsidiaries (collectively referred to as 'the group'), on her behalf.

Opinion

We have audited the financial statements of the group on pages 34 to 60, that comprise 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 ended on that date and the notes to the financial statements that include accounting policies and other explanatory information.

In our opinion the financial statements of the group

- present fairly, in all material respects:
  - its financial position as at 30 June 2016; and
  - its financial performance and cash flows for the year then ended; and
- comply with generally accepted accounting practice in New Zealand and have been prepared in accordance with New Zealand equivalents to International Financial Reporting Standards and International Financial Reporting Standards.

Our audit was completed on 24 August 2016. This is the date at which our opinion is expressed.

The basis of our opinion is explained below. In addition, we outline the responsibilities of the Board of Directors and our responsibilities, and we explain our independence.

Basis of opinion

We carried out our audit in accordance with the Auditor-General's Auditing Standards, which incorporate the International Standards on Auditing (New Zealand). Those standards require that we comply with ethical requirements and plan and carry out our audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

Material misstatements are differences or omissions of amounts and disclosures that, in our judgement, are likely to influence readers' overall understanding of the financial statements. If we had found material misstatements that were not corrected, we would have referred to them in our opinion.

An audit involves carrying out procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on our judgement, including our assessment of risks of material misstatement of the financial statements whether due to fraud or error. In making those risk assessments, we consider internal control relevant to the group's preparation of the financial statements that fairly reflect the matters to which they relate. We consider internal control 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 group's internal control.

Building a better working world

An audit also involves evaluating:

- the appropriateness of accounting policies used and whether they have been consistently applied;
- the reasonableness of the significant accounting estimates and judgements made by the Board of Directors;
- the adequacy of all disclosures in the financial statements; and
- the overall presentation of the financial statements.

We did not examine every transaction, nor do we guarantee complete accuracy of the financial statements. Also, we did not evaluate the security and controls over the electronic publication of the financial statements.

We believe we have obtained sufficient and appropriate audit evidence to provide a basis for our audit opinion.

Responsibilities of the Board of Directors

The Board of Directors is responsible for the preparation and fair presentation of financial statements for the group that comply with generally accepted accounting practice in New Zealand, New Zealand equivalents to International Financial Reporting Standards and International Financial Reporting Standards.

The Board of Directors' responsibilities arise from the Crown Research Institutes Act 1992.

The Board of Directors is responsible for such internal control as it determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error. The Board of Directors is also responsible for the publication of the financial statements, whether in printed or electronic form.

Responsibilities of the Auditor

We are responsible for expressing an independent opinion on the financial statements and reporting that opinion to you based on our audit. Our responsibility arises from section 15 of the Public Audit Act 2001.

Independence

When carrying out the audit, we followed the independence requirements of the Auditor-General, which incorporate the independence requirements of the External Reporting Board.

Other than the audit, we have no relationship with or interests in the Group.

Susan Jones
EY
On behalf of the Auditor-General
Auckland, New Zealand

GROUP STATEMENT OF COMPREHENSIVE INCOME
FOR THE YEAR ENDED 30 JUNE 2016

	Note	ACTUAL 2016 $000	BUDGET (unaudited) 2016 $000	ACTUAL 2015 $000
Revenue	2 (a)	**49,599**	49,329	47,340
Other Income/(Expenditure)	2 (b)	**297**	0	16
Expenditure	3 (a)	**(47,001)**	(46,776)	(43,863)
Finance Costs	3 (b)	**0**	0	(1)
Share of Profit/(Loss) of Associates	14 (b)	**(401)**	(200)	(122)
Profit Before Tax		**2,494**	2,353	3,370
Tax Expense	9	**(657)**	(727)	(940)
Total comprehensive income for the period attributable to the shareholders of the parent company		**1,837**	1,626	2,430

The accompanying notes form part of these financial statements.

GROUP STATEMENT OF CHANGES IN EQUITY
FOR THE YEAR ENDED 30 JUNE 2016

	Ordinary Shares	Asset Revaluation Reserve	Retained Earnings	Total	Ordinary Shares	Asset Revaluation Reserve	Retained Earnings	Total
	2016 $000	2016 $000	2016 $000	2016 $000	2015 $000	2015 $000	2015 $000	2015 $000
GROUP								
Balance as at 1 July	**17,516**	**61**	**16,971**	**34,548**	17,516	61	14,541	32,118
Profit for the period	0	0	1,837	1,837	0	0	2,430	2,430
Total comprehensive income	**0**	**0**	**1,837**	**1,837**	0	0	2,430	2,430
Balance as at 30 June	**17,516**	**61**	**18,808**	**36,385**	17,516	61	16,971	34,548

The accompanying notes form part of these financial statements.

GROUP STATEMENT OF FINANCIAL POSITION
AS AT 30 JUNE 2016

	Note	ACTUAL 2016 $000	BUDGET (unaudited) 2016 $000	ACTUAL 2015 $000
Equity				
Share capital	5	17,516	17,516	17,516
Retained earnings	5	18,808	18,030	16,971
Revaluation reserve	5	61	61	61
		36,385	35,607	34,548
Non-Current Liabilities				
Provisions	6	472	404	439
Defined benefit plan	7(a)	796	995	898
Deferred tax liability	9(d)	1,132	2,116	1,957
		2,400	3,515	3,294
Current Liabilities				
Trade and other payables	8	8,013	8,391	7,682
Provisions	6	256	190	235
Defined benefit plan	7(a)	200	155	62
Tax payable		780	206	489
		9,249	8,942	8,468
Total Equity and Liabilities		48,034	48,064	46,310
Non-Current Assets				
Property, plant and equipment	10	27,346	36,157	30,353
Biological assets	11	550	504	466
Intangible assets	12	746	330	511
Investments in associates	14	332	257	313
Other investments		30	30	30
		29,004	37,278	31,673
Current Assets				
Cash and cash equivalents	15	11,433	3,331	7,744
Trade and other receivables	16	7,217	7,075	6,437
Inventories	17	380	380	456
		19,030	10,786	14,637
Total Assets		48,034	48,064	46,310

The accompanying notes form part of these financial statements.

For and on behalf of the Board, who authorised the issue of these accounts on 24 August 2016.

Chairman

Director

GROUP STATEMENT OF CASH FLOWS
FOR THE YEAR ENDED 30 JUNE 2016

	Note	ACTUAL 2016 $000	BUDGET (unaudited) 2016 $000	ACTUAL 2015 $000
Cash Flows from Operating Activities				
Cash was provided from:				
Receipts from customers		49,520	48,551	47,843
Receipts from sale of harvest produce		0	0	240
Interest received		331	252	264
		49,851	48,803	48,347
Cash was applied to:				
Payments to employees		24,522	25,987	24,163
Payments to suppliers		17,105	16,735	14,840
Interest paid		0	0	1
Income tax paid		1,191	745	662
		42,818	43,467	39,666
Net cash flows from operating activities	19	7,033	5,336	8,681
Cash Flows from Investing Activities				
Cash was provided from:				
Proceeds from sale of fixed assets		0	0	18
		0	0	18
Cash was applied to:				
Purchase of property, plant and equipment		2,781	8,162	4,216
Purchase of intangibles		213	120	211
Additional investment in associate		350	150	165
		3,344	8,432	4,592
Net cash flows used in investing activities		(3,344)	(8,432)	(4,574)
Net Increase (Decrease) in Cash Held		3,689	(3,096)	4,107
Add opening cash brought forward		7,744	6,427	3,637
Ending Cash Carried Forward	15	11,433	3,331	7,744

The accompanying notes form part of these financial statements.

1. Statement of Accounting Policies

Reporting Entity

New Zealand Forest Research Institute Limited is a Crown Research Institute registered under the Companies Act 1993. The registered office is Te Papa Tipu Innovation Park, 49 Sala Street, Rotorua. The financial statements consists of New Zealand Forest Research Institute Limited and its subsidiaries (the group).

New Zealand Forest Research Institute Limited (the Company) is a reporting entity for the purposes of the Financial Reporting Act 2013. It is domiciled and incorporated in New Zealand and is wholly owned by the Crown.

The Financial Statements of New Zealand Forest Research Institute Limited for the year were authorised for issue in accordance with a resolution of the directors on the date as set out on the Statement of Financial Position.

The activities of New Zealand Forest Research Institute Limited include a range of research and development programmes aimed at using plant-based renewable resources and waste streams to create new materials, energy sources and environmentally sustainable products and processes.

New Zealand Forest Research Institute Limited trades as Scion and these names have identical meaning in this report.

1.1 Summary of Significant Accounting Policies

a) Basis of Preparation

The financial statements have been prepared in accordance with generally accepted accounting practice in New Zealand (NZ GAAP) and the requirements of the Companies Act 1993 and the Financial Reporting Act 2013. The financial statements have also been prepared on a historical cost basis, except for forestry assets, carbon credits and certain heritage assets that have been measured at fair value.

The financial statements are presented in New Zealand dollars and all values are rounded to the nearest thousand dollars ($000).

b) Statement of Compliance

The financial statements have been prepared in accordance with NZ GAAP. They comply with New Zealand equivalents to International Financial Reporting Standards, and other applicable Financial Reporting Standards, as appropriate for profit-oriented entities. The financial statements comply with International Financial Reporting Standards (IFRS).

c) Basis of Consolidation

The consolidated financial statements comprise the financial statements of the Group and its subsidiaries as at 30 June. Control is achieved when the Group is exposed, or has rights, to variable returns from its involvement with the investee and has the ability to affect those returns through its power over the investee. Specifically, the Group controls an investee if and only if the Group has:

- Power over the investee (i.e. existing rights that give it the current ability to direct the relevant
- activities of the investee)
- Exposure, or rights, to variable returns from its involvement with the investee, and
- The ability to use its power over the investee to affect its returns

When the Group has less than a majority of the voting or similar rights of an investee, the Group considers all relevant facts and circumstances in assessing whether it has power over an investee, including:

- The contractual arrangement with the other vote holders of the investee
- Rights arising from other contractual arrangements
- The Group's voting rights and potential voting rights

The Group re-assesses whether or not it controls an investee if facts and circumstances indicate that there are changes to one or more of the three elements of control. Consolidation of a subsidiary begins when the Group obtains control over the subsidiary and ceases when the Group loses control of the subsidiary. Assets, liabilities, income and expenses of a subsidiary acquired or disposed of during the year are included in the statement of comprehensive income from the date the Group gains control until the date the Group ceases to control the subsidiary.

All intra-group assets and liabilities, equity, income, expenses and cash flows relating to transactions between members of the Group are eliminated in full on consolidation.

c) Basis of Consolidation (continued)

A change in the ownership interest of a subsidiary, without a loss of control, is accounted for as an equity transaction. If the Group loses control over a subsidiary, it:

- Derecognises the assets (including goodwill) and liabilities of the subsidiary
- Derecognises the carrying amount of any non-controlling interests
- Derecognises the cumulative translation differences recorded in equity
- Recognises the fair value of the consideration received
- Recognises the fair value of any investment retained
- Recognises any surplus or deficit in profit or loss
- Reclassifies the parent's share of components previously recognised in OCI to profit or loss or retained earnings, as appropriate, as would be required if the Group had directly disposed of the related assets or liabilities.

d) Associate Companies

These are companies in which the group holds substantial shareholdings but does not have control and in who's commercial and financial policy decisions it participates.

Associate companies have been reflected in the consolidated financial statements on an equity accounting basis which shows the group's share of surpluses in the Consolidated Statement of Comprehensive Income and its share of post-acquisition increases or decreases in net assets, in the Consolidated Statement of Financial Position.

e) Intangible Assets

Intangible assets acquired separately are capitalised at cost and those acquired from a business combination are capitalised at fair value as at the date of acquisition. Following initial recognition, the cost model is applied to the class of intangible assets.

The useful lives of these intangible assets are assessed to be either finite or indefinite.

Where amortisation is charged on assets with finite lives, this expense is recognised in profit and loss.

Intangible assets created within the business are not capitalised and expenditure is charged to profit and loss in the year in which the expenditure is incurred.

Intangible assets are tested for impairment where an indicator of impairment exists, and in the case of indefinite life intangibles, annually, either individually or at the cash generating unit level. Useful lives are also examined on an annual basis and adjustments, where applicable, are made on a prospective basis.

A summary of the policies applied to the group's capitalised intangible assets is as follows:

	Software
Useful lives	Finite
Method used	4 years – Straight line
Type	Acquired
Impairment test/Recoverable amount testing	Amortisation method reviewed at each financial year-end; Reviewed annually for indicators of impairment

Gains or losses arising from de-recognition of an intangible asset are measured as the difference between the net disposal proceeds and the carrying amount of the asset and are recognised in the profit and loss when derecognised.

Carbon Credits

New Zealand emission reduction units (NZU's) are recognised when the Group controls the units, provided that it is probable that economic benefits will flow to the Group and the fair value of the units can be measured reliably. Control of the NZU's arises when the Group is entitled to claim the NZU's from the government.

NZU's are initially measured at fair value on entitlement as an intangible asset unless the Board have determined they are held for sale, in which case they would be recorded at fair value as inventory.

Following initial recognition, the intangible asset is measured at fair value when the Board of Directors consider there is an active market for the sale of NZU's. NZU's determined as held for sale at recognition and recorded as inventory, are subsequently measured at the lower of cost and net realisable value.

The liability arising from the deforestation of eligible land is measured using the market value approach. A liability exists and is recognised on pre-1990 forests if the land use changes from forestry.

f) Biological Assets

Biological assets consist entirely of tree plantations which are measured at fair value less any point of sale costs. Gains and losses arising on initial recognition or change in fair value, less estimated point of sale costs, are included in profit and loss in the period in which they arise.

The fair value of tree plantations is determined by an independent valuer.

The valuation method for immature trees is the net present value of future net harvest revenue less estimated costs of owning, protecting, tending and managing trees. For mature trees fair value is deemed to be the net harvest revenue value.

g) Property, Plant and Equipment

All items of property, plant and equipment are valued at the cost of purchase from the Crown as at 1 July 1992 adjusted for subsequent additions at cost, disposals, depreciation and impairment. Plant and equipment are recorded at cost less accumulated depreciation. Land and capital work in progress are recorded at cost. Some library books have been identified as heritage assets and are recorded at fair value as determined by an independent valuer. Valuations are obtained every five years or more often where circumstances indicate that a significant change in fair value has occurred.

Expenditure incurred on property, plant and equipment is capitalised where such expenditure will increase or enhance the future benefits provided by the asset. Expenditure incurred to maintain future benefits is classified as repairs and maintenance.

When an item of property, plant and equipment is disposed of the difference between the net disposal proceeds and the carrying amount is recognised as a gain, or loss, in profit and loss.

Depreciation is provided for using the straight-line method to allocate the historical cost, less an estimated residual value, over the estimated useful life of the asset.

The useful lives of the major classes of assets have been calculated as follows:

Buildings and Land Improvements	20–60 years
Plant and Equipment	3–20 years
Furniture and Fittings	10–20 years
Motor Vehicles	3–7 years
Library Books and Periodicals	20 years

h) Recoverable amount of non-current assets

At each reporting date, the group assesses whether there is any indication an asset may be impaired. Where an indicator of impairment exists, the group makes a formal estimate of recoverable amount. Where the carrying amount of an asset exceeds its recoverable amount the asset is considered impaired and is written down to its recoverable amount.

Recoverable amount is the greater of fair value less costs to sell and value in use. It is determined for an individual asset, however, if the asset's value in use cannot be estimated to be close to its fair value less costs to sell, and it does not generate cash inflows that are largely independent of those from other assets or groups of assets, it is determined for the cash-generating unit to which the asset belongs.

In assessing value in use, the estimated future cash flows are discounted to their present value using a pre-tax discount rate that reflects current market assessments of the time value of money and the risks specific to the asset.

i) Trade Receivables

Trade receivables are initially recognised at fair value and subsequently valued at amortised cost less impairment allowance.

Collectability of trade receivables is reviewed on an ongoing basis. Debts that are known to be uncollectible are written off when identified. An allowance for doubtful debts is raised when there is objective evidence that it is probable the group will not be able to collect the debt. Financial difficulties and payment defaults without explanation are considered objective evidence of impairment.

j) Inventories

Consumable stores are valued at the lower of cost, on a weighted average price of stock on hand, and net realisable value.

Nursery stocks are valued at lower of cost or net realisable value. Changes in net realisable value are recognised in the profit and loss account in the period in which they occur.

k) Research Costs

Research costs are expensed in the period incurred.

l) Provisions and Employee Benefits

Provisions are recognised when the group has a present obligation (legal or constructive) as a result of a past event, it is probable that an outflow of resources embodying economic benefits will be required to settle the obligation and a reliable estimate can be made of the amount of the obligation.

Provisions are measured at the present value of management's best estimate of the expenditure required to settle the present obligation at the Statement of Financial Position date using a discounted cash flow methodology.

(i) Wages, Salaries and Annual Leave

The liability for wages, salaries and annual leave recognised in the Statement of Financial Position is the amount expected to be paid at balance date. Provision has been made for benefits accruing to employees for annual leave in accordance with the provisions of employment contracts in place at balance date.

(ii) Long Service Leave

The liability for long service leave is recognised and measured as the present value of expected future payments to be made in respect of services provided by employees up to the reporting date using the projected unit credit method. Consideration is given to expected future wage and salary levels, experience of employee departures, and periods of service. Expected future payments are discounted using market yields at the reporting date on national government bonds with terms to maturity and currencies that match, as closely as possible, the estimated future cash outflows.

(iii) Defined Benefit Plan

The defined benefit plan is unfunded. The cost of providing benefits under the defined benefit plan is determined using the projected unit credit actuarial valuation method. Actuarial gains and losses are recognised in the profit and loss account in the period in which they arise.

The defined benefit liability recognised in the Statement of Financial Position represents the present value of the defined benefit obligations.

Long service leave and defined benefit plan provisions are based on an actuarial valuation.

m) Leases

The determination of whether an arrangement is or contains a lease is based on the substance of that arrangement at inception date.

Group as a Lessee

Operating lease payments, where the lessors effectively retain substantially all the risks and benefits associated with ownership of the leased items, are included as an expense in the profit and loss in equal instalments over the lease term.

Group as a Lessor

Leases in which the group retains substantially all the risks and benefits of ownership of the leased asset are classified as operating leases. Initial direct costs incurred in negotiating an operating lease are expensed as incurred.

n) Cash and Cash Equivalents

Cash and short-term deposits in the Statement of Financial Position comprise cash at bank and in hand and short-term deposits with an original maturity of three months or less.

For the purposes of the Statement of Cash Flows, cash and cash equivalents consist of cash and cash equivalents as defined above, net of outstanding bank overdrafts.

o) Goods and Services Tax (GST)

All items in the financial statements are stated net of GST, with the exception of trade receivables and payables, which are inclusive of GST invoiced.

p) Foreign Currencies

Functional and presentation currency

Both the functional and presentation currency of New Zealand Forest Research Institute Limited and its subsidiaries is New Zealand dollars.

Transactions and balances

Transactions in foreign currencies are initially recorded in the functional currency by applying the exchange rates ruling at the date of the transaction. Monetary assets and liabilities denominated in foreign currencies are retranslated at the rate of exchange ruling at the Statement of Financial Position date.

Non-monetary items that are measured in terms of historical cost in a foreign currency are translated using the exchange rate as at the date of the initial transaction. Non-monetary items measured at fair value in a foreign currency are translated using the exchange rates at the date when the fair value was determined.

q) Revenue Recognition

Research Revenue

Research revenue from both Government and commercial sources is recorded when earned based on the percentage of work completed. Percentage of work completed is based on management judgement, after considering costs incurred and other contracted commitments. Work completed but not invoiced is recorded as accrued revenue while work invoiced but not completed is recorded as revenue in advance.

Government revenue includes revenue received from the Ministry for Science and Innovation in the form of Core Funding, Public Good Science and Technology investment, and Preseed Accelerator Fund programmes. Funding includes both devolved and milestone related programmes. Government revenue has only been recognised after all appropriate conditions have been met.

Sale of Goods

Revenue is recognised when the significant risks and rewards of ownership of the goods have passed to the buyer. Risk and reward are considered passed to the buyer at the time of delivery.

Interest Revenue

Interest revenue is recognised when earned based on applicable interest rates applied to the group's cash deposit balances.

r) Taxation

The income tax expense charged to the profit and loss includes both the current year's provision and the income tax effects of temporary differences calculated using the liability method.

Tax effect accounting is applied on a comprehensive basis to all temporary differences. A debit balance in the deferred tax account, arising from temporary differences or income tax benefits from income tax losses, is only recognised if it is probable there will be taxable profits available in the future against which the deferred tax asset can be utilised.

Subsequent realisation of the tax benefit is subject to the requirements of income tax legislation being met.

s) Borrowing Costs

Borrowing costs are recognised as an expense when incurred except for those borrowing costs determined as directly attributable to the acquisition, construction or production of a qualifying asset (i.e. an asset that necessarily takes a substantial period of time to get ready for its intended use or sale).

t) Interest-bearing Loans and Borrowings

All loans and borrowings are initially recognised at the fair value of the consideration received net of issue costs associated with the borrowing.

After initial recognition, interest-bearing loans and borrowings are subsequently measured at amortised cost using the effective interest method. Amortised cost is calculated by taking into account any issue costs, and any discount or premium on settlement.

For the purpose of valuing bank borrowings, the bank interest rate is taken as the discount rate. As such the bank borrowings are carried at the value of the debt with the bank.

u) Trade and Other Payables

Trade and other payables are carried at amortised cost and due to their short term nature they are not discounted. They represent liabilities for goods and services provided to the group prior to the end of the financial year that are unpaid and arise when the group becomes obliged to make future payments in respect of the purchase of these goods and services. The amounts are unsecured and are usually paid within 60 days of recognition.

1.2 Significant Accounting Judgements, Estimates and Assumptions

a) Revenue Recognition

Revenue is recognised based on the percentage of work completed on a project basis. Percentage of work completed is based on management judgement after considering such things as hours completed, costs incurred, milestones achieved, costs to complete and actual results to date.

b) Heritage Assets

The group holds several heritage assets which have significant value due to being both rare, and having importance to the nation. Where a heritage cost can be measured reliably they are revalued at least every five years and included as part of property plant and equipment.

Due to the nature of some heritage assets, management does not believe they can be valued reliably. These assets have been identified and disclosed. Details of heritage assets can be found in Note 10 and 21.

c) Biological Assets

The group's biological assets consist of tree plantations. These are valued at the net present value of future net harvest revenue less estimated costs of owning, protecting, tending and managing trees. The valuation process includes several judgements and estimations around discount rates, future costs, and future prices. Management used the experience of a registered forestry valuer to reduce the risk of misstatement resulting from these judgements and estimates.

d) Defined Benefit Scheme

The group operates an unfunded defined benefit plan. Significant assumptions used involving the plan include the discount rate and future salary increases as set out in the notes to the financial statements. Management used the experience of a registered actuary to reduce the risk of misstatement resulting from these judgements and estimates.

1.3 Accounting Standards issued but not yet Effective

The following standards have had changes that have been issued but not yet made effective:

	Date Applicable for Scion
• NZ IFRS 5 Non-Current Assets Held for Sale	1 July 2016
• NZ IFRS 7 Financial Instruments – Disclosures	1 July 2016
• NZ IFRS 9 Financial Instruments (2014)	1 July 2018
• NZ IFRS 10 Consolidated Financial Statements	1 July 2016
• NZ IFRS 12 Disclosure of Interest in Other Entities	1 July 2016
• NZ IFRS 15 Revenue from Contracts with Customers	1 July 2018
• NZ IFRS 16 Leases	1 July 2019
• NZ IAS 1 Presentation of Financial Statements	1 July 2016
• NZ IAS 7 Statement of Cash Flows	1 July 2017
• NZ IAS 12 Income Taxes	1 July 2017
• NZ IAS 16 Property, Plant and Equipment	1 July 2016
• NZ IAS 19 Employee Benefits	1 July 2016
• NZ IAS 27 Consolidated and Separate Financial Statements	1 July 2016
• NZ IAS 28 Investments in Associates and Joint Ventures	1 July 2016
• NZ IAS 38 Intangible Assets	1 July 2016

The group has chosen not to apply the changes in the above standards prior to their effective date. While these standards are applicable to the group they are not expected to have a material impact on our accounts.

In addition under the Annual Improvements to NZ IFRS programme, amendments have been made to the following standards, effective 1 July 2016, that affect Scion but are not seen to have a material impact on the financial statements.

- NZ IAS 41 Agriculture

		ACTUAL 2016 $000	ACTUAL 2015 $000
2.	**Revenue and Other Income**		
	(a) Revenue		
	Government research revenue	30,301	28,789
	Commercial research revenue	17,975	16,838
	Software product sales and maintenance	155	155
	Commercial lease revenue	714	740
	Sale of trees	0	382
	Royalty	86	142
	Interest revenue	368	294
		49,599	47,340
	(b) Other Income/(Expenditure)		
	Change in fair value of plantation trees	84	(38)
	Change in fair value of carbon credits	213	54
		297	16
3.	**Expenditure and Finance Costs**		
	(a) Expenditure		
	Personnel remuneration and expenses	24,311	23,737
	Other personnel related costs	502	489
	Contractors and subcontractors	6,472	5,869
	Consumables	1,211	961
	External services	2,981	3,195
	Travel and accommodation	1,506	1,495
	Lease and rental costs	184	241
	Depreciation	5,481	3,701
	Amortisation	191	181
	Loss on disposal of fixed assets	298	12
	Impairment of assets	140	397
	Reversal of impairment	(23)	(14)
	Premises	2,756	2,623
	Directors' fees	224	250
	Restructuring costs	152	196
	Doubtful debt provision	2	(7)
	Bad debts expense	1	0
	Unrealised exchange fluctuations	1	0
	Other	611	537
		47,001	43,863
	(b) Finance Costs		
	Bank loans and overdraft interest	0	1
		0	1
4.	**Auditor's Remuneration**		
	Amounts paid or due and payable to the auditors for:		
	Auditing financial statements		
	Parent entity auditor	116	120
		116	120

5. Equity

New Zealand Forest Research Institute Limited has authorised, issued and paid up capital of 17,516,000 (2015: 17,516,000) ordinary shares. Shares do not have a par value.

All shares have equal rights with respect to voting, dividends and distribution on winding up. There are no restrictions on the distribution of dividends or repayment of capital.

No dividends were declared or paid to shareholders during the year (2015: $0).

The asset revaluation reserve is used to record increments and decrements in the fair value of heritage book assets. Movements in the asset revaluation reserve are not reclassified to the profit and loss in subsequent periods.

Capital Management

Scion is 100% Crown owned. Scion completes a five year plan on an annual basis and as part of that five year plan, any capital requirements for the future. When managing capital, management's objective is to ensure the entity continues as a going concern while balancing its financial goals of delivering returns in line with market cost of capital, with its public good goals of reinvesting in science that will benefit New Zealand. Management uses total equity as capital. The group has no externally imposed capital requirements.

6. Provisions

The group has provisions for long service leave and restructuring. The long service leave provision totals $545k at June 2016 (2015: $553k) and was valued by an actuary.

The group has a restructuring provision of $183k at June 2016 (2015: $121k).

The provisions are made up as follows:

	ACTUAL 2016 $000	ACTUAL 2015 $000
Current Provision	256	235
Non-Current Provision	472	439
	728	674

Movement in each class of provision during the year is as follows:

	Long Service Leave	Restructuring	TOTAL	Long Service Leave	Restructuring	TOTAL
		2016			2015	
	$000	$000	$000	$000	$000	$000
Balance 1 July	553	121	674	484	110	594
Provision reversed during the year	0	(31)	(31)	0	(55)	(55)
Amounts used during the year	(87)	(90)	(177)	(66)	(55)	(121)
Provisions made during the year	79	183	262	135	121	256
Balance 30 June	545	183	728	553	121	674

7. Pension Plans

a) Defined Benefit Plan

Scion operates an unfunded final salary defined benefit plan. The level of benefits provided depends on the member's length of service and salary at retirement age. The plan is closed to new members and will cease when all current members have either retired or left the group. There are no assets backing the unfunded liability.

The cost of providing benefits under the defined benefit plan is determined using the projected unit credit actuarial valuation method. Actuarial gains and losses are recognised in the Profit and Loss account. Past service cost is recognised immediately.

The defined benefit liability recognised in the Statement of Financial Position represents the present value of the defined benefit obligation.

	ACTUAL 2016 $000	ACTUAL 2015 $000
Net plan expense		
Current service cost	35	33
Interest cost on benefit obligation	45	51
Net actuarial gains recognised in the year	31	(18)
Net plan expense/(income)	111	66

The net plan expense is included in the Personnel remuneration and expense line in Note 3(a) Expenditure.

	Defined Benefit Plan				
	2016 $000	2015 $000	2014 $000	2013 $000	2012 $000
Benefit liability included in the Statement of Financial Position					
Present value of defined benefit obligation	996	960	1,030	1,264	1,509

	ACTUAL 2016 $000	ACTUAL 2015 $000
Changes in the present value of the defined benefit obligation are as follows:		
Opening balance	960	1,030
Current service cost	35	33
Interest cost	45	51
Actuarial gains recognised in the year	31	(18)
Benefits paid	(75)	(136)
Closing balance	996	960
Current provision	200	62
Non-current provision	796	898
	996	960

7. Pension Plans (cont.)

a) Defined Benefit Plan

The history of experience adjustments is as follows:

	2016 $000	2015 $000	2014 $000	2013 $000	2012 $000
Experience adjustments on plan liabilities	(37)	(75)	(59)	(103)	(39)

The principal actuarial assumptions used in determining the defined benefit plan obligations are shown below:

	2016 $000	2015 $000
Discount rate	3.30%	4.29%
Future salary increases	4.20%	4.50%

At 30 June a change in the assumed rates of salary growth and resignation rates, all other assumptions remaining unchanged, would affect the balance of the liability as follows:

	ACTUAL 2016 $000	ACTUAL 2015 $000
Current liability	996	960
Salary growth		
Reduction of 1% per annum	932	892
Increase of 1% per annum	1,056	1,035
Resignation rates		
150% of assumed rates	963	926
50% of assumed rates	1,021	995

Interest rate assumptions are based on Treasury's published risk free discount rates.

b) Defined Contribution Plan

During the period defined contributions totalling $699k (2015: $657k) were made to the Government Superannuation Fund and KiwiSaver.

8. Trade and Other Payables

	ACTUAL 2016 $000	ACTUAL 2015 $000
Trade payables	4,179	4,370
Other payables	0	1
Employee payables and accruals	2,009	2,157
Revenue in advance	1,825	1,154
	8,013	7,682

The carrying amount disclosed above is a reasonable approximation of fair value. Trade creditors are non-interest bearing and are normally settled within 60 days.

	ACTUAL 2016 $000	ACTUAL 2015 $000
9. Income Tax		
(a) Income Tax Expense		
The major components of income tax expense in the Statement of Comprehensive Income are:		
Current income tax		
Current income tax charge	1,436	1,094
Adjustments to prior year current income tax charge	47	5
	1,483	1,099
Deferred income tax		
Deferred tax expenses/(income) related to prior year	(38)	10
Relating to origination and reversal of temporary differences	(788)	(169)
	(826)	(159)
Income tax expense/(income) reported in the Statement of Comprehensive Income	657	940
(b) Amounts charged or credited directly to other comprehensive income		
Deferred income tax related to items charged (credited) directly to other comprehensive income		
Net gain on revaluation of heritage assets	0	0
(c) Reconciliation between the aggregate tax expense recognised in the Statement of Comprehensive Income to tax expense calculated at the statutory income tax rate		
Accounting profit before income tax	2,494	3,370
Tax at the statutory income tax rate of 28% (2015: 28%)	698	944
Adjusted by:		
Prior year income tax	10	13
Entertainment	14	11
Other	(65)	(28)
Income tax expense	657	940
(d) Deferred income tax relates to the following:		
Deferred tax liabilities		
Property, plant and equipment	(1,923)	(2,768)
Nursery inventory	(102)	(125)
Standing timber	(154)	(130)
	(2,179)	(3,023)
Deferred tax assets		
Patents and trademarks	177	189
Payroll provisions	798	772
Provision for doubtful debts	10	11
Income in advance	42	70
Other	20	24
	1,047	1,066
Net Deferred Tax Asset/(Liability) per Statement of Financial Position	(1,132)	(1,957)

The group has no unused tax losses (2015: $0k).

10. Property, Plant and Equipment

GROUP	Land & Improvements $000	Buildings $000	Plant & Equipment $000	Furniture & Fittings $000	Motor Vehicles $000	Books & Periodicals $000	Capital Work in Progress $000	Total $000
At 1 July 2015								
Carrying amount net of accumulated depreciation and impairment at 1 July 2015	**1,784**	**15,126**	**10,395**	**987**	**362**	**251**	**1,448**	**30,353**
Additions	136	0	1,787	0	41	0	925	2,889
Transfers from CWIP	0	0	572	0	0	0	(572)	0
Disposals	0	0	(108)	0	0	(169)	(21)	(298)
Impairment provision made	0	(140)	0	0	0	0	0	(140)
Reversal of impairment provision	0	23	0	0	0	0	0	23
Depreciation expensed	(60)	(2,827)	(2,398)	(89)	(106)	0	0	(5,481)
Carrying amount net of accumulated depreciation and impairment at 30 June 2016	**1,860**	**12,182**	**10,248**	**897**	**297**	**82**	**1,780**	**27,346**
At 30 June 2016								
Cost or fair value	2,357	23,024	42,768	2,742	853	82	1,780	73,606
Accumulated depreciation and impairment	(497)	(10,842)	(32,520)	(1,845)	(556)	0	0	(46,260)
Net carrying amount	**1,860**	**12,182**	**10,248**	**897**	**297**	**82**	**1,780**	**27,346**

Books and periodicals include some library books classified as Heritage Assets. The group engaged Rowan Gibbs, an antiquarian bookseller of 37 years' experience of Smith's Bookshop Limited to determine the fair value of the heritage library books as at 30 June 2013. Fair value is the amount for which the books could be exchanged between a knowledgeable willing buyer and a knowledgeable willing seller in an arms-length transaction as at valuation date. Fair value is determined by reference to recent prices realised at national and international auctions and prices being asked for by specialist dealers for comparable items. Refer to Note 21 regarding other heritage assets. The heritage asset library books have been valued at $82k (2015: $82k).

Scion recognised an impairment loss of $140k on buildings which are not tenanted and the company considers that they are unlikely to be tenanted in the foreseeable future (2015: $251k). Scion also re-assessed the economic useful life of some buildings that are to be partly or wholly demolished as part of its campus development plans and accordingly accelerated depreciation on the buildings. Scion made no other impairment provisions and reduced provisions where depreciation on an asset has continued to be recognised.

10. Property, Plant and Equipment (cont.)

GROUP	Land & Improvements $000	Buildings $000	Plant & Equipment $000	Furniture & Fittings $000	Motor Vehicles $000	Books & Periodicals $000	Capital Work in Progress $000	Total $000
At 1 July 2014								
Carrying amount net of accumulated depreciation and impairment at 1 July 2014	**1,839**	**16,239**	**9,661**	**1,058**	**363**	**251**	**830**	**30,241**
Additions	0	228	2,547	20	117	0	1,315	4,227
Transfers from CWIP	0	43	538	0	0	0	(581)	0
Disposals	0	(4)	(19)	0	0	0	(4)	(27)
Impairment provision made	0	(251)	(34)	0	0	0	(112)	(397)
Reversal of impairment provision	0	10	0	0	0	0	0	10
Depreciation expensed	(55)	(1,139)	(2,298)	(91)	(118)	0	0	(3,701)
Carrying amount net of accumulated depreciation and impairment at 30 June 2015	**1,784**	**15,126**	**10,395**	**987**	**362**	**251**	**1,448**	**30,353**
At 30 June 2014								
Cost or fair value	2,220	23,269	38,779	2,743	695	251	830	68,787
Accumulated depreciation and impairment	(381)	(7,030)	(29,118)	(1,685)	(332)	0	0	(38,546)
Net carrying amount	**1,839**	**16,239**	**9,661**	**1,058**	**363**	**251**	**830**	**30,241**
At 30 June 2015								
Cost or fair value	2,220	23,260	40,851	2,755	812	251	1,560	71,709
Accumulated depreciation and impairment	(436)	(8,134)	(30,456)	(1,768)	(450)	0	(112)	(41,356)
Net carrying amount	**1,784**	**15,126**	**10,395**	**987**	**362**	**251**	**1,448**	**30,353**

11. Biological Assets

Biological assets consist of tree plantations. The group has 73.2 hectares of trees planted initially for experimental purposes. When experiments are completed, they are classified as biological assets. Trees will be harvested when they reach maturity.

	ACTUAL 2016 $000	ACTUAL 2015 $000
Carrying amount 1 July	466	504
(Loss)/Gain from changes in fair value less estimated point-of-sale costs	84	(38)
Carrying amount 30 June	550	466

The above biological assets are level 3 in the fair value hierarchy.

The group has tree plantations at three locations:

(a) 31 hectares of immature Radiata Pine is located at Puruki. The trees were planted for experimental purposes. The group has a forestry right which expires in 2067.

(b) 5.5 hectares of Mexican Cypress are located at Tikokino. The trees were planted for experimental purposes. The Mexican Cypress has a clear fell date of June 2033.

(c) 34.5 hectares of immature Radiata Pine is located at Mamaku plus 2.2 hectares of mature Sitka Spruce. The trees were planted for experimental purposes. The group has a forestry right which terminates when the trees are harvested or in 2024, whichever is the earlier.

The tree plantations were valued as at 30 June 2016 by PF Olsen Limited, an independent forestry management and consultancy company.

The valuation method for immature trees is the net present value of future net harvest revenue less estimated costs of owning, protecting, tending and managing trees. For mature trees fair value is deemed to be the net harvest revenue value.

Fair value is sensitive primarily to log prices. Significant increase (decreases) in log prices would result in a significantly higher (lower) fair value.

12. Intangible Assets

	ACTUAL 2016 $000	ACTUAL 2015 $000
Software		
Opening balance 1 July		
At cost	3,817	3,618
Less accumulated amortisation	(3,439)	(3,270)
Opening net carrying amount 1 July	378	348
Opening carrying amount 1 July	378	348
Additions	213	211
Current year amortisation	(191)	(181)
Closing carrying amount 30 June	400	378
Closing balance 30 June		
At cost	4,028	3,817
Less accumulated amortisation	(3,628)	(3,439)
Closing net carrying amount 30 June	400	378
Carbon Credits		
Carrying amount 1 July	133	79
Increase/(Decrease) in fair value	213	54
Carrying amount 30 June	346	133
Total intangible assets 30 June	746	511

13. Investments in Subsidiaries

	Shares	Percentage Held 2016	Percentage Held 2015	Balance Date
Subsidiaries				
Te Papa Tipu Properties Limited	100	100%	100%	30 June
Forest Research Holdings Limited	100	0%	100%	30 June
Sala Street Holdings Limited	100	100%	0%	30 June

Te Papa Tipu Properties Limited was incorporated on 25 March 2004. The company owns the group's land assets.

On 25 November 2015 Forest Research Holdings Limited was de-registered and removed from the Companies Office register. The company did not trade.

Sala Street Holdings Limited was incorporated on 9 November 2015. The company holds the groups 50% investment in Scion Terax technologies.

All subsidiaries are incorporated in New Zealand.

14. Investments in Associates

	ACTUAL 2016 $000	ACTUAL 2015 $000
(a) Investment Details		
Biopolymer Network Limited	259	240
Terax 2013 Limited	0	0
Terax Limited Partnership	73	73
	332	313

New Zealand Forest Research Institute Limited has a 33.33% (2015: 33.33%) shareholding in Biopolymer Network Limited, a company carrying on research, development and commercialisation of biopolymers.

New Zealand Forest Research Institute Limited Group has a 50% shareholding in Terax 2013 Limited. The company was incorporated in February 2012. Terax 2013 Limited manages Terax Limited Partnership in which Scion Group also has a 50% interest. Terax Limited Partnership was registered on 8 April 2013.

The group's proportion of voting power held in each associate is the same as its ownership interest.

All of the companies are incorporated in New Zealand.

	ACTUAL 2016 $000	ACTUAL 2015 $000
(b) Movements in the carrying amount of the group's investments in associates		
Opening carrying amount of investments	313	285
Current year investment in associates	420	150
Current year share of increase/(decrease) in net assets of associates	(401)	(122)
Closing carrying amount of investments	332	313

		ACTUAL 2016 $000	ACTUAL 2015 $000
14.	**Investments in Associates (cont.)**		
	(c) Summarised financial information		
	The following table illustrates summarised financial information relating to the group's associates:		
	Extract from the associates' Statement of Financial Position:		
	Current assets	1,112	1,102
	Non-current assets	347	250
		1,459	1,352
	Current liabilities	536	501
		536	501
	Net assets	923	851
	Share of associates' net assets	332	313
	Extract from the associates' Statement of Comprehensive Income:		
	Revenue	4,039	4,005
	Net Profit	(536)	(240)

There are no known contingent liabilities relating to Associates.

15.	**Cash and Cash Equivalents**		
	Cash on hand	7	8
	Bank	1	1
	Call deposits	3,791	2,181
	Short term deposits	7,634	5,554
		11,433	7,744

Deposits earn interest at rates ranging from 2.25% to 3.57% (2015: 3.40% to 4.35%). For the purposes of the Statement of Cash Flows, Cash and Cash equivalents are equivalent to Cash and Cash equivalents presented in the Statement of Financial Position.

		ACTUAL 2016 $000	ACTUAL 2015 $000
16.	**Trade and Other Receivables**		
	Trade receivables	5,091	4,794
	Allowance for impairment loss	(35)	(37)
	Other debtors	79	41
	Prepayments	927	567
	Accrued revenue	989	608
	Related party receivables:		
	Associates	166	352
	Other related parties	0	112
	Carrying amount 30 June	7,217	6,437

(a) The carrying amount disclosed above is a reasonable approximation of fair value due to the short term nature of the receivables.

(b) Allowance for Impairment Loss
Trade receivables are non-interest bearing and are generally on 30-60 day terms. A provision for impairment loss is recognised when there is objective evidence that a trade receivable is impaired. A decrease in the allowance for impairment loss of $2k (2015: impairment loss decrease of $46k) has been recognised for specific debtors. The allowance is included in a separate line item in Note 3 (a) Expenditure.

Movements in the allowance for impairment loss were as follows:

	ACTUAL 2016 $000	ACTUAL 2015 $000
Opening balance 1 July	37	83
Reversal of prior year provision	(2)	(11)
Charge for the year	6	1
Bad debts written off	(6)	(36)
Closing balance 30 June	35	37

At 30 June, the ageing analysis of trade receivables is as follows:

	Total $000s	0-30 Days CNI* $000s	0-30 Days CI* $000s	31-60 Days CNI* $000s	31-60 Days CI* $000s	61-90 Days PDNI* $000s	61-90 Days CI* $000s	+91 Days PDNI* $000s	+91 Days CI* $000s
2016	4,724	4,294	0	218	0	3	0	174	35
2015	4,794	4,367	0	183	0	118	0	89	37

* Current not impaired (CNI)
* Past due not impaired (PDNI)
* Considered impaired (CI)

(c) For related party terms and conditions refer to Note 23.

		ACTUAL 2016 $000	ACTUAL 2015 $000
17.	**Inventories**		
	Consumable stores (at cost)	16	9
	Nursery stock	364	447
	Closing carrying amount	380	456

Consumable stores recognised as an expense for the year are $35k (2015: $67k). The expense has been included in the "consumables" line item in Note 3 (a). Consumable inventory write-down in the period was $0k (2015: $0k).

18. Financial Instruments

Financial Instruments include:

Loans and Receivables
Cash and cash equivalents
Trade receivables
Other debtors
Related party receivables

Other Financial Liabilities
Trade payables
Other payables
Related party payables

All the above financial instruments apart from derivative financial instruments are measured at amortised cost. Due to their short term nature their carrying amount is a reasonable approximation of their fair value.

All financial instruments held at fair value are Level 2.

Management have not identified any concentrations of risk for any of the below risk categories.

Liquidity Risk

The group's objective is to maintain a balance between continuity of funding and flexibility through the use of a bank debt facility and a bank overdraft. Management monitors, on a monthly basis, our free capacity within the debt facility and our forecasted ability to pay for that debt.

Trade payables ($1,970k) are non-interest bearing and are normally settled within 60 days. The company and group liabilities all have contractual maturities of less than 120 days.

Credit Risk

Financial instruments that potentially subject the group to credit risk consist of bank balances and accounts receivable. The group generally does not require any security.

Significant new non-Government customers are credit checked. Trade receivable ageing is reviewed monthly and all aged trade receivables are followed up. Credit stops are used for non-paying customers.

Maximum exposures to credit risk as at balance date are:

	ACTUAL 2016 $000	ACTUAL 2015 $000
Current account	1	1
Call and short term deposits	11,425	7,735
Trade receivables	4,689	4,757
Other debtors	79	41
Related party receivables	166	464

The above maximum exposures are net of any provision for impairment on these financial instruments.

18. Financial Instruments (cont.)

Market Risk

Market risk on financial instruments comprise the following three types of risk:

Interest Rate Risk

The group's exposure to market interest rates relates primarily cash deposits. Cash and cash equivalents have increased during the year to a year ended 30 June 2016 group balance of $11,433k (2015: $7,744k).

	ACTUAL 2016 $000	ACTUAL 2015 $000
Cash in hand	7	8
Current account	1	1
Call deposits	3,791	2,181
Short term deposits	7,634	5,554
	11,433	7,744

The current account is managed at low levels and interest returns on the current account are not material. Cash funds in excess of our current requirements are invested in short-term bank deposits to attract improved interest returns. At 30 June 2016 bank call and short term deposits were earning interest at rates between 2.25% and 3.57% (2015: 3.40% and 4.35%).

At 30 June 2016, if interest rates moved as indicated in the table below, with all other variables being held constant, post-tax profit and equity would have been affected as follows:

Judgement of reasonably possible movements in interest rates	2016		2015	
	Change in Interest Rate	Effect on Post Tax Profit & Equity $000	Change in Interest Rate	Effect on Post Tax Profit & Equity $000
	+1%	82	+1%	56
	-1%	(82)	-1%	(56)

Management has taken account of Reserve Bank of New Zealand indications of future interest rate movements in the Official Cash Rate and various other market indicators and after considering these indicators, believe the interest rate changes are reasonable and possible.

Currency Risk

Only small balances are held in currencies other than New Zealand dollars, materially all in debtors. Collection on all these debtors is expected within 60 days resulting in minimal foreign exchange risk.

Other Price Risk

Other price risk primarily relates to the market price of financial instruments. As Scion does not trade in financial instruments there is no perceived risk in this category.

	ACTUAL 2016 $000	ACTUAL 2015 $000
19. Reconciliation of operating surplus after taxation with cash flows from operating activities		
Reported surplus/(loss) after taxation	1,837	2,430
Add (less) non-cash items:		
Depreciation (Refer Note 3 and 10)	5,481	3,701
Amortisation	191	181
Impairment provision	117	383
Movement in deferred tax (Refer Note 9)	(825)	(159)
	4,964	4,106
Add (less) items classified as investing activity:		
Investment contribution included in payables	(70)	(15)
(Gain) loss on disposal of property, plant and equipment	299	12
Share in associate company (profit)/loss	401	122
Capital related items in creditors	(109)	(10)
Fair value movement in carbon credits	(213)	(54)
Fair value movement in in biological assets	(84)	38
	224	93
Movements in working capital items:		
(Increase)/Decrease in debtors and prepayments	(779)	1,764
(Increase)/Decrease in inventories	76	(48)
Increase/(Decrease) in creditors and accruals	420	(101)
Increase/(Decrease) in taxation payable	291	437
	8	2,052
Net cash flows from operating activities	7,033	8,681

20. Contingencies

Treaty of Waitangi Issues

Two verified land claims affecting the group currently exist:

(i) Ngati Whakaue – covering the whole Rotorua Campus

(ii) Ngati Wahiao – covering the southern end of the Rotorua Campus

No reliable estimates can be made of the impact of these contingencies.

21. Heritage Assets

The company has identified its library, herbarium and germplasm collections as heritage assets. For the herbarium and germplasm collections the Directors believe that there is no practical basis upon which to reliably value these collections. For the library refer to note 10.

22. Commitments

Operating Lease Commitments – Group as Lessee:

The group has entered into commercial leases on certain motor vehicles and items of office equipment. The leases have lives of three or four years with renewal options included in the motor vehicle leases only. There are no restrictions placed on the lessee by entering into these leases. In addition the parent company leases land from its subsidiary Te Papa Tipu Properties Limited.

Future minimum rentals payable under non-cancellable operating leases as at 30 June are as follows:

	ACTUAL 2016 $000	ACTUAL 2015 $000
Lease commitments under non-cancellable operating leases:		
Within one year	22	28
One to five years	31	53
	53	81

Operating Lease – Group as Lessor:

The group has entered into commercial property leases for buildings and land. These non-cancellable leases have remaining terms including rights to renew of up to 5 years on buildings and 13 years on land leases, with rights to renew for further 40 years. All leases include a clause to enable upward revision of the rental charge at a specified review date of between one and five years basis according to prevailing market conditions.

Future minimum rentals receivable under non-cancellable operating leases as at 30 June are as follows:

	ACTUAL 2016 $000	ACTUAL 2015 $000
Within one year	344	340
One to five years	617	468
Greater than five years	483	570
	1,444	1,378

Capital Commitments

Capital expenditure contracted for at balance date but not provided for	0	121

23. Transactions with Related Parties

(a) Parent

New Zealand Forest Research Institute Limited is wholly owned by the New Zealand Government (the ultimate parent). All transactions with the Government, Government departments and agencies and Government entities are conducted at arms-length. Government Public Good Science funding and Capability funding comprises close to 50% of research revenue earned by Scion.

	ACTUAL 2016 $000	ACTUAL 2015 $000
(b) Subsidiary Companies of Parent		
Te Papa Tipu Properties Ltd		
Charge for services	76	76
Payment of Rent	(398)	(398)
Net Paid on behalf	151	231
Amount (payable)/receivable at balance date		
– Intercompany account	(80)	91
Sala Street Holdings Ltd		
Paid on behalf	100	0
Amount receivable at balance date	100	0

		ACTUAL 2016 $000	ACTUAL 2015 $000
23.	**Transactions with Related Parties (cont.)**		
	(c) Associates of Parent		
	Biopolymer Network Ltd		
	Supplied goods and services	1,722	1,779
	Received goods and services	0	(1)
	Receivable at balance date	163	167
	Terax 2013 Ltd		
	Services provided	288	177
	Receivable at balance date	2	35
	Terax Limited Partnership		
	Services provided	0	68
	Services paid on behalf	22	0
	Receivable at balance date	0	16
	(d) Other Related Parties		
	WQI Ltd		
	Supplied goods and services	211	243
	Received goods and services	(13)	(9)
	Receivable/(Payable) at balance date	0	134

New Zealand Forest Research Institute Limited has a 5.05% shareholding in WQI Limited (2015: 5.05%). The company's policy is to record such investments at fair value but these shareholdings have not been recorded in the financial statements as their value is not considered to be material to the group. Refer to Note 14 for shareholdings in associates.

Other

The group's transactions during the year and year end balances with other parties are as follows:

i) New Zealand Forest Owners Association Incorporated (related party up to 30 September 2015)
Provided services totalling $0k (2015: $2,790k). The amount receivable at year end was $0k (2015: $842k). No goods or services were received at year end (2015: $0k).

ii) Juken New Zealand Limited (related party up to 30 September 2015)
Provided services totalling $12k (2015: $213k). No services were received at year end (2015: $0k). The amount receivable at year end was $0k (2015: $83k). The amount payable at year end was $0k (2015: $0k).

iii) Waiariki Institute of Technology (related party up to 30 April 2016)
Provided services totalling $3k (2015: $25k). Services received during at year end totalled $20k (2015: $30k). No amounts were receivable or payable at year end.

iv) Grow Rotorua Limited (related party up to 15 September 2015)
Provided services totalling $2k (2015: $22k) at year end. No services were received. The amount receivable at year end was $0 (2015: $1k). There was no payable at year end (2015: $0k).

v) Te Arawa Group Holdings Limited
Provided services totalling $0k at year end (2015: $4k). No services were received. There was no receivable at year end (2015: $4k).

vi) Oji Fibre Solutions (NZ) Limited (related party from 1 January 2016)
Provided services totalling $137k for the period form 1 January 2016 to 30 June 2016. The amount receivable at year end was $21k.

vii) Wood Processing and Manufacturing Association (related party from 1 January 2016)
Received services totalling $3k for the period form 1 January 2016 to 30 June 2016. No amount was payable at year end.

23. Transactions with Related Parties (cont.)

(d) Other Related Parties (cont.)

Other (cont.)

Mr Sheldon Drummond, a director of New Zealand Forest Research Institute Limited, was a director of New Zealand Forest Owners Association Inc, an employee of Juken New Zealand Ltd and Director of Juken Nominees Limited up to 30 September 2015. Ms Colleen Neville, a director of New Zealand Forest Research Institute Limited, is Chief Executive Officer of Te Arawa Group Holdings Limited.

Mrs Judith Stanway, a director of New Zealand Forest Research Institute Limited, is Chair of Te Papa Tipu Properties Limited and a Director at Terax 2013 Limited.

Dr Jon Ryder, a director of New Zealand Forest Research Institute Limited, is a director of Oji Oceania and Wood Processors and Manufacturers Association.

Dr Warren Parker, CEO of New Zealand Forest Research Institute Limited, is a director of Te Papa Tipu Properties Limited, and until 15 September 2015, a director of Grow Rotorua Limited.

Mr Rob Trass, CFO and Company Secretary of New Zealand Forest Research Institute Limited, was an Audit and Risk Committee member at Waiariki Institute of Technology up to 30 April 2016.

Terms and conditions of transactions with related parties

Outstanding balances at year end are unsecured and interest free. No guarantees are provided or received for any related party receivables or payables.

No related party debts were written off during the year (2015: $0k) and no impairment allowance has been raised for any of these debts.

24. Key Management Personnel

	ACTUAL 2016 $000	ACTUAL 2015 $000
Short term employee benefits	1,925	2,094
KiwiSaver employee benefits	34	19
	1,959	2,113

BOARD OF DIRECTORS

Mr Tony Nowell CNZM – Chair
Ms Elizabeth Chambers (resigned 31 December 2015)
Mr Sheldon Drummond
Ms Colleen Neville
Dr Barry O'Neil
Mr Jon Ryder (commenced 1 January 2016)
Mrs Judith Stanway

Mr Rob Trass (Company Secretary)

EXECUTIVE MANAGEMENT

Dr Warren Parker – Chief Executive Officer

Dr Russell Burton – General Manager, Research and Investments, Māori Stakeholder Partnerships
Dr Elspeth MacRae – General Manager, Manufacturing and Bioproducts
Mr Rob Lei – Acting General Manager, Business Development and Commercialisation
Prof Alison Stewart CNZM– General Manager, Forest Science
Mrs Keri-Anne Tane – General Manager, People, Culture and Safety
Mr Rob Trass – Chief Financial Officer

AUDITORS

Susan Jones
Ernst & Young, Auckland, on behalf of the Auditor-General

BANKERS

ANZ Bank of New Zealand

SOLICITORS

Bell Gully, Auckland

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