E/S/R
He Pūtaiao, He Tāngata

Te Pūrongo ā-Tau 2021
Annual Report

Te kaupapa
Our purpose

"Our purpose is to deliver enhanced scientific and research services to the public health, food safety, security and justice systems, and the environmental sector. By doing this, we help improve the safety of, and contribute to, the economic, environmental and social wellbeing of people and communities in New Zealand."

(Statement of Core Purpose)

Through our leadership, we:

Through our ability to:

Innovate / Collaborate / Elevate

(Statement of Corporate Intent)

Ngā kai o roto
Contents

Front cover: *Ngāi te Rangi – He Wai Māpuna iwi partner. Ka nui te mihi ki a Ngāti Te Wai (Ngāti Raninui), ki a Ngāi Tamawhariua hapū, me ngā tamariki me ngā whānau, ki a Ngāi te Rangi hoki. Filmed on location at Te Rereatukahia Stream, and Rereatukahia Marae, Katikati.*

ESR is New Zealand's Crown research institute specialising in science for communities

Presented to the House of Representatives pursuant to section 17 of the Crown Research Institutes Act 1992.

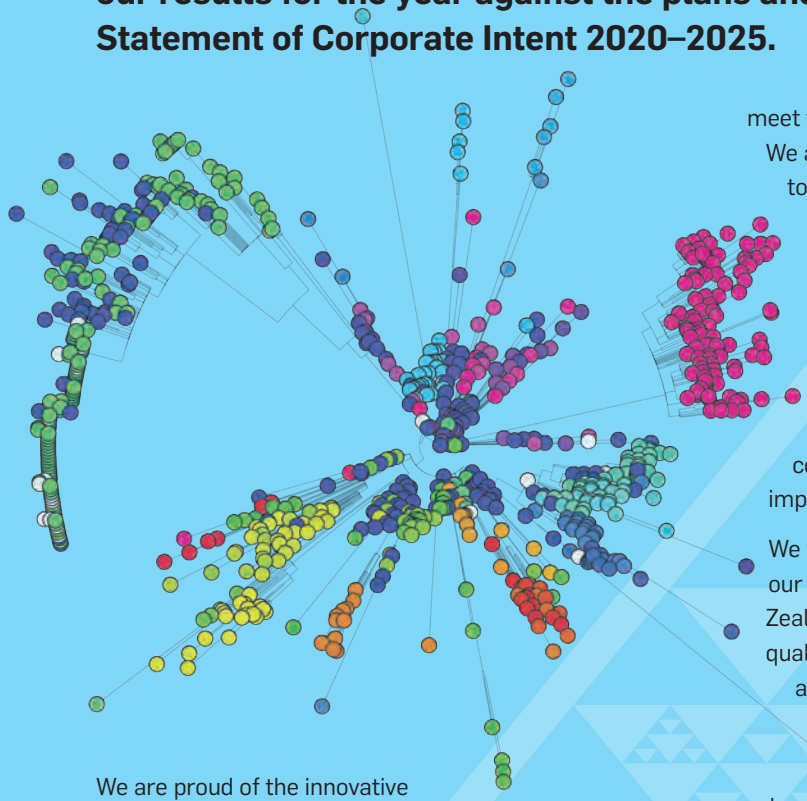
He kupu nā te Heamana / Tumuaki

Chair and Chief Executive's overview

Kia whakatōmuri te haere whakamua[1]

Delivering for New Zealand by innovating and providing science for communities leadership in uncertain times

We are pleased to present ESR's 2020/21 Annual Report. It records our results for the year against the plans and objectives outlined in our Statement of Corporate Intent 2020–2025.



We are proud of the innovative and proactive role ESR has played in managing the COVID-19 pandemic. ESR continued staying ahead of the game with our molecular scientists, epidemiologists and analysts providing real-time health intelligence. They continue expanding genome sequencing and wastewater testing, applying the multidisciplinary analysis needed to distil the public health intelligence that underpins New Zealand's success in managing the spread of COVID-19.

Highlights

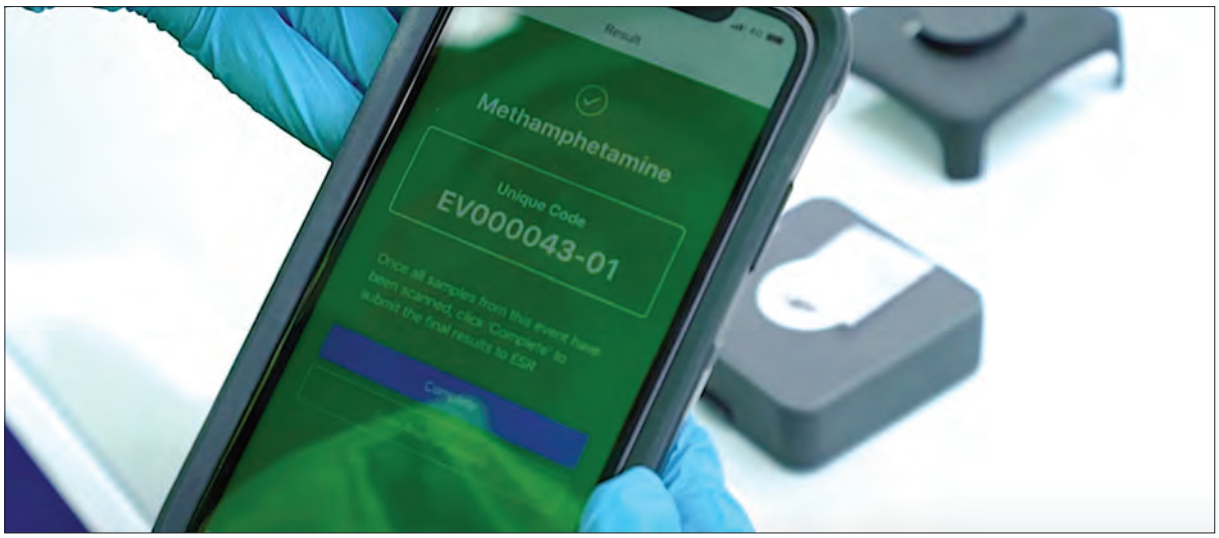
We continued our journey of embedding our strategy He Pūtaiao, He Tāngata to deliver science solutions that meet the needs and aspirations of Māori communities. We appointed the General Manager Māori Impact to the Senior Leadership Team and strengthened our resourcing and focus on this important mahi. Through this approach, we are identifying and creating our strongest opportunities to deliver systemic change for and with Māori. Our flagship He Wai Māpuna and Te Hāpai Ō strategic programmes are strengthening and building enduring relationships to grow genuine collaboration and partnership with Māori and impact for communities.

We were very proud when, in December 2020, our COVID-19 team was awarded Science New Zealand's Supreme Award. The judges lauded the quality, relevance and timeliness of the team's work as New Zealand faced its biggest public health test in more than a century.

However, our role in the COVID-19 pandemic is only part of the applied science success we have delivered to keep communities healthy and safe. Our expert staff ensure the food New Zealand's people eat and export is safe, by **detecting** the sources of livestock and food contamination, **connecting** with our partner agencies, and implementing plans of action **protecting** our communities. For example, ESR is currently working with the poultry industry, MPI, and the New Zealand Food Safety Science and Research Centre to understand sources and potential interventions to reduce *Campylobacter* in the food chain.

New Zealand communities continue to be **protected** through our leadership role in supporting frontline

[1] *This whakataukī or 'proverb' speaks to Māori perspectives of time, where the past, the present and the future are viewed as intertwined. Translated, it reads: 'I walk backwards into the future with my eyes fixed on my past'.*



policing and the justice investigation processes. ESR and the New Zealand Police concluded the pilot of Lumi Drug Scan, a mobile drug-testing device, which received positive feedback from frontline policing. Over the next year, we will work with New Zealand Police to consider options to implement Lumi and further develop its data science and machine learning capabilities.

ESR's expertise in groundwater resources, surface water systems and the quality and safety of drinking water was also to the fore. As a leader in water quality and management, we provided leading science advice and support to the Manatū Hauroa (Ministry of Health) and Public Health South in their investigation into lead contamination in part of Dunedin's drinking-water supply.

To continue positioning ESR as a leader and provider of technology-enabled science and intelligence, to support decision-makers across government and communities, we continually refresh our strategy and strategic action plan. It's important that, where appropriate, we collaborate with and make use of specific scientific and technical expertise across the whole of the Crown research institute network. We have started by signing an agreement with GNS Science that will see ESR share an enterprise system to align core business processes and generate cost savings. A better understanding of where synergies occur is essential. We need to determine in what areas these may exist to contribute to and support a more integrated, collaborative, connected and evidence-based research system that delivers greater impact.

We are working towards rejuvenating our science centre at Kenepuru to a world-class science facility that embraces the mana and wairua of Ngāti Toa Rangatira and reflects the community we are a part of and work in. As mana whenua and partners with ESR, Ngāti Toa Rangatira are deeply engaged and involved in all components of the design and build process. We have been engaging with other organisations that have expressed interest in co-locating to Kenepuru. We look forward to working with the shareholding Ministers to make our future Kenepuru Science Centre a reality.

ESR's innovation journey

For the immediate future, ESR will focus on solutions that contribute to the wellbeing of communities and New Zealand's economic recovery from the COVID-19 pandemic. We are on a journey of continuing to **detect**, **connect** and **protect** to address emerging issues and provide leadership through:

- increasing our collaboration and partnerships with Māori communities
- embedding much-valued te ao Māori principles and perspectives into our science and who we are
- delivering applied science solutions, services and policy-ready information and intelligence to our sector partners
- providing assured science sector and public health leadership in times of disruption

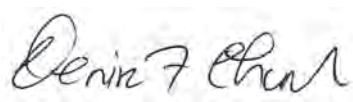
- deepening collaboration and interconnectedness through peer-to-peer strategic relationships that deliver value to New Zealand
- innovating to develop products and services that improve New Zealand's wellbeing
- integrating genomics into more applied settings across our five domain areas (public health, forensics, radiation detection, water and the environment) to detect and prevent public health and environmental risks, such as detecting diseases like cancer, infectious diseases, rare disorders and antimicrobial resistance
- establishing greater data science capability, to better understand the causal effects that can lead to improved health and wellbeing outcomes for our customers, iwi and communities
- investing in people and infrastructure to ensure we have the right capability and capacity to apply new scientific solutions to future challenges and support government wellbeing and science priorities
- increasing New Zealand's and ESR's global scientific reputation through collaborative projects.

We remain focused on ESR being an agile, innovative and customer-focused organisation that can adapt and quickly respond to new opportunities and changes. This will ensure we continue to deliver creative and collaborative science solutions for the major health, community and environment challenges facing the country. In this way, we will contribute to the Government's goals of improving the health and wellbeing of everyone in New Zealand to build a resilient and robust economy and enhance the wairua of wai and the ora of kai.

It takes a team to create great solutions

This has been a year of challenges that has showcased our leadership role in responding to uncertainty and change. We are extremely proud of the innovative and high-quality work produced and wish to recognise the absolute commitment and positive response from our **One ESR** team. We would like to thank our iwi and mana whenua partners for their support on our journey. We are appreciative of the support and cooperation shown by our Ministers, the Ministry of Business, Innovation and Employment, Ministry of Health, Ministry for Primary Industries, the New Zealand Police and other government agencies and key collaborators we work with to deliver for New Zealand.

Denise Church QSO
Chair



Peter Lennox
Chief Executive Officer

He matapihi ki te tau

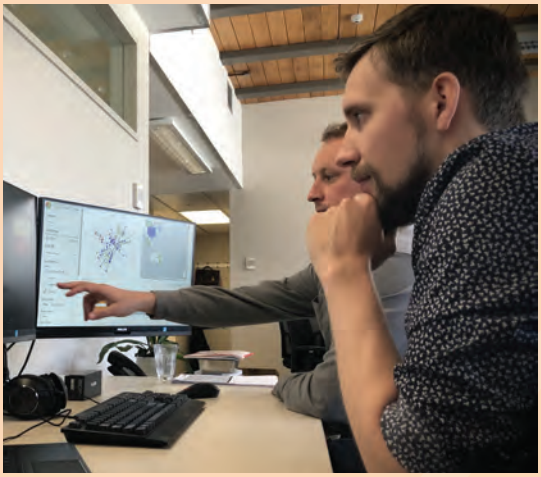
At a glance – the year in review

Science New Zealand

ESR WINNER

Science New Zealand Supreme award

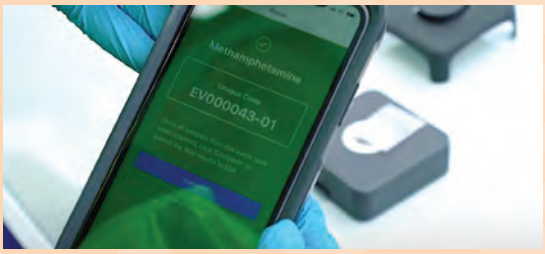
We are making **genomic analysis** accessible and portable for patients and communities to help people get results and act faster than ever before to protect health and wellbeing. **P 24**



884

items screened by Lumi during the pilot

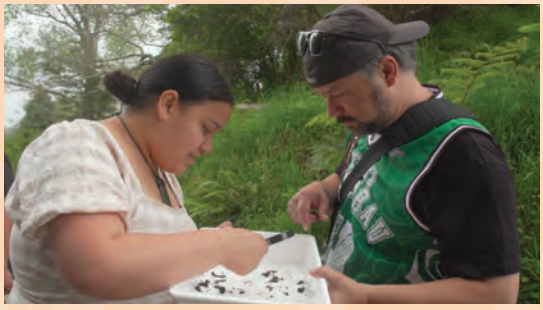
A six-month pilot of the **Lumi Drug Scan** handheld device that lets frontline Police officers carry out on-the-spot screening of suspected drugs has shown promising results. **P 26**



3

iwi partners contracted

He Wai Māpuna Improving our contribution to impact for Māori communities is a priority. **P 22**



313

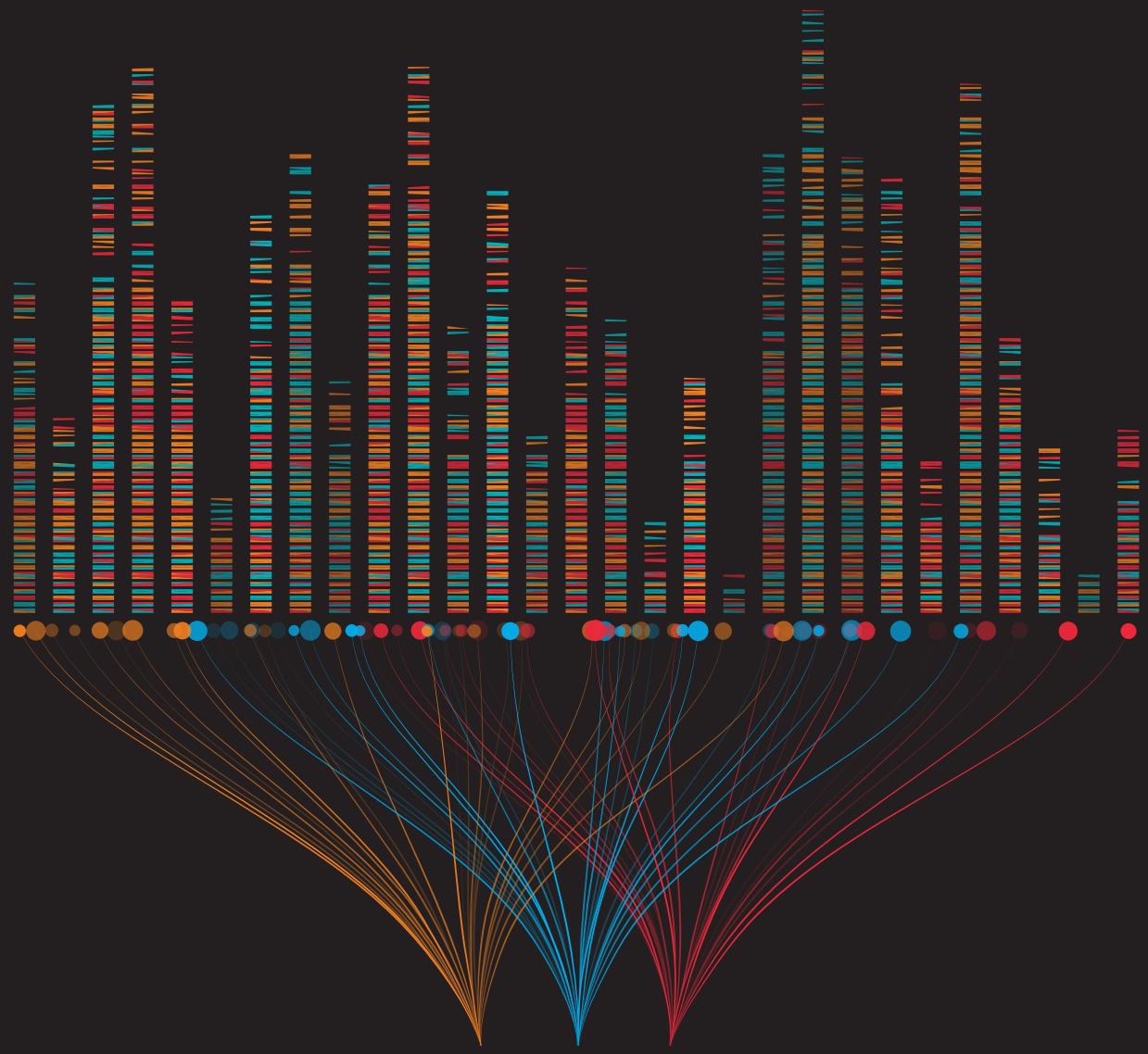
staff attended ESR's foundational the Wall Walk® cultural training programme

Growing our **cultural capability**, our first Tangata Tiriti workshop dispels Tiriti myths. **P 44**

38

food safety projects completed

We are using our expertise in whole genome sequencing to reduce the burden of **foodborne illnesses**. **P 28**

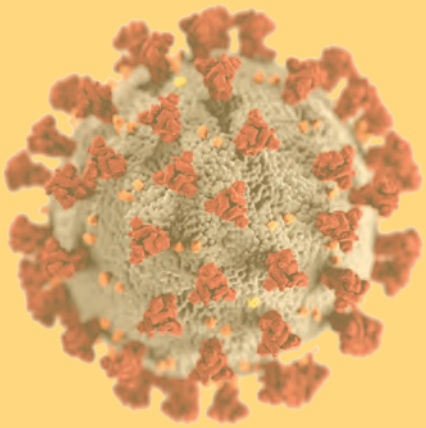


HUINGA IRA
GENOME

'I have been impressed with how you have worked together to establish and grow the capacity for the high quality testing service for COVID-19 that we have today. It is a service that is the envy of many countries.'

Ashley Bloomfield, *Director-General of Health*

ESR's COVID-19 leadership and innovation



Our leadership and agile science, supported by innovative systems, underpin ESR's COVID-19 work. To improve the capacity, timeliness and resilience of our genome sequencing, ESR set up sequencing capability at its Mount Albert and Christchurch science centres to complement existing capability at Kenepuru. This has proved invaluable, with outbreaks of COVID-19 in different parts of New Zealand. To help **detect** COVID-19 in communities, we have expanded our wastewater testing capability research to include COVID-19 testing and surveillance at treatment plants. This helps generate new insights and intelligence that both expand and improve public health surveillance.

Increasing the tools available in our public health surveillance toolkit is critical for shaping evidence-based policy and outcomes that strengthen the Government's COVID-19 public health response and recovery plans for New Zealand. We connect with many different government agencies and partners, such as universities and other science organisations, to enhance detection, elevate our science and find new ways to protect New Zealand's people.

18 months
of dedicated work to create data pipelines, develop real-time public health dashboards, and integrate systems that inform and support the public health response

Delivered 180
reports to the Ministry of Health on whole genome sequencing and wastewater testing

5
COVID-19 Innovation Acceleration Fund research projects where ESR is leading or collaborating with AgResearch and Otago University

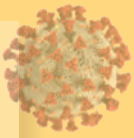
1,200
Wastewater samples tested for COVID-19

40-plus
wastewater treatment plants tested for COVID-19 since surveillance began

Expanding COVID-19
wastewater testing capability and surveillance across treatment plants in New Zealand to detect early warning signals and support public health surveillance

Consistently delivered a genome within
24 hours
of a COVID-19 case being detected providing investigation, analysis, and intelligence

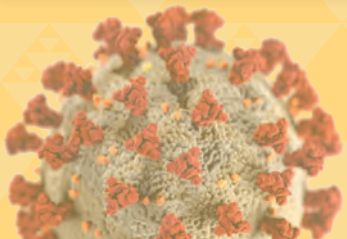
1,634
COVID-19 genomes completed since the start of the pandemic



Provided vaccine modelling
to support the Government's plan for safely reopening New Zealand's borders while ensuring people and communities are protected

First in New Zealand
For our ground-breaking work and leadership to integrate genomics with epidemiological data, support decision-makers and provide real-time public health surveillance for the COVID-19 pandemic

$3.5 billion
The estimated benefit of the economic cost avoided by having genome sequencing



Te whakatinanatanga o te rautaki

Our strategy and what we have done to deliver

Among the Crown research institutes (CRIs), ESR is unique in having the sole focus of protecting and improving the health and wellbeing of communities. Combining and applying expertise from our health, forensic, food, water and radiation sciences allows communities to thrive and prosper.

In an increasingly complex and fast-paced world, maintaining our position means being ahead of the game. We need to be at the forefront of solutions, anticipating where our expertise will be needed next and moving quickly to deliver.

During the year, we developed our strategy 'Setting our direction: 2020–2025'. This identified the shifts needed to ensure ESR continues to grow its leadership in health and community science and strengthens ESR as a more proactive, responsive, diverse, resilient and relevant organisation.

Our strategic focus areas allow us to create the future we want through harnessing the ingenuity of our people, innovative science and technology. This helps us solve problems in partnership with key stakeholders, including government, industry and Māori, to strengthen New Zealand's health, safety and wellbeing. We create innovative products and services for communities around the globe for the enduring benefit of New Zealanders.

Our strategic focus areas

Impact for Māori is central to everything we do and critical to our journey. He Pūtaiao, He Tāngata is our overarching strategy and action plan that reflects the importance of Māori leadership and impact with Māori to ESR. It recognises that impact with and for Māori touches all aspects of our operations. Innovative and uniquely New Zealand science and research solutions are enabled by valuing and combining Māori and Western knowledge to increase the wellbeing of communities and the environment.

He Pūtaiao, He Tāngata *Supporting the aims of the Vision Mātauranga*	Valuing and combining Māori and Western knowledge enables innovative science and research solutions that are uniquely Aotearoa New Zealand – increasing the wellbeing of our communities and the environment
Strategic focus area	**Our future state**
Understanding our value *"Growing our innovation and influence by putting our customers, iwi and communities at the core of our mahi"*	Regarded as an influential leader building valued and meaningful partnerships with our customers, iwi and communities, continually improving health, safety and wellbeing outcomes
Shaping the future of our science *"Remaining relevant and building trust in science and scientists by ensuring our customers, iwi and communities' aspirations and needs are met"*	Fundamentally embracing a te ao Māori approach to achieve scientific excellence, positioning ESR for future success Enhancing our reputation as an influential leader co-designing transformational research and service delivery that meets the needs of our customers, iwi and communities within the wider science system
Increasing our impact *"Improving outcomes for our customers, iwi and communities through innovative science"*	Providing collaborative, prioritised and integrated research that grows innovation, and seeking to secure opportunities to deliver better outcomes for our customers, iwi and communities
Building our team *"Capable and engaged staff, strong, accountable leadership, and clear strategic direction"*	Recognised as an employer of choice Our ethnicity and diversity is reflective of New Zealand's societal profile We are positioned for continued and future success through strong accountable leadership, and a healthy work environment as we seek to broaden our workforce talent and embed cultural competency
Building stronger foundations *"Embedding and strengthening our infrastructure, systems and processes by strengthening our collaboration partnerships"*	Effective business and governance systems, enabling decision-making to be smarter and more impactful in delivering research and science solutions for our customers, iwi and communities

By developing and strengthening our strategic focus areas of understanding our value, shaping the future of our science, increasing our impact, building our team and building stronger foundations, we are working to deliver enhanced scientific and research services to improve the safety of and contribute to the economic, environmental and social wellbeing of New Zealanders.

Progress against our strategy

Our strategic action plan was rolled out in December 2020. It includes flagship initiatives against each of our five strategic focus areas. During the year, most initiatives have focused on strengthening ESR's governance, relationships, infrastructure and business systems, to create a more agile and responsive organisation. Other initiatives include looking at how we elevate our science capabilities for greater influence and impact both now and in the future.

How we are tracking

He Pūtaiao, He Tāngata *Supporting the aims of the Vision Mātauranga*	Building genuine relationships with iwi and mana whenua through He Wai Māpuna, Te Hāpai O and He Ō Uta, He Ō Tai programmes Growing whanaungatanga and tikanga across ESR's science as an integral part of our identity and greater impact with and for Māori
Increasing collaboration	Growing new or strategic relationships Investing in the Pūhoro STEM academy to support Māori secondary students onto a pathway towards tertiary study and potential careers in science and engineering
Shaping ESR for the future	Taking a genomics-first approach across our five science domains to detect issues, generate results and act faster to improve wellbeing outcomes Connecting strategically to shape, support and increase ESR's impact for New Zealand's future health system
Customer insights	Phase 1 of customer-insights work completed to inform evidence-based insights First pilot design sprint held to grow a customer-centric and innovation first approach to our work
Cultural competency	313 staff attended first foundational training session Developed a bespoke cultural competency training programme that will lift our Māori language and tikanga practices across our science and increase our impact with and for Māori
Strengthening systems and processes	Joint Enterprise Resource Planning system agreement signed between ESR and GNS Science, a first of its kind collaboration between two Crown research institutes to promote greater resource sharing and encourage cost savings Implementing a programme of work to lift ESR's organisational resilience and business continuity

Te whakaū i ngā hononga ki te Māori

Our journey to stronger relationships with Māori

Growing whanaungatanga and tikanga as an integral part of our identity for greater impact with and for Māori

Our commitment to Māori as an equal partner within our science and research programmes is an important aspect of our mahi. ESR's approach is to embed its Māori impact strategy, He Pūtaiao, He Tāngata in every aspect of its work, to create a positive impact for Māori and all New Zealand's people.

Two generations of kaitiaki from Tauranga Moana testing wai at Te Rereatukahia Stream in Katikati.

He Pūtaiao, He Tāngata is a fundamental shift in thinking and approach to embed te ao Māori (the Māori worldview) as a core part of ESR's identity and delivery. It is at the heart of ESR's strategy and spans the five strategic focus areas. This strategy aims to help us design programmes by and with iwi and hapū that place ESR at the forefront of science organisations meeting the aspirations of Māori communities.

We are on a journey to deliver against the goals outlined in He Pūtaiao, He Tāngata. Our focus is on building genuine and enduring relationships with mana whenua associated with our four sites.

This includes growing our cultural capability, building our team and shaping our science to respond to Māori communities to deliver increasing value and impact for Māori. This will also help us to reduce health inequities and improve overall community wellbeing outcomes across all our science areas.

This year, we started work on our new multi-year Strategic Science Investment Fund flagship programmes, He Wai Māpuna and Te Hāpai Ō. He Wai Māpuna is a dynamic method of working for ESR and offers Māori-led research opportunities relating to wai (water). He Wai Māpuna provides an opportunity to engage in new relationships and nurture previously held connections while building cultural competency and increasing our knowledge of te ao and mātauranga Māori. We have relationships with Ngāti Awa, Ngāti Kahungunu ki Wairarapa, Tauranga Moana iwi, hapū and whānau, Ngāti Toa Rangatira and Ngāi Tahu.

Te Hāpai Ō focuses on mahinga kai and food safety practices within customary protection areas.

Working directly with iwi, hapū, mana whenua and tangata tiaki, this work programme is engaged with Te Rūnanga o Ngāi Tahu and several hapū located across Te Waipounamu (the South Island). Te Hāpai Ō has

provided an opportunity for ESR to be actively engaged in a public health event at the request of hapū. This is an example of true partnership with Māori.

Through He Ō Uta, He Ō Tai, our Māori outreach programme, we are developing and nurturing relationships with local kura and hāpori whānui (the community). Our investment in and support of the Pūhoro STEM Academy is ongoing as we work towards our ambition that young Māori will be awakened to the wonders of scientific knowledge, encouraging the next generation of kaitiaki to apply science to heal and nourish their whenua, wai and whānau.

We have shown our commitment to impact for Māori by strengthening our investment and engagement in our capability offering. We created a Māori impact group, with five dedicated staff members and a wider group of 15 connected employees located across ESR. By creating a dedicated team, we have become more kaupapa Māori focused and increased our hāpori whānui outreach across all four of ESR's domains (public health, forensics, water and the environment).

To support our outreach approach, we developed a comprehensive ESR-wide cultural capability training programme in te reo Māori, tikanga and Te Tiriti o Waitangi (Treaty of Waitangi). By offering this training and a specialised programme for staff who currently engage with iwi and hapū, we are building a culture where staff are equipped, engaged and capable to lead ESR relationships with Māori. To meet the aspirations of Māori, we must build trust and show our commitment to building relationships and advocating for mātauranga Māori. This will increase our value and impact with and for Māori and our success as a trusted co-partner.

We are growing our relationships with Ngāti Toa Rangatira, Ngāti Whātua and Ngāi Tahu, and exploring ideas and opportunities to collaborate on science projects that will support their goals for hauora and the environment.

We are working closely with Ngāti Toa Rangatira on our Kenepuru Science Centre redevelopment. The main elements of the concept have been co-designed with their feedback at the forefront. The final design will show our commitment to building an enduring relationship with Ngāti Toa Rangatira and the principles of Te Tiriti o Waitangi, and our He Pūtaiao, He Tāngata strategy.

We have developed a model for ESR's Māori Data Leadership Group to develop best practice and policy in all aspects of Māori data within the ESR ecosystem. This operational model will give access to Māori industry professionals who will provide strategic guidance and support emerging Māori data practitioners at ESR.

Paria Te Tai members outside the ESR's Specimen Reception Lab kitted up for their tour (left to right) Tayla-Paige Kenny, Riria Solomon, Pania Solomon (Ngāti Toa Rongoā practitioner), Russleigh Parai (Paria te Tai Kaiārahi), Marina Magele (Paria te Tai Project Co-ordinator) and ESR's Ngāti Toa mana whenua liaison Donna Warren.

Pūtea whakawhanake pūtaiao

Funding our science

Along with investment from commercial earnings, the Strategic Science Investment Fund (SSIF) supports ESR's strategic investment in research programmes and scientific infrastructure that have long-term beneficial impacts on New Zealand's health, economy, environment and society.

How we fund our science

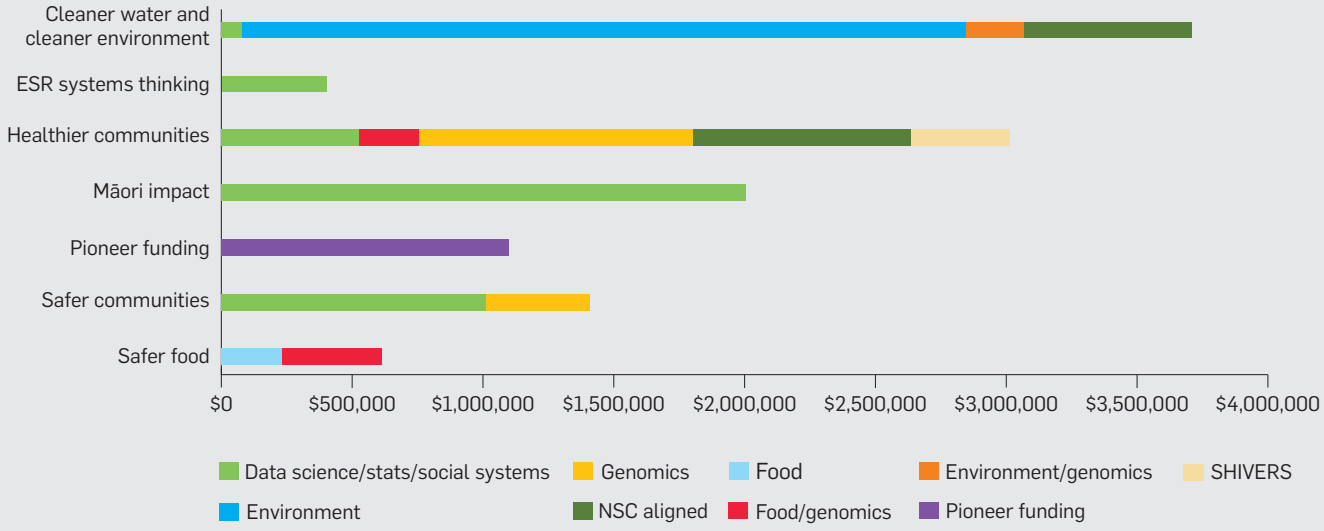
ESR reinvests its earnings from commercial activities, such as STRmix™, and key service contacts, back into science research and infrastructure to facilitate improved health and wellbeing outcomes. We also apply for various funding grants, for example, through the United States National Institutes of Health, the Ministry of Business, Innovation and Employment Endeavour Fund and the Health Research Council.

SSIF supports the research and capabilities that underpin our essential services and ensure we deliver to the mandate outlined in the ESR Statement of Core Purpose. Our assigned SSIF funding is across two platforms: public health and forensics.

In 2020/21, we received SSIF funding of $12.234 million to build our capability in water and waste, genomics, data science, statistics, informatics, and social systems science. We are embedding a social science and systems-thinking approach to our research. In 2020/21, 14 new projects received funding of $5 million. Of these, 3 projects ($2 million) are kaupapa Māori-led projects to deliver solutions, advice and expertise to grow impact for Māori. Funding aligned to National Science Challenges (NSCs) includes epigenomics research (Healthier Lives), groundwater research (Our Land and Water) and environmental DNA (New Zealand's Biological Heritage).

Of this SSIF funding, $3.7 million (30 percent) in is water and environmental research, focusing on groundwater research and research aligned to NSCs. Pioneer funding (9 percent) is used for new research ideas to grow our main science capabilities and explore opportunities for commercial benefit, including sharing knowledge with the wider science system. In 2020/21, 20 projects received Pioneer funding. Pioneer funding projects include research into developing digital technology tools for drug surveillance, such as the Lumi Drug Scan, developing our microbiological testing for medicinal cannabis and investigating the direct sequencing of viral RNA from environmental samples.

Strategic Science Investment Fund research funding for 2020/21



Te hiranga o te pūtaiao

Delivering our science excellence

By detecting problems, finding solutions, and connecting analysis and intelligence at the right time with the right people in the right way, our leading-edge science protects and enhances the wellbeing of all people in New Zealand.

We take a **One ESR** approach to our multi-disciplinary science capabilities. This is essential for creating value and increasing our impact. We apply a genomics-first approach, where appropriate, to support our world-leading science. This helps us detect emerging and existing issues and gain insights that let us explore new and novel research ideas and develop complementary areas of research. We use our expertise and leadership to connect and collaborate nationally and worldwide with different stakeholders and partners. Quality science, supported by innovative, co-designed solutions created with and for our key partners, makes a big difference to protecting and enhancing the wellbeing of all people in New Zealand and Pacific countries.

We have strongly improved our underlying business systems to support our science delivery and position us as a leader in technology-enabled science and provider of trusted intelligence. We established a scrum team to work with the Ministry of Health, district health boards and public health units. This improved the resiliency and capability of the core systems behind the COVID-19 pandemic response, such as EpiSurv (New Zealand's national disease database) and Éclair (the country's national laboratory results repository). Other priority work included enhancing our information technology infrastructure and sensitive public health surveillance information, to protect against attacks and breaches, as part of our pan-CRI virtual Chief Information Security Officer (vCISO) initiative.

Testing wastewater samples for viruses.

ESR's impact areas

Our unique core science capabilities, supported by innovative systems, span five domains (public health, forensics, radiation detection, water and the environment) across four impact areas.

Healthier communities	We detect existing and emerging public health and environmental health threats and risks by connecting information to protect the health and wellbeing of New Zealand's people.
Safer communities	We use the latest advances in forensic science to increase the effectiveness of forensic science services and research across nine forensic science disciplines to improve justice and wellbeing outcomes. We use our radiation services to reduce occupational and medical exposure to radiation, contributing to keeping people safer.
Safer food	By researching and collaborating with government agencies and food industry partners to detect, trace and eliminate pathogens that cause foodborne disease and other contaminants that may cause harm, we help protect New Zealand's food-based economy and improve public health and economic outcomes.
Cleaner water and environment	We develop sustainable, long-term options and solutions for fresh water and groundwater resources and explore options for the sustainable use of waste, including radiation compliance, monitoring and testing to protect the environment and enhance public health and wellbeing outcomes.

Our ground-breaking science, leadership and influence in genome sequencing, modelling and analysis of infectious diseases is providing opportunities for increased collaboration nationally and internationally with governmental organisations, companies and institutions. Our expectation is that our engagement with these organisations will translate into new international projects and collaborations for ESR in 2022/23 and beyond.

Living Standards Framework

We have a significant role in creating a healthy, safe and prosperous country. Our science and research contribute to long-term wellbeing outcomes by supporting core government and industry priorities and activities. We have used the Treasury's Living Standards Framework[2] to assess our achievements for the past year against the four capitals, which are assets that create wellbeing. For example, ESR's ability to carry out genome sequencing as part of the public health response to the COVID-19 pandemic has contributed directly to reducing the material economic costs of lockdowns on New Zealand's economy. By having genome sequencing and wastewater testing, the estimated benefit of the economic cost avoided is around $3.5 billion. The drivers of these benefits are the high daily cost of the lockdowns. Even reducing the time at Level 3 lockdown in Auckland by one day can save the economy an estimated $50 million.

Natural capital: This includes land, soil, water, plants and animals, as well as minerals and energy resources. These aspects of the natural environment are needed to support life and human activity.

Social capital: This describes the norms and values that underpin society. It includes things like trust, the rule of law, cultural identity and the connections between people and communities.

Human capital: This includes people's skills, knowledge and physical and mental health. These things let people fully take part in work, study, recreation and society.

Financial and physical capital: This includes things like houses, roads, buildings, hospitals, factories, equipment and vehicles. These are the things that make up the country's physical and financial assets, which have a direct role in supporting incomes and material living conditions.

[2] *https://www.treasury.govt.nz/information-and-services/nz-economy/higher-living-standards/our-living-standards-framework*

Ngā mahi whakahirahira
Highlights

The overview below highlights some of our high-quality work over the past year and shows the scope and breadth of our innovative research and services.

Our achievements	How our work aligns to the Living Standards Framework	Impact area
This year we: • continued human genomics research to increase our ability to develop new technological tools and offer insights into clinical health to improve the health of New Zealand's people • continued to develop our genome sequencing techniques to build a profile of pathogens that are antibiotic resistant • researched and analysed COVID-19 saliva test results to determine the best way of handling saliva samples in the laboratory • continued to expand COVID-19 wastewater testing capability and surveillance across treatment plants in New Zealand to detect early warning signals and support public health surveillance of COVID-19, collaborating nationally and internationally on this project • received additional international funding from Flu Lab for SHIVERS V, a collaborative research project with the University of Auckland, to help prepare New Zealand for new and resurgent respiratory disease outbreaks • continued vaccine modelling to support the Government's plan for safely reopening New Zealand's borders while ensuring people and communities are protected. Collaboratively, we delivered a key improvement to the Éclair system, which collects COVID-19 results from diagnostic laboratories		**Healthier communities** **Cleaner water and environment**
• started work with Rūnanga o Ngāi te Rangi and Ngā Hapū o Matakana me Rangiwaea to develop a wai programme for Matakana whānau as part of the He Wai Māpuna programme. Our groundwater science team is developing a work programme for groundwater visualisations and groundwater monitoring on Matakana Island • continued research into establishing a groundwater health index, focusing on macroinvertebrate presence and microbial diversity • continued contributing to collaborative scoping work and developing co-design concepts for future public health programmes with and for countries in the Pacific region (from policy to practice), to empower them to achieve their goals for cleaner, safer drinking water and sanitation		**Healthier communities** **Cleaner water and environment**

Our achievements	How our work aligns to the Living Standards Framework	Impact area
This year we: • collected and analysed 256 recreational water samples over a 16-week period using faecal source tracking to test for ruminant, human and avian faecal contamination in each sample and assess the public health risk posed by microbiological contamination of recreational waters. This analysis supports Manatū Mō Te Taio (the Ministry for the Environment) to build the revised Quantitative Microbial Risk Assessment database. The database forms part of a study to revise the *Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas in New Zealand* • participated in a scientific expedition led by the Blue Cradle Foundation, which focused on microplastics and marine biosecurity risks. We collected 108 samples between Auckland and Opua, Te Tai Tokerau (Northland), to analyse these microplastics. This work forms part of ESR's research into the effects of microplastics on the environment and marine life. A highlight of the journey included presentations to communities and schools about how significant and widespread the pressures are on marine ecosystems because of microplastics pollution		**Healthier communities** **Cleaner water and environment**
• continued to operate five Comprehensive Nuclear Test Ban Treaty (CTBT) monitoring stations in New Zealand and the Pacific, including New Zealand's certified radionuclide laboratory in Christchurch. As New Zealand's National Data Centre, we provide essential monitoring and ongoing verification of worldwide CTBT-relevant activities. A highlight included a presentation of our work to the Minister for Disarmament and Arms Control • developed a national hazard assessment for Guyana, on behalf of the International Atomic Energy Agency (IAEA), to inform an emergency response arrangement and a radiological risk profile. This hazard assessment model has been adopted by the IAEA to help other countries in the Caribbean Community (CARICOM). The IAEA has contracted ESR radiation scientists to conduct similar assessments for Jamaica, Antigua and Barbuda, Trinidad and Tobago and Barbados • provided ongoing environmental monitoring of artificial radioactive contaminants in air, rainwater, food samples and sea water • continued to test and certify New Zealand food exports for radioactive contaminants		**Cleaner water and environment** **Healthier communities**

Our achievements	How our work aligns to the Living Standards Framework	Impact area
This year we: • provided analysis of soils and sediments for radiometric dating and erosion studies in cooperation with CRIs and universities • performed inspections and investigations and provided advice and emergency preparedness and response services to support the national radiation safety regulatory authority • delivered radiation safety training courses to all sectors using radiation sources and calibrated radiation survey meters for users of radiation sources		**Cleaner water and environment** **Healthier communities**
• progressed work to develop an objective test for diagnosing concussion by using RNA sequencing, bioinformatics and appropriate statistical analyses to distinguish between individuals who have suffered a concussion and those who have not • received KiwiNet funding to progress two areas of research and development in recognition of our high-quality forensic work to: – explore DNA methylation for the ability to differentiate between the DNA of twins and age estimation from a body fluid – develop SorTR, an in-house system for analysing DNA profiles. We have successfully received a patent for this work • used ESR's wide-ranging expertise in forensics, pharmaceuticals, health and environmental science to research the quality of vaping e-liquids and test for the presence of controlled substances, bacteria, and endotoxins. These findings will help inform New Zealand's vaping regulations • developed an evaluative statistical computational tool to compare firing pin impression evidence and interpret the test results, reliably distinguishing firing pin impressions from different firearms based on random (identifying) features • continued to explore novel image processing and machine learning biometric technology that uncovers the vein patterns of subjects in colour digital images as part of our *Vein Pattern Extraction for Forensic Investigation* research project. The project aims to ensure the physical and digital safety of New Zealand's people		**Safer communities** **Healthier communities**

Our achievements	How our work aligns to the Living Standards Framework	Impact area
This year we: • provided ongoing support to and collaboration with scientists from the Ministry for Primary Industries, Ministry of Health and New Zealand Food Safety Science and Research Centre to help the poultry industry track, trace and eliminate *Salmonella enteritidis* from the poultry and egg production chain • progressed research into endolysins and aptamers to combat pathogens that contribute to increased outbreaks of zoonotic disease • developed new networks and nurtured previously active relationships through He Ō Uta, He Ō Tai, ESR's Māori outreach programme. This collaborative outreach programme works with kura (schools), hāpori whānui (the community) and ESR scientists to share and grow knowledge about testing the safety of drinking water as well as local awa (rivers) used for gathering mahinga kai (traditional harvested foods) and for leisure activities like kau (swimming). A contract was finalised with the New Zealand Marine Studies Centre to create outreach resources to be used by tamariki, whānau and rangatahi. We have also grown our relationship with the Pūhoro STEM Academy through this programme • delivered contamination testing and research for ESR's Te Hāpai Ō programme. Te Hāpai Ō aims to answer the question 'is our kai safe to eat?' Contamination testing and research helps to inform local harvesters of the safety of local mahinga kai for consumption in rohe in the South Island. Our major partnerships in 2021 were with various hapū across the Ngāi Tahu rohe. The programme is for safe mahinga kai harvesting environments in Aotearoa New Zealand	 	**Safer food** **Healthier communities**

SHOWCASE

A dynamic way of working with and for Māori

Our He Wai Māpuna journey

Our multi-year flagship programme, He Wai Māpuna, incorporates mātauranga Māori and modern science to support Māori to achieve their aspirations for wai by changing the way we work across ESR to deliver greater impact for Māori.

He Wai Māpuna was launched in October 2020 with the support of ESR's Strategic Science Investment Fund. This research programme is a new and dynamic way of working for ESR and our iwi partners. Three iwi partners joined the programme at the beginning – Ngāti Awa, Ngāti Kahungunu ki Wairarapa, Tauranga Moana Iwi. Ngāti Toa Rangatira and Ngāi Tahu have more recently joined the programme.

He Wai Māpuna is enabling our iwi partners to define and lead programmes of work that will benefit their whānau, hapū and communities. The focus of the programme is water but the benefits are not limited to a physical improvement in water quality. They also incorporate social, economic outcomes alongside broader environmental benefits. Harnessing both mātauranga Māori and Western science, He Wai Māpuna is demonstrating how dual knowledges can positively impact Aotearoa New Zealand communities.

Central to our programme is strong, enduring relationships with Māori. By placing a key focus on the relationship, this programme supports all parties to develop their capability. By committing to a longer-term relationship, the programme offers the flexibility that is required as new aspirations emerge, capability grows, regulations change, and any external environmental crises arise.

Each of our partners has a different focus based on their unique environmental features and whānau aspirations. Taking the time to develop a mutual understanding of what is important to each individual iwi whānau, and what ESR researchers and scientists are able to offer, helps us undertake co-designed research and services that will make a difference. Impact for the community is the focus. Living the principles of manaakitanga (hospitality) and kotahitanga (collaboration) has guided our relationships.

With a deeper mutual understanding of aspirations and capabilities, we have co-designed initial projects. The project in Tauranga Moana is improved visualisation of their groundwater features. Ngāti Awa are focusing on a visualisation of a significant water site in their takiwā. In Wairarapa Moana, a major project focused on the value of wai and restoration is beginning. All iwi have expressed an interest in visualisation tools to 'see' the current state of their wai and help generate insights and requirements across their rohe.

Our He Wai Māpuna team also hosted environmental monitoring education sessions within the Ngāti Toa Rangatira rohe. Learning the importance of environmental monitoring with a hands-on approach is vital for renewing kaitiakitanga in whānau.

He Wai Māpuna is a transformational change in science delivery. It is a change that we expect to result in better outcomes for Māori and for New Zealand communities. By living our He Pūtaiao, He Tāngata strategy, we are embedding a new way of working across ESR.

SHOWCASE

Growing our leadership in creating affordable genomics for the future

Real-time public health intelligence, surveillance and analysis will inform a more targeted response to managing and mitigating public health and environmental health threats.

By investing in a genomics-first approach across our science domains, we are leading the development of affordable genomics for the future. Detecting pathogens faster and developing rapid solutions will increasingly protect New Zealand's people.

ESR's increasing investment in genomic capability and building collaborative international partnerships to develop genomics technology will transform genomics in the future.

Our ground-breaking work to integrate genomics with epidemiological data, support decision-makers and provide real-time public health surveillance for the COVID-19 pandemic was a New Zealand first. To prepare for future possible disruptions and provide service resilience, we introduced real-time sequencing capability in Auckland, Wellington and Christchurch, undertaking both regular and urgent genomic sequencing of positive COVID-19 samples.

We consistently delivered a genome within 24 hours of a COVID-19 case being detected, providing investigation, analysis and intelligence. Increasing our sequencing capacity let us quickly identify and share genomes from samples to generate insights, supporting a more holistic approach to public health surveillance and the Government's wellbeing outcomes while reducing the economic impact of lockdowns.

Our genomics was at the forefront of supporting the Government's response to the two Auckland lockdowns in August 2020 and February 2021, when community transmission cases occurred. We also quickly responded to the case of a vaccinated Australian traveller who arrived in Wellington in June 2021 and then tested positive for COVID-19 once they returned to Australia.

We are using our COVID-19 experience in genome sequencing to take an increasing genomics-first approach to our science. Genomics has a vital role in many areas, from public health surveillance, clinical metagenomics and epigenomics, forensics, food safety, biodiversity and tracing antibiotic resistant pathogens in wastewater.

We are an active partner with the Australian Communicable Diseases Genomics Network on microbial genomics, to support public health activities. We share microbial genomics data and knowledge on pathogens of significance, including antimicrobial resistance pathogens.

By moving more microbial species over to full genomic sequencing and surveillance, we can generate, in real time, more genomes for diagnostic purposes at a much faster rate than ever before. This helps us profile the genetics of pathogens and build a genomic database that can be used to answer increasingly complex public health and environmental health questions and

Dr Miles Benton with the portable adaptive sequencing device he created.

generate insights. By tracing and identifying sources of disease outbreaks, we can provide targeted intervention tools.

Our genomic and bioinformatic scientists have been looking at ways to make genomics accessible and affordable, by creating technological solutions and data pipelines that can be used by a range of end users.

Dr Miles Benton, a senior scientist and bioinformatician in ESR's Human Genomics Team, has created portable, battery-operated genome-sequencing devices that allow real-time genome sequencing to be deployed in the field or a clinical setting. These devices allow for live-base calling to generate and interpret genomic sequencing analysis in real time. Dr Benton's successful collaboration with Oxford Nanopore Technologies and other global collaborators on this ground-breaking adaptive sequencing work has resulted in affordable and faster genomic technology that can be used for point-of-care diagnostics, including analysing crops, waterways and mahinga kai. This portable sequencing device is being used in a hospital in Basel, Switzerland, to generate genomes from cancer patients to identify and interpret epigenetic changes or mutations to genes, which are characteristics of cancer-causing cells. Plans are under way to trial this technology in New Zealand hospitals. Dr Benton has also supported the University of Otago's research into the genetic health of kea populations across New Zealand.

Working with the Wellington Regional Hospital, we are currently researching how we can provide a clinical metagenomics platform using the latest generation of sequencing technology (independent of culture-based traditional techniques) to speed up the diagnosis of critically ill patients and provide timely information to guide targeted treatment decisions. We can identify pathogens within hours of receiving the sample, providing findings that are consistent with diagnosis made using standard laboratory techniques.

Our pilot, while still being evaluated, is showing promising results and holds the potential to point to effective drugs to treat the relevant pathogen. We are continuing to develop and validate the methods across a range of samples.

Together with other key collaborators, we are continuing to push the boundaries of genomics technology. We are using our leadership role to ensure that genomics technology for the future delivers increasing value and impact.

SHOWCASE

How our innovative forensic science technology is changing frontline policing in New Zealand

"Lumi has proven very popular with Police staff. It allows officers to test drugs through plastic, eliminating the need to open packets with suspected drugs inside" says Assistant Commissioner Bruce O'Brien.

An evaluation of the six-month pilot Lumi Drug Scan service, jointly developed by ESR and Ngā Pirihimana o Aotearoa (New Zealand Police), has shown promising results.

At its core, Lumi has been developed to reduce the harm caused by illicit drugs. It provides real-time results that support police officers at the frontline to improve decision-making when handling suspected illicit drug samples.

Lumi combines powerful machine-learning drug-detection models and a mobile app that syncs wirelessly with a handheld device. Lumi rapidly processes results within seconds to detect if substances are cocaine, MDMA (ecstasy) or methamphetamine (P). Results are displayed on the police officer's connected work phone. Behind the scenes, Lumi draws on ESR's forensic chemistry and data science expertise, and a vast reference library of drug data. During the pilot, 25 Lumi-equipped devices have been trialled across 5 Police districts: Counties Manukau, Waitematā, Central, Canterbury and Auckland.

Lumi can scan through plastic packaging, enhancing the safety of the public as well as officers on the frontline when handling unknown samples. Lumi's

real-time detection of substances likely to be controlled drugs lets Police resolve events quickly and, where appropriate, seek non-judicial pathways for crime incidents, such as referring drug users to addiction services.

Lumi's digital case record and electronic chain of custody workflow support a 'more street, less station' approach to policing, reducing manual paperwork requirements. Data generated by Lumi testing is collated and visualised in the Lumi Analytics Dashboard. This dashboard provides geo-spatial and time-series trends of drug interceptions to help generate improved insights for Police districts and national managers.

During the pilot, Lumi was used at 481 different events with 884 items screened. Lumi identified methamphetamine, MDMA and cocaine in more than half of these events.

ESR's Forensic Research and Development Manager, Dion Sheppard, says the Evaluation Report highlights the unique opportunity Lumi has presented for frontline police and ESR scientists to collaborate to an unprecedented degree.

"Our partnership with Police means Lumi is intuitive and meets the needs of the frontline officers who use the service. Through our co-design approach we were able to develop a unique service that combines forensic science expertise, frontline knowledge and cutting-edge technology into a solution that works in the real-world," said Dion.

The pilot found most frontline officers who used Lumi have 'high confidence' in the game-changing service.

The value of Lumi was clearly voiced by one officer in the Evaluation Report: "[Lumi's] good when dealing with a small sample, you're just putting it straight onto the device in the bag, pressing a button on your phone, you don't actually have to handle the substance".

Assistant Commissioner O'Brien said: "It allows officers to consider the best way to resolve the incident and ensure the person in possession of the drug is considered for a health-based resolution".

Most of the officers who used the service reported it had helped them make informed decisions quicker, without needing to take someone back to the station.

At over 95 percent accuracy, Lumi is effective and will be significant in keeping our communities safer. Lumi is one of many tools, techniques and processes ESR scientists have refined over the years that complement one another. When police officers find larger quantities of suspected drugs, these substances are sent to ESR's forensic chemistry laboratories for comprehensive evidential analysis.

Data from the Lumi Drug Scan has the potential to produce crucial information about drugs within New Zealand that will give our partners better insights into education and intervention tactics. Improved insights support consistent decision-making and effective policing, contributing to New Zealand Police outcomes of keeping communities, homes and roads safe.

New Zealand Police is now evaluating the benefits of the service, to determine Lumi's role in keeping communities safer and when the Lumi Drug Scan service is likely to be rolled out around New Zealand.

SHOWCASE

Using our expertise in whole genome sequencing to reduce the burden of foodborne illnesses

We are using our expertise in whole genome sequencing (WGS) to lead collaborative food industry research projects to develop faster methods of detecting foodborne pathogens and trace contamination sources.

This will help protect the integrity of New Zealand's food-based economy and support the health, wellbeing and productivity of New Zealand's people.

Ensuring New Zealand's food is safe to eat is vital for protecting public health and accessing international markets. A foodborne outbreak can have devastating effects, cause significant economic losses to the food industry and adversely affect a country's reputation and economy.

Foodborne disease is costly for New Zealand's food industry. It is estimated foodborne illnesses cost New Zealand nearly $86 million per year. This relates to increased healthcare costs, loss of productivity, the burden to individuals of long-term illness and death, and significant economic costs for the food industry.

Food processing systems are complex. Sources of contamination can arise from multiple areas and can reappear and persist over time. Food industry companies have a requirement to undertake regulatory testing for pathogenic bacteria such as *Listeria* or *Cronobacter*, two bacteria that can, on rare occasions, cause serious disease and even death in vulnerable groups of people.

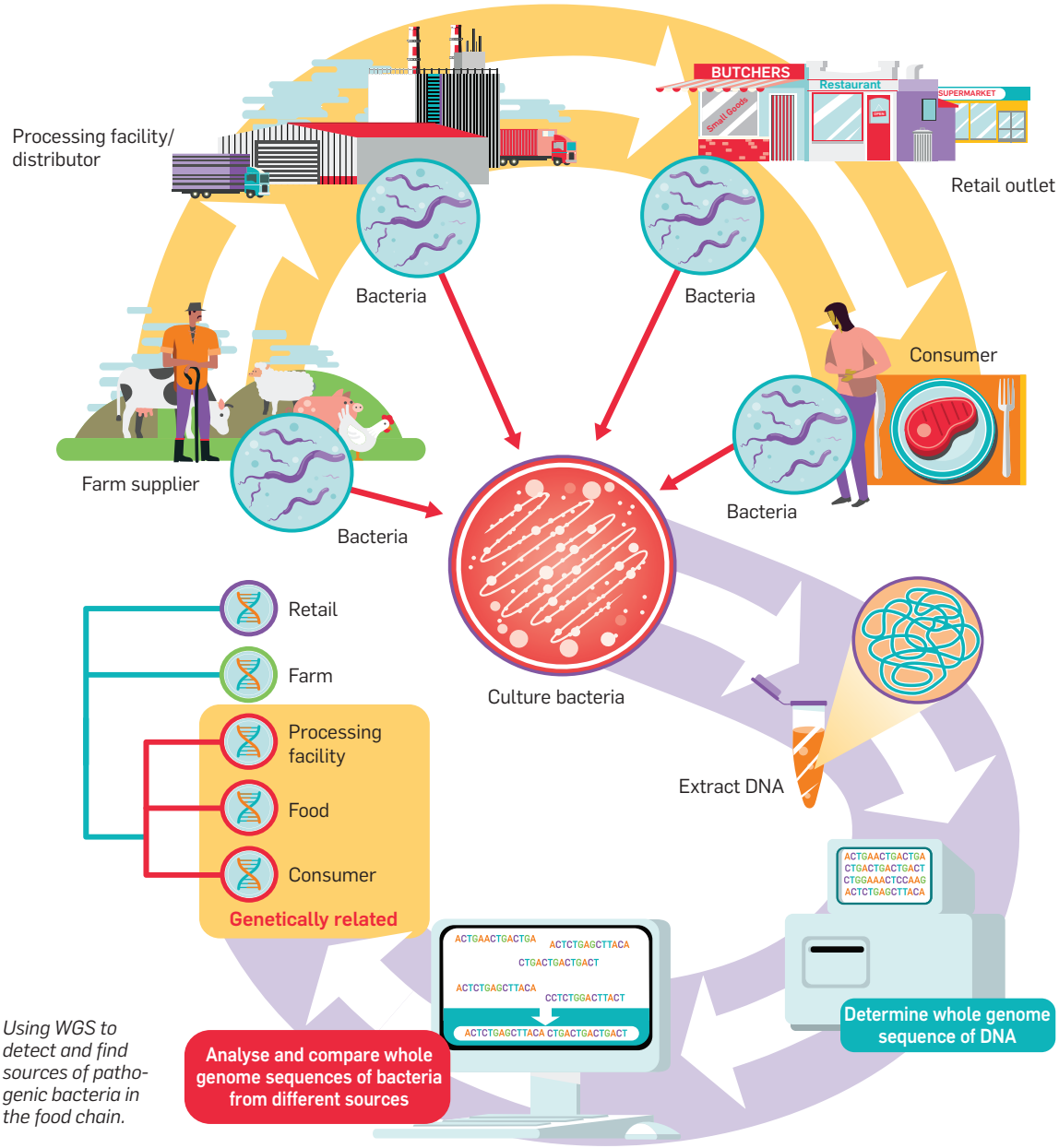
Detecting, mitigating and eliminating contamination issues contribute to substantial costs for food industry companies in terms of sampling and testing through to production halts and delays, and even product recall or reprocessing products.

At ESR, we have been at the forefront of researching microorganisms of public health significance associated with food safety. We use WGS to generate and analyse information on these pathogens. WGS is a valuable tool to detect, identify and trace pathogens in food processing systems.

This SSIF research project has strengthened our partnership with the New Zealand Food Safety Science and Research Centre (NZFSSRC). To keep New Zealand's food system safer and support the NZFSSRC, we have been leading and collaborating on WGS research projects with Massey University, Plant and Food Research, AgResearch and the University of Otago to identify food safety pathogens within food production environments. This year, the NZFSSRC has facilitated and co-funded eight WGS research projects.

By gaining the entire DNA make-up or 'whole genome sequence' of a pathogen, WGS offers a faster and more precise method than those previously used

[3] *Ministry for Primary Industries Food Safety / Haumaru Kai Portfolio Briefing 2020. Retrieved from https://www.beehive.govt.nz/sites/default/files/2020-12/Food%20Safety.pdf.*



Using WGS to detect and find sources of patho-genic bacteria in the food chain.

for identifying pathogens and tracing sources of contamination. It helps identify areas where food producers can focus efforts for cleaning, with the aim of eliminating potential sources of contamination. Those New Zealand food industry members who have been early adopters of WGS can identify new or persisting pathogen types in sources by comparing the historical dataset of pathogens in their risk management systems. The cost benefits are particularly worthwhile if a company is facing chronic contamination issues in its processes.

One recent research project included developing a shared WGS database for over 1,000 *Listeria monocytogenes* isolates as a resource available to NZFSSRC members including food industry members and scientists. This WGS database can be interrogated to enable genetic comparisons with easy-to-use visualisation tools to provide a 'bigger picture' and context as to how common a particular type is in New Zealand. We hope to extend the database to include other pathogens and incorporate additional features, such as adding the data onto processing plant maps for food industry members. Although this database will not be used as a public health surveillance tool, the WGS data will help researchers to determine the population structure of *Listeria* in New Zealand and within an international context. This helps us gain insights into how these pathogens have evolved and to identify the appearance of new types. By looking at genetic traits, this may explain how *Listeria* causes disease and how resistant it is to antimicrobials such as cleaners and sanitisers. This may help find new ways to combat these pathogens in the food manufacturing environment.

We continue to discover opportunities to develop new and novel research ideas and develop complementary areas of research using WGS applications. We received funding from the Health Research Council to research *Yersinia* using WGS to identify significant sources of human infection. WGS will contribute to improving public health surveillance because it is increasingly being used worldwide for surveillance and outbreak investigations.

SHOWCASE

Connecting to protect New Zealand's water quality

Our scientists play a leading role in helping keep the water New Zealand's people use every day safe from toxins and pathogens, by providing high quality analysis and advice.

ESR scientists use their unique skills and techniques to maintain New Zealand's water quality. From Havelock North to the more recent detections of lead in the Waikouaiti drinking-water supply, ESR has played a critical role in tracking and advising on drinking-water issues.

Earlier this year, in the communities of Waikouaiti, Karitāne and Hawkesbury, just north of Dunedin, the water supplier detected high levels of lead. On 4 February 2021, a 'Do Not Drink' notice was put in place after discussion between Public Health South and the Ministry of Health. ESR public health and drinking-water specialists were rapidly brought in to provide advice on potential public health risks. A collective decision was made to screen blood lead levels to determine possible historical exposures to lead. By the end of February, blood lead tests were being offered to all community members and, within two weeks, over 1,500 tests had been conducted.

The emerging situation required broader expertise and ESR was able to contribute epidemiological, forensic, clinical, toxicological and risk management expertise as well as drinking-water knowledge. Our scientists were at the forefront of decoding and analysing the data from the blood tests and in determining the potential risks from the water supply. Our teams have stood alongside Public Health South in providing scientific expertise and analysis through the full investigation into the cause of the lead contamination. This resulted in the lifting of the Do Not Drink notice in July 2021, after comprehensive testing and analysis.

In addition to the drinking-water investigation, existing relationships with the local Taiāpure hapū

ESR's public health response to lead contamination in the Waikouaiti water supply included Georgia Bell, ESR's Kai Rangahua Māori scientist, providing guidance on lead levels in mahinga kai.

meant guidance could be given on results of heavy metal testing from mahinga kai. These connections let us support local communication efforts about what was happening and why. Work with the marae will be ongoing, to ensure we fulfil our community responsibilities and continue to support the environmental responsibilities assumed by the hapū.

Waikouaiti River estuary at Karitāne. Photo: Wikipedia; Nankai

The information developed through this investigation has helped government agencies, such as the Ministry of Health, Ministry for the Environment, Public Health South and the water supplier. We will continue to use our technical and social expertise to support the current water reforms. The drinking-water team continues to advise both the Ministry of Health and Taumata Arowai (the new water regulator) on public health risks associated with water treatment and management.

An independent review into the initial response to lead contamination in Waikouaiti's drinking-water supply endorsed the public health response that focused on reducing the risk to the community's health first but also raised several concerns, particularly around aging infrastructure. Our scientists have subsequently been requested to provide advice on how New Zealand should be prioritising infrastructure investment from a public health perspective.

In response to the Waikouaiti incident, ESR's drinking-water team is undertaking further training in emergency preparedness. This will allow the team to continue to add value if a major drinking-water event were to happen before Taumata Arowai has fully developed systems in place. As with the COVID-19 pandemic, when major public health incidents occur, ESR's role is vital in ensuring accurate information is available to multiple parties quickly, allowing data-driven decisions to be made. This works to protect the health of New Zealand's people and reflects ESR's commitment to science for communities.

E whakanui ana i te hiranga o te pūtaiao

Celebrating our science excellence

Our dedicated people continue to be recognised for their outstanding science contributions

Our people and our scientists are among the world's best in their respective fields of genomics, bioinformatics, forensics, social, radiation, epidemiology, virology, drug chemistry and toxicology, environmental science and food safety. Our people are dedicated to making a real impact on the safety, health and wellbeing of people and communities in New Zealand and globally.

We continue to build on the great work we have been recognised for in previous years. Our people were again recognised and acknowledged by receiving some of the most prestigious national and international awards and invited to participate in scientific and advisory committees both internationally and nationally.

Dr SallyAnn Harbison, Member of the New Zealand Order of Merit for services to forensic science

Dr SallyAnn Harbison was appointed as a Member of the New Zealand Order of Merit in the New Year's Honours list for services to forensic science. This award reflects the massive contribution SallyAnn has made during her stellar career of over 30 years at ESR. The ceremony was held at Government House in April 2021 where SallyAnn received her honour from the Governor General, Her Excellency the Rt Hon Dame Patsy Reddy.

SallyAnn is a senior science leader in ESR's Forensic Biology Team. She has played a significant part in prominent New Zealand criminal cases and contributed to the development and application of New Zealand's forensic DNA capability.

In 1999, SallyAnn worked on the first homicide case solved by using the DNA Profile Databank. She has represented ESR on international committees and spoken at many conferences and meetings.

SallyAnn has also supervised more than 60 Master of Science and doctorate students at the University of Auckland, led the Biology Specialist Advisory Group of the Australia/New Zealand Forensic Executive Committee, and been an assessor for Australian and American accreditation bodies.

SallyAnn was humbled to receive this recognition and says she could not have achieved it without the support of her forensic colleagues.

Science New Zealand Supreme award

During December 2020, our COVID-19 team won the Supreme Award at the Science New Zealand Awards for their tireless determination, innovation and leadership in supporting the Government's COVID-19 response and recovery.

Dr Joep De Ligt spoke for ESR saying, "I want to acknowledge all the people who were not here to accept the award who played an incredibly crucial part in the COVID response. Everyone in the wider ESR team, from IT staff to communications to the cleaners who kept our workspaces safe, had a role to play in the pandemic response".

The team's biggest achievements included creating the country's first COVID-19 test, sequencing the genome of every positive local case and providing real-time datastreams. The team created the New Zealand COVID-19 dashboard, set up a national COVID-19 result repository to provide real-time feeds of positive and negative COVID-19 results, and integrated COVID-19 testing data and surveillance information. This provides analysis and advice that informs and underpins the investigation by public health units, epidemiologists and others working with the Government to trace the origin of cases and manage the spread of the disease. Other work includes screening wastewater samples for COVID-19 to determine any potential areas of community transmission. Work continues on vaccine modelling and saliva studies to determine new ways of testing for COVID-19.

Dr Virginia Hope – Science New Zealand Individual Lifetime Achievement Award 2020

Virginia is ESR's medical director and has contributed significantly to achieving better public health outcomes and equity for New Zealanders throughout her career in public health.

She joined ESR in 2006, bringing with her a wealth of healthcare knowledge gained as a frontline public health specialist, including serving as the Medical Officer of Health (Environmental Health) for Auckland. Virginia is an adept leader, with governance roles chairing district health boards.

ESR has been well-placed to rise to the unprecedented challenge brought about by the COVID-19 pandemic thanks to Virginia's leadership, such that ESR's public health surveillance and science is trusted and relied upon by the health system and Government to inform New Zealand's lauded pandemic response.

Virginia's acumen for scientific research is highlighted by the significant body of research she has authored or contributed to. For her services to health, Dr Hope became a Member of the New Zealand Order of Merit in 2014.

Virginia is a board member of the new water regulator Taumata Arowai as well as a commissioner and board member of Te Kāhui Tātari Ture – the Criminal Cases Review Commission.

Georgia Bell – Science New Zealand ESR Early Career Researcher 2020

Georgia Bell (*Ngāti Maniapoto, Ngāti Pū and Ngāi Te Rangi*) is a committed advocate of science and mātauranga knowledge systems and strong leadership in microbiology, immunology and marine science. This places her in the ideal position to lead ESR's Te Hāpai Ō mahinga kai programme and community education and outreach programmes. These programmes encourage tamariki and rangatahi to be excited about mātauranga and science.

Georgia has led successful Vision Mātauranga and Curious Minds projects. Her work has led to the development of a food safety testing programme for mahinga kai gatherers and educational water sampling resources for use in kura.

Photo: James Humphries

Bronwyn Humphries awarded the New Zealand Land Treatment Collective (NZLTC) Award for her contribution to land treatment in Aotearoa

ESR and Lowe Environmental Impact partner to manage the NZLTC. The NZLTC is a community of around 350 people nationwide and growing, with a dozen overseas members who belong to government research organisations. The New Zealand community consists of research organisations, universities, councils, government departments, and environmental and engineering consultants.

Bronwyn Humphries is a scientist in ESR's groundwater team and technical manager for the NZLTC. Her role is to constantly improve how land treatment science and technology are communicated to NZLTC members and the wider land treatment community.

Bronwyn was presented with the award at the NZLTC annual conference in Palmerston North in May 2021, to recognise her outstanding contribution to land treatment science.

Bronwyn says the kaupapa that ESR is pursuing in managing the NZLTC is also relevant to ESR's journey with Māori. The NZLTC provides an invaluable opportunity to bring scientists working on various water and land treatment projects together in one room, to share approaches and inspire new ideas.

2021 PRINZ Awards: Sally Logan-Milne Young Practitioner of the Year Award

In May 2021, **Ryan Willoughby**, ESR's senior communications advisor, won the 2021 PRINZ (Public Relations Institute of New Zealand) Sally Logan-Milne Young Practitioner of the Year award. As ESR's public information manager, this award recognised Ryan's efforts over 18 months to keep New Zealand's public informed about our innovative science and leadership during the COVID-19 pandemic, highlighting the importance of good science communication.

Left: Anja Roemer and Ryan Willoughby

Our groundwater science team – Science and Research Section Finalist 2020 of the Strategic Science Investment Fund Primary Industries New Zealand Awards

ESR's Woodchip Denitrification Wall Technology was a finalist in the Science and Research section of the New Zealand Primary Industry Awards held on 23 November 2020 at Te Papa, Wellington.

The project, led by **Lee Burbery**, **Theo Sarris** and **Murray Close** and supported by ESR's groundwater team of **Louise Weaver**, **Phillip Abraham**, **Richard Sutton**, **Panan Sitthirit**, **Judith Webber** and **Erin McGill**, were nominated for their project on woodchip denitrification wall technology that aims to mitigate on-farm nitrate pollution from farming activities. The awards provide a unique opportunity to reward excellence and celebrate success throughout the primary industries value chain from the farm gate to research.

ESR's COVID-19 laboratory digital response team selected as one of three finalists in the 2021 Excellence in IT Awards for the Excellence in Digital Health category

The ESR COVID-19 laboratory digital response team was selected as one of three finalists in the 2021 Excellence in IT Awards for the Excellence in Digital Health category. This nomination recognised the team's work in supporting and developing the systems that provide real-time data streams and integrate COVID-19 testing data for the National COVID-19 Result Repository. The team supported the Ministry of Health to set up paperless scheduling, collecting and processing of COVID samples and delivery of results at managed isolation quarantine facilities. ESR's COVID-19 laboratory digital response team is made up of **Andrew Crooke** and **Dr Mehnaz Adnan**, supported by ESR's scrum team. Members include **Marty Cook**, **Trevor Cuttriss**, **Bryant Longley**, **Nicholas Hill**, **Todd Humphries**, **Dale Gutierrez**, **Joe Kuttikkatt**, **Justin Souto**, **Adeel Ibrahim** and **Sarah Cao**, including others who supported these systems.

Highlighting our science quality

We are recognised for our outstanding original research. Our science quality is reflected in the growing number of research papers we submit and collaborate with others on, reflecting the quality and impact of our contributions to scientific knowledge.

COVID-19 research

In a first for ESR, *The Lancet: Public Health* published a paper authored by **Dr Sarah Jefferies** *et al* titled 'COVID-19 in NZ and the impact of the national response: a descriptive epidemiological study' in October 2020.

The paper described the New Zealand experience, to provide valuable insights to the international community to inform future actions. In the study, the researchers unpacked and analysed how New Zealand's science-informed public health measures managed the first wave of the COVID-19 pandemic. It details how the speed and intensity of New Zealand's response during this wave resulted in a much lower impact on the country and the initial elimination of COVID-19. It found that New Zealand's response was notable for its strict border closures, rapid implementation of national lockdown, and rapid enhancement of surveillance activities.

Environmental research

A paper co-authored by our scientist **Laura Banasiak** won the 2021 International Association for Bridge and Structural Engineering Outstanding (Scientific) Paper Award. The paper, just the second from New Zealand to earn this prestigious award in the past 30 years, looks at how shredded tyres could be used in novel seismic isolation applications.

The team's award-winning paper 'Eco-rubber seismic-isolation foundation systems: A sustainable solution for the New Zealand context' details their research into recycling waste tyres for use in various seismic isolation techniques that could help protect buildings – and more importantly the people inside – during earthquakes.

Laura co-authored the paper with Ernesto Hernández (doctoral student), Alessandro Palermo (professor), Gabriele Granello (lecturer) and Gabriele Chiaro (senior lecturer) from the University of Canterbury, where trials have been taking place.

The research, a win-win from an environmental perspective, presents non-invasive techniques and a straightforward method for shoring up small- to medium-sized buildings to protect inhabitants during earthquakes, while also helping deal with the massive problem posed by difficult to dispose of waste tyres.

Forensic research

The National Institute of Forensic Science is a directorate within the Australia New Zealand Policing Advisory Agency (ANZPAA NIFS). The best paper awards granted by the ANZPAA NIFS recognise the contribution of forensic scientists in New Zealand and Australia to the field of forensic science. The award for Best Paper in a refereed journal, 'Examining the additivity of peak heights in forensic DNA profiles' was won by our scientists **Kevin Cheng**, **Jo-Anne Bright**, **Zane Kerr** and **John Buckleton** and co-authors **James Curran**, **Duncan Taylor** and **Anne Ciecko**.

Several of ESR's forensic scientists were highly commended for forensic papers published in 2020, recognising their work across a range of forensic disciplines. Congratulations to: **Cameron Johnson**, **Chrissy Stansfield**, **Vivienne Hassan**, **Emma Kolbe**, **Meng-Han Lin**, **Lisa Melia**, **SallyAnn Harbison**, **Hannah Partington**, **Diana Kappatos** and **Robyn Sommerville**.

Axe showing damage to black plastic area of the handle. Highlighted area below shows magnified detail.

Our science quality by the numbers

81
Peer-reviewed publications

70
Collaborative co-authored publications

8
Awards received

29
Appointments to national and international committees, panels and groups

He waka eke noa
One ESR

Our people are our greatest asset and vital to ESR's success. Our success is underpinned by investing in and developing our people to increase ESR's performance and reputation for leadership in science.

As a good employer, we are committed to providing a positive and productive work environment to let our people excel.

Through our shared values, we build a positive and collaborative One ESR workplace culture. We empower our people to challenge old ways of thinking by fostering and growing innovation and embedding a te ao Māori approach to our science and mahi.

Creating and providing opportunities for growth and leadership will build a resilient, healthy, agile and diverse organisation that values, energises and rewards its people.

Growing our culture, leaders and people

We are developing a workforce strategy to ensure we attract, retain and develop a high-performing and collaborative workforce aligned with our culture.

ESR is striving to be an employer of choice for Māori scientists and professionals. Through our investment in and support of the Pūhoro STEM academy, we have an internship programme to attract young Māori science students to grow and advance Māori science leadership and capability.

We established a new business unit at the senior leadership team level. The Māori Impact Unit focuses on our Māori impact strategy, He Pūtaiao, He Tāngata, and provides leadership and support across ESR to show us the way to achieve greater benefits for and encourage engagement with and from tāngata whenua.

Supporting our He Pūtaiao, He Tāngata goals

We have set bold targets to accelerate and uplift our cultural capability for greater science impact and

An interactive display from the the Wall Walk® training workshop

to support the goals of our He Pūtaiao, He Tāngata strategy. We know this important investment will help us deepen our connections with iwi and support our work in He Wai Māpuna.

During the year, we developed a multi-layered curriculum kaupapa that aims to build cultural capability at all levels to support outcomes of inclusion, partnerships and belonging.

Our progress this year included:

- 313 of our staff attending the Wall Walk® an interactive half-day workshop designed to raise collective awareness of important events in the history of New Zealand's bicultural relations

- 182 of our staff attended Tangata Tiriti a full day learning about Te Tiriti o Waitangi history and context in modern New Zealand
- 54 of our staff engaging in Puawai an online learning experience teaching tikanga and te reo Māori
- our first group of 20 staff starting Te Pihanga, an experiential learning with noho marae, iwi visits and specialised workshops over a 12-month period.

Our leadership, accountability and culture

We are on a journey to review and evolve our internal capabilities. This will ensure we will continue to operate effectively in future changing working environments. We recognise effective leadership at ESR as being crucial to supporting and championing a high-performing, customer-centric culture and organisation.

Our Te Kāpehu Performance Experience programme is based on building a collaborative, high-performing culture. It encourages clear accountability through meaningful performance-development conversations and defined work outputs aligned to business plans and our strategic objectives. Our Te Kāpehu and remuneration framework ensure staff feel valued, recognised and appropriately rewarded for their contribution.

We have extended Te Kāpehu into an online platform that enables our people leaders and coaches to provide day-to-day support and coaching to their teams. We created a 'coaching' framework and rolled out training for people leaders in targeted development coaching skills. This will help our leaders engage in positive conversations with their people. We will continue to embed this work and to support our people leaders in building their leadership skills.

Recruitment and remuneration

Our recruitment and selection processes foster equal employment opportunity (EEO) principles. Recruitment is focused on competencies, values, skills and experience, backed by appropriate assessment and selection tools, to ensure the best candidate is selected in a fair and equitable manner.

Our terms and conditions of employment are consistent with the good employer philosophy, with a range of benefits valued by our employees. We reward people fairly and equitably based on contribution, regardless of gender, age or ethnicity. During the year, we agreed with the Public Service Association to a review of ESR's existing remuneration framework and design a new framework for consideration and implementation.

We are committed to promoting a culture in which all people, whatever their gender, ethnic or social background, sexual orientation, role, or other differences, are valued and treated equally and with respect. Our transparent hiring processes ensure we meet legislative requirements.

Our new employees receive a thorough induction programme that includes familiarisation with key policies and processes. We are currently implementing a new digital onboarding system that will engage with new employees before they start with the organisation.

We continue to systemise our recruitment practices and approvals to expand consistency across the organisation.

Developing the potential of our people

Te Kāpehu encourages employees' development by providing clear and achievable progression through building technical skills and behavioural competencies.

Our annual science promotions process supports staff career progression. We also offer on-the-job opportunities, internal secondments and attendance at national and international science conferences.

Employees who leave us can participate in either an online or a face-to-face exit interview. The feedback is consolidated and used to assess how we can continue to build on areas of strength and improve our working environment.

Our job evaluation processes include the ongoing review of job descriptions to ensure they accurately reflect the work being done.

Supporting flexible working arrangements

We have policies that support flexible working arrangements, including flexible hours and working from home or alternative locations as outlined in our employee handbook.

We support parents returning to work by offering part-time and gradual return to full-time work arrangements. At 30 June 2021, 18 percent of our employees were working part time.

We provide active support to staff with family and other obligations. We encourage:

- our staff to take annual leave in the year it is accrued and to manage their hours to maintain wellbeing
- employees to take their volunteering day, which aims to support staff who wish to contribute to the wider community through volunteer work. During the year, our people donated 16 days to voluntary activities in the community.

We have invested in technology that allows staff in different locations to link and collaborate with colleagues, providing us with a valuable platform to host calls, deliver information and collaborate in a remote environment.

Our people's wellbeing is important to us

We seek to understand and improve our engagement and culture on an ongoing basis and continually improve the way we track and measure our progress.

During the year, we invested in Qualtrics, a new survey platform, to provide real-time reporting for leaders. It includes dashboards that generate personalised action plans for every leader based on results and priorities.

These action plans can be shared, to enable more collaboration across the business, ensuring everyone plays a part in building an employee experience that attracts, engages and retains the best people.

We rolled out our wellbeing app, RUOK, during the year to check and respond to staff's wellbeing and health as the country moved through alert levels. COVID-19 presented challenges for people to take leave while we supported the Government's response to the pandemic.

The outcome of this was a tired workforce, prompting an initiative to introduce an extended break over the 2020 Christmas and New Year period. Nearly 90 percent of our people took leave during this time with most taking a consecutive break of 18 days.

In April 2021, we implemented an ESR-wide wellbeing survey. The survey's purpose was to hear directly from our people so we could better understand their current work environment and determine how ESR could further support them and their wellbeing.

Based on feedback we received, the results allowed us to target key initiatives that would benefit our people. Three areas were identified as a focus: stress, leave and work versus family commitments, self-help resources and benefits.

We provide annual flu immunisation for all staff. This year, more than three-quarters of our staff received a flu shot through the programme.

We proactively take part in mental health initiatives including Mental Health Awareness week.

Behaviour that reflects our values

The nature of our work requires us to uphold the highest standards of integrity, discretion and ethical conduct.

To create and maintain a workplace that is safe and healthy, underpinned by equity and respect, our people treat each other fairly and professionally and in a way that reflects our values. Our code of conduct and acceptable behaviour policy set the required standards of behaviour for all our people.

We provided resources for staff, including a guide for managers, to help them feel confident should they need to deal with a bullying situation. We are currently refreshing our anti-bullying policy.

In late May 2021, our senior leadership team and staff celebrated 'Pink Shirt Day', which promotes anti-bullying. Our staff came together at morning teas across the country in a show of 'pink' solidarity, to give their commitment to anti-bullying and raise money in support of the mental health foundation. Participation rates were high and more than $1,000 in donations was raised for the foundation on the day.

A safe and healthy culture

We are committed to providing a healthy and safe working environment

We continually improve our health and safety systems and performance to keep staff safe at work. This is supported by our health and safety at work (HSW) policy statement, associated HSW policies and procedures, and HSW training for all staff. We are currently fully reviewing our health and safety policies, practices and procedures, to ensure best practice safety outcomes.

We developed a new strategic health and safety workplan during the year. This focuses on health and safety governance and leadership; measuring and monitoring health and safety performance; building organisational health, safety and wellness capability and creating effective risk management practices. This plan is supported by a health and safety critical risk work plan, which is a proactive programme of detailed analysis of ESR workplace risks that have the potential to cause fatalities or permanent incapacity. We prioritised four risk areas, and safety improvements are under way to address these. We have developed a work programme for 2021/22 to action the remaining risks.

We support all our staff through a confidential employee assistance programme, which includes a trauma support programme, providing tailored support to help staff in dealing with the physical and psychological symptoms associated with exposure to traumatic events, unpleasant information or ongoing traumatic experiences as part of their roles.

We have zero tolerance to bullying and deal with it promptly and appropriately

Our code of conduct and acceptable behaviour policy outline the standards of behaviour we expect of our people, how to deal with unacceptable behaviour (including harassment and bullying) and where to access further information and support if required, including the Employee Assistance Programme.

Kenepuru Science Centre staff members planted trees locally, as part of an initiative supported by ESR's Sustainability Committee.

New employees are introduced to the policy and given training as part of their induction. We review the policy regularly. We align our approaches with the bullying guidelines produced by WorkSafe New Zealand[4] to ensure we are following best practice.

To support an anti-bullying culture at ESR, we:

- launched an e-learning module designed to help people understand what bullying is (and isn't) and how to tackle it
- started work on strengthening our policies and frameworks that respond to harassment and bullying.

Promoting integrity, accountability and acceptance of our values is core to our culture

We are committed to ensuring our people have the confidence and support to report a real or potential wrongdoing. Our 'Protected Disclosures Policy' provides information about how to recognise what serious wrongdoing looks like and the steps to follow to report wrongdoing. This policy is supported by ESR's 'Speak Up' programme, to allow anonymous reporting.

Both the policy and the programme help contribute to a safe and lawful workplace that reflects ESR's values and code of conduct.

Our commitment to sustainability

Our sustainability commitment aligns with one of our main values, Mahi Pono – We do the right thing. We are committed to being an environmentally conscious workplace and encourage all our staff to follow sustainable practices as much as possible.

We are changing our procurement practices to reduce all waste across ESR and source more environmentally friendly alternatives as a first choice.

We will review our sustainability policy to ensure we are able to make the important shifts needed to meet our sustainability goal.

To complement existing sustainability initiatives, we will explore new ideas to reduce our organisational carbon footprint further and work towards a low carbon future.

[4] *See WorkSafe New Zealand, Bullying, at https://worksafe.govt.nz/topic-and-industry/bullying/.*

SHOWCASE

Growing our cultural capability together

"Fascinating, illuminating and confronting" – our first Tangata Tiriti workshop dispels Tiriti myths

During the year, we released several learning programmes across ESR to build our knowledge and understanding of te ao Māori and increase our cultural capability.

Our cultural capability curriculum has been developed with expert advice and is designed to support three outcomes: inclusion, partnerships and belonging.

This training provides a great opportunity for staff to learn about the factors that shaped modern New Zealand. During March 2021, many Te Tiriti o Waitangi myths were dispelled at the first Tangata Tiriti workshop held at our Kenepuru Science Centre. Around 20 staff from the Kenepuru and Wallaceville science centres journeyed into the injustices experienced by Māori at the hands of government.

Role playing and working in pairs and as a group provided interactive ways to build understanding about the role of Te Tiriti in European settlement and the Te Whakaputanga Declaration of Independence of 1835, as well as Māori commercial, political and social activity. Participants said: *"The workshop is an exceptional learning opportunity which complements the Wall Walk® workshops beautifully".*

"I found the content fascinating, illuminating and confronting. "We all need to continue to better understand the harsh reality of our history in order to make a better future".

While the Wall Walks® held last year focused on New Zealand history from 1840 to today, the Tangata Tiriti workshop focused mainly on the time before Te Tiriti o Waitangi was signed in 1840.

Workshop participants learned how quickly Māori rights were eroded after the signing through the establishment of political systems, legislation and military intervention.

Bringing in other perspectives allowed our people to gain an appreciation of the wider community and how, collectively, we need to increase our knowledge of history and the effect this has had on Māori.

Our people by the numbers

497
employees

Over 80%
ESR staff are engaged in science and research

45 years
average age

85
(**17%**) of our staff work part-time

9 years
average length of service

The largest group of our employees, **19%**, have worked with us for **five** to **ten** years. The smallest group, **5%**, have worked with us for more than **30** years, while **11%** of staff have worked with us for less than one year.

65%
ESR staff are female

(Higher than the 2020 public service average)

77%
of staff are enrolled in KiwiSaver

No
gender pay gap

5.70
average days lost due to sickness, accidents, domestic leave

5.29% staff turnover

Our annual rolling average turnover based on headcount is **5.29%**, **0.72** percentage points higher than the same time last year.

This is **4.8%** lower than the most recent State Services Commission Public Service Workforce Data 2020 benchmark of **10.1%**.

Cultural capability

Staff attendance

313 – The Wall Walk®

182 – Tangata Tiriti

54 – Te Reo Puawai

20 – Te Pihanga

Ethnicity

NZ European – **56%**

Māori – **4%**

Asian – **17%**

Pacific peoples – **1%**

Other European – **20%**

Middle Eastern, Latin American and African (MELAA) – **1%**

Disability

profile

NZ European – **≤1%**

153
health and safety event notifications in 2020/21

40%
near misses in 2020/21

25
promotions and secondments 2020/21

promotion, career progression, redeployment – **20**

internal secondments – **4**

external secondment – **1**

ESR actively seeks to support staff development, through secondment opportunities and the promotion of staff based on merit.

Ngā whakahaere – Te Poari me ngā Kaiārahi Matua

Governance – Our Board and senior leadership team

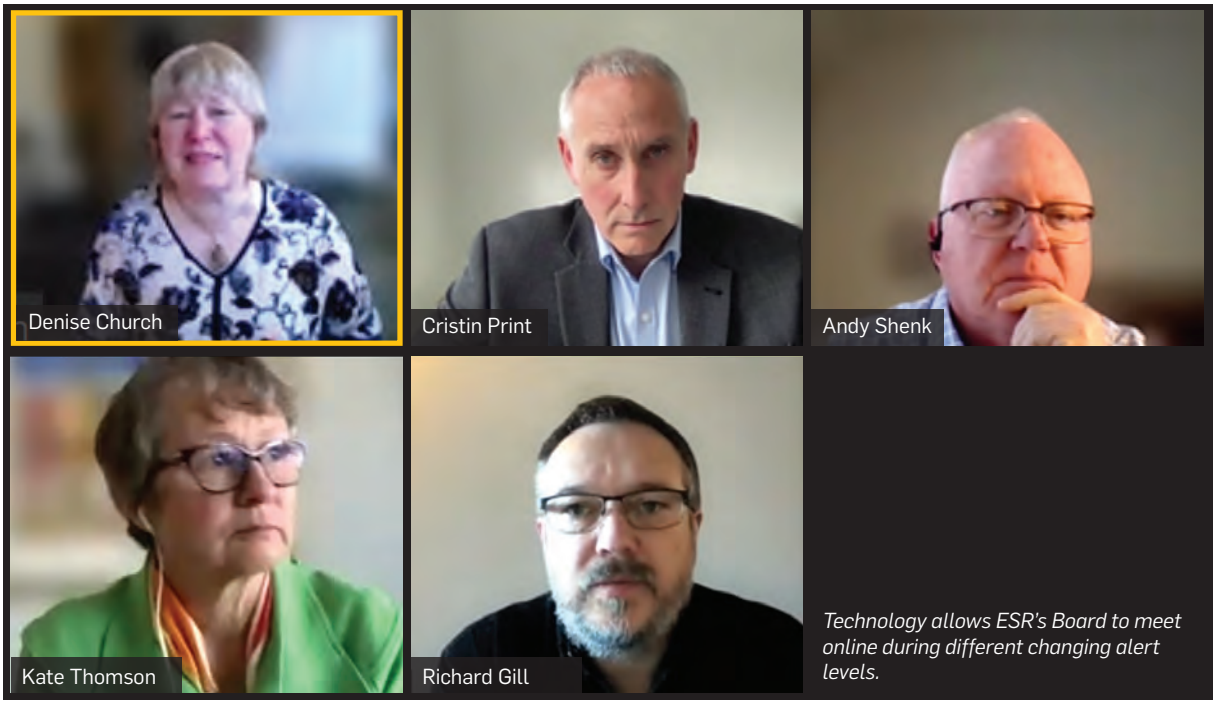
ESR's Board is appointed by the Minister of Science, Innovation and Research. Directors' remuneration is set by shareholding Ministers under the fees framework approved by Cabinet.

The Board is responsible for ensuring our governance is purposeful, robust and accountable.

Their responsibilities include acting on behalf of, and being accountable to the Minister of Research, Science and Innovation, and the Minister of Finance. Our Board fulfils regulatory expectations under the Companies Act 1993, the Crown Research Institutes Act 1992, Crown Entities Act 2004 and the Public Finance Act 1989, including helping to establish strategic policy.

The Board and its two committees, the Audit and Risk Committee and People, Culture and Performance Committee, are supported by our senior leadership team and an independent strategic science advisory panel. The Board and its committee members are subject to ESR's code of conduct.

Our Board of Directors



Technology allows ESR's Board to meet online during different changing alert levels.

Denise Church QSO, CFInstD, Chair

Denise Church is a Wellington-based company director and consultant who was appointed as Chair of the ESR Board in July 2015. She is also Chair of Airways New Zealand and serves on the Boards of Predator Free Wellington and the Scouts Youth Foundation.

Denise has wide ranging governance experience, including as Chair of Zealandia, and has held other governance appointments in the health, tertiary education and science sectors. In her consulting practice, Leadership Matters, Denise focuses on strategy and leadership.

Denise has also been Chief Executive of the Ministry for the Environment. She holds degrees in zoology, economics, resource management and urban and regional planning.

Professor Cristin Print, Deputy Chair

Professor Cristin Print is a medically qualified biomedical scientist who joined the ESR Board in August 2017. He has a 25-year career in academic medical research and biotechnology, including work in Australia, the United Kingdom and Japan. He is a professor in the University of Auckland's Department of Molecular Medicine and Pathology, where he uses genomic and bioinformatic technologies alongside traditional pathology to better understand human disease.

Cris is currently Chair of the Auckland Regional Tissue Bank's Scientific Advisory Board, a principal investigator in the Maurice Wilkins Centre and leads the Genomics Into Medicine Strategic Research initiative in Auckland.

Kate Thomson

Kate Thomson was appointed to the ESR Board in July 2018. Currently, she is the General Manager at Te Aka Matua o te Ture – Law Commission. Most recently Kate was based in Australia working in the engineering and research sectors as a senior executive. She is also an independent member of the Indigo Shire Council Audit and Risk Committee.

Kate is a chartered accountant and an experienced chief financial officer and has held several senior roles in the commercial sector during her career. Kate holds a post-graduate certificate in science and technology and is a graduate of the Australian Institute of Company Directors.

Richard Gill

Richard Gill is a technology innovator and serial entrepreneur who has more than 30 years' experience founding and growing high-tech start-ups serving a range of industries, including broadcasting, manufacturing, finance, education, health care and water. Richard has worked extensively in technology development, product conceptualisation, early stage

commercialisation and high-growth execution. He is Chief Executive of events technology start-up Blerter.

Dr Andy Shenk

Dr Andy Shenk graduated with a PhD in biological sciences from the University of Delaware, Newark, United States. He has had a 30-year career spanning academic research, management and governance in biotechnology and nutrition start-up companies and senior management in a major corporate.

Andy currently works across many fields of research, development and commercialisation of intellectual property, including early-stage investment in new technologies here in New Zealand and overseas.

Access to independent professional advice

It may be necessary, from time to time, for directors to seek independent professional advice, either individually or collectively, to help them fulfil their duties and obligations. This advice, with the approval of the Board Chair, is at ESR's expense.

Directors' use of information

No member of the Board of ESR, or any subsidiary, issued a notice requesting to use information received in their capacity as directors that would not otherwise have been available to them.

Directors' development

Directors can access ESR-funded development opportunities to support their practice and ensure ESR maintains strong governance arrangements. The Board has a budget of $20,000 to cover directors' development. Any such costs are authorised by the Chair or, in the case of the Board Chair, the Chair of the Audit and Risk Committee. During 2022/21, directors attended both face to face and online governance development activities. Several directors participated in ESR workshops set up to build cultural competence.

Board activity in 2020/21

During 2020/21, 22 Board and committee meetings were held. Meetings were a mix of in person meetings across ESR's sites and video conferences. Video conferences were the necessary method of engagement during various movements in COVID-19 levels around the country, and the Board and management worked together to make these effective and impactful. Where it was possible, directors continued their practice of on-site visits with a new health and safety focus. Directors were actively involved in the welcome and induction for our new CEO, Peter Lennox, and also attended virtual meetings of our Strategic Science Advisory Panel. Members of the ESR Property Committee met on several occasions throughout the year. The purpose of these meetings was to provide governance oversight of the planned redevelopment of the Kenepuru Science Centre. The Committee comprises of Kate Thomson (Chair), Richard Gill and Denise Church.

The Board has put particular focus on governance performance and resilience. An external board review led by Richard Westlake included survey, discussion and interviews with all directors and assessment of the Chair. This review identified several ways that the Board could enhance and develop its practices. The second exercise, conducted over two board meetings, was an externally facilitated reflection led by Erica Seville, on governance learnings from 2020. This work on 'Board Management through a Crisis' identified a number of practical steps the Board could take to ensure a resilient approach to governance through disruptive times.

Audit and Risk Committee

The objective of this committee is to help the Board in discharging its responsibilities in relation to the oversight of ESR's risk management policies and processes, internal and external audit and control functions, and overseeing financial information for reporting purposes.

Members are:

- Kate Thomson (Chair)
- Denise Church
- Richard Gill.

People, Performance and Remuneration Committee

The objective of this committee is to help the Board in discharging its responsibilities in relation to overseeing ESR's people and performance strategies, principles and frameworks that support a high-performance culture, including the remuneration of the Chief Executive and ESR staff.

Members are:

- Professor Cristin Print (Chair)
- Denise Church
- Dr Andy Shenk.

Board and Board committee attendance for the year ending 30 June 2021

This table includes attendance by Board committee members only and does not include attendance by other Board members who are not members of the committee.

Total number of meetings attended

Board of Directors	Board meetings (out of 14)	Audit and Risk Committee (out of 4)	People, Performance and Remuneration Committee (out of 3)
Denise Church (Chair)	14	3	3
Cristin Print	14	–	3
Kate Thomson	13	4	–
Andy Shenk	14	–	3
Richard Gill	14	4	–

Dividends

No dividends have been declared or paid in respect of the 2021 financial year.

Donations

The Group made koha and donations of $1,583 during the 2021 financial year.

Directors' disclosure of interests

Directors complete a declaration of interests at the start of their appointment.

At each Board meeting, the directors are asked to check and update (as necessary) the register of interests declared that the Board secretariat maintains. Declaration of interests is a standing item on the agendas for all Board and Board committee meetings. Any changes to Board members' interests are tabled and reviewed at the opening of every Board meeting.

For Board decisions relating to significant matters, any potential conflict issues are discussed with the Office of the Auditor-General, or independent legal advice is sought with the prior approval of the Board Chair at ESR's expense.

Directors' interests

No director held any interest in the shares of ESR. ESR has funding contracts with the Marsden Fund of the Royal Society and the Ministry of Business, Innovation and Employment, which are negotiated at arm's length with appropriate directors' interests being declared. Except for these contracts, no material contracts involving directors' interests were entered into during, or subsequent to, the period covered by this report.

As at 30 June 2021, the following directors had made the following general disclosures:

Denise Church (Chair)

Director and Shareholder, Leadership Matters Limited

Trustee, Scout Youth Foundation, including related appointments to SANZ Trustee Company Limited (Director)

Brookwood Estate Ltd (Director) (Lorna Maisie Eade Memorial Trust)

Te Roto Ltd (Director) (Mathias Paulson Memorial Trust)

Jack and Tui Lucas Trust

Director, Predator Free Wellington Ltd

Chair, Airways NZ

Trustee, J Illott Trust

Past President, Rotary Club of Wellington

Richard Gill

Director, Shareholder and CEO, Cloud M Limited

Director and Shareholder, Richard Gill Limited

Director, Richard Gill Trustees Limited

Director and Shareholder, Sumfood Limited

Director and President, Blerter Inc. Blerter is a technology provider to St John and may be involved in technical integration with the Lumi Drug Scan product on behalf of St John.

Professor Cristin Print (Deputy Chair)

Member of the Science Leadership Team of Genomics Aotearoa

Professor, Department of Molecular Medicine and Pathology, University of Auckland, and lead of the University of Auckland Genomics Into Medicine research programme

Principal Investigator, Maurice Wilkins Centre

Standing member of the Assessment Committee of Cancer Research Trust NZ

Member of the New Zealand eScience Infrastructure Research Reference Group

Chair of the Auckland Regional Biobank Scientific Advisory Board (working in the COVID-19 biobanking field in which ESR also works)

Co-leader of the Ministry of Business, Innovation and Employment/Genomics Aotearoa Precision Medicine Pathfinder Project (includes collaboration with ESR staff)

Scientific Director for solid tumours, Grafton Clinical Genomics

Membership of a Genomics Aotearoa project for 'graph-based' genome alignment

Dr Andrew Shenk

CEO, Auckland UniServices Limited

Director, The Icehouse Limited

Advisor, Matū Fund Limited

Director, Hop Revolution Limited

Director, Hop Garden Services Limited

Director, Hop Revolution Trading Company Limited

Kate Thomson

Shareholder, Dandaloo Farming Company Limited

General Manager, Te Aka Matua o te Ture – Law Commission

Board member, Endangered Species Foundation New Zealand

Directors' indemnity

ESR has arranged for directors' and officers' insurance for any act or omission in their capacity as a director of the company.

Disclosure of directors' and executive employees' remuneration

Directors' remuneration

The directors who held office in the period of this report and their total remuneration and other benefits were:

Directors' remuneration

Denise Church (Chair)	$48,064
Cristin Print (Deputy Chair)	$30,040
Kate Thomson (Audit and Risk Chair)	$24,032
Richard Gill	$24,032
Andrew Shenk	$24,032
Total	$150,200

Chief Executive's remuneration

The remuneration of our Chief Executive is reviewed annually by the Board and determined by factors such as advice from external remuneration specialists, including job sizing and market relativity exercises. These are undertaken on a regular basis and drawn on to inform the determination of salary package.

Chief Executive remuneration summary 2017–2021

Financial year	Salary [a]	STI [b]	Percentage STI against maximum	Benefits [c]	Total
Peter Lennox					
2021	$454,372	n/a	n/a	$14,048	$468,420
Keith McLea					
2021	$134,961	n/a	n/a	$19	$134,980
2020	$508,210	n/a	n/a	$533	$508,743
2019	$394,746	$89,200	81%	$599	$484,545
2018	$379,256	$80,000	73%	$644	$459,900
2017	$359,086	$95,000	100%	$523	$454,609

[a] *Chief executive remuneration in 2021 and 2020 did not include a short-term incentive (STI) component.*

[b] *STIs are shown for the year to which they relate but were unpaid as at that balance date.*

[c] *Benefits comprise insurance cover and employer KiwiSaver contributions.*

Senior leadership team remuneration

The total combined remuneration of our senior leadership team (excluding the Chief Executive's remuneration) from 2017–2021 was:

Senior leadership team remuneration summary 2017–2021

Financial year	Salary & STI [a]	Benefits [b]	Total
2021	$2,104,372	$57,595	$2,161,967
2020	$1,463,900	$42,189	$1,506,089
2019	$1,827,863	$55,489	$1,883,352
2018	$1,681,556	$45,248	$1,726,804
2017	$1,587,967	$40,664	$1,628,631

[a] *Senior leadership team remuneration in 2021 and 2020 did not include a short-term incentive (STI) component. STIs are shown for the year to which they relate but were unpaid as at that balance date.*

[b] *Benefits comprise insurance and employer KiwiSaver contributions.*

Employee remuneration

As at 30 June 2021, the following total remuneration above $100,000 was paid to 169 employees:

Remuneration range	No. of staff
$100,000 – $109,999	51
$110,000 – $119,999	38
$120,000 – $129,999	13
$130,000 – $139,999	17
$140,000 – $149,999	10
$150,000 – $159,999	15
$160,000 – $169,999	3
$170,000 – $179,999	4
$180,000 – $189,999	6
$190,000 – $199,999	2
$220,000 – $229,999	2
$240,000 – $249,999	1
$250,000 – $259,999	1
$260,000 – $269,999	2
$270,000 – $279,999	1
$280,000 – $289,999	1
$290,000 – $299,999	1
$460,000 – $469,999	1
Total	169

Strategic Science Advisory Panel

ESR's Strategic Science Advisory Panel (SSAP) is appointed by ESR's Board of Directors. The main role of the panel is to provide independent, high-level strategic advice to ESR's Board and management relating to ESR's science, research and innovation activities.

This advice helps ESR to identify risks and gaps in its activities and to position activities within the context of international best practice.

The SSAP also provides comment on the competitiveness and quality of ESR's science activities, with suggestions for improvement and any other science advice as requested by the Board.

Members of the SSAP during the financial year were:

- Dr Ian Elsum
- Dr Liz Jazwinska
- Professor James Curran
- Dr Bruce Weir (until October 2020).

ESR wishes to congratulate former SSAP member Bruce Weir on his election in 2021 as Fellow of the Royal Society of London. Bruce was a founding member of the SSAP and served until late in 2020.

Member profiles

Dr Ian Elsum, Australian National University

Dr Ian Elsum (PhD, BSc Hons) is an Honorary Associate Professor, Research School of Management, at the Australian National University and an Adjunct Professor in the Centre for Transformative Innovation at Swinburne University of Technology. His research and teaching are focused on the management of innovation.

Ian is a member of Innovation Research Interchange (previously the Industrial Research Institute), where he has co-chaired projects to improve the management of radical and breakthrough innovation; to overcome the challenges of business model innovation in established firms; and to improve speed-to-market for new product development.

Past positions include 28 years with the Australian Commonwealth Scientific and Industrial Research Organisation (CSIRO), where he gained extensive experience in the strategic management of applied research, and membership of a number of boards and advisory committees in the area of science and technology-based innovation. Before joining CSIRO, Ian carried out fundamental research in chemistry at universities in Australia and the United States of America.

Dr Elizabeth Jazwinska, Independent Board Member and Science Advisor

Dr Elizabeth (Liz) Jazwinska (PhD, MBA, GAICD, BSc Hons) has more than 30 years' experience in research and development (R&D), management and business development, and has held senior positions in academia, industry and government internationally. Liz is currently an independent board member and science advisor to various boards in both Australia and New Zealand. These include member of the Board of the Westmead Institute of Medical Research (WIMR), member of the WIMR IP & Commercialisation Committee, Chair of the Board of FOXG1 Research Foundation Australia and Chair of the Governance Board of Phenomics Australia (a national collaborative research infrastructure strategy facility). In these roles, she combines her knowledge of genomic sciences with her expertise in industry to deliver strategic R&D partnerships between academic groups, industry and government, focusing on increasing the impact of research outcomes through translation into commercial products.

Liz has held senior leadership positions at Monash University (Director, Business Development), RMIT University (Director Research, Innovation and Entrepreneurship), Agency for Science, Technology and Research (A*STAR) in Singapore (Director Industry Engagement), the Ministry of Science and Innovation in New Zealand (Deputy Chief Executive Science Strategy and Investment), the Australian Research Council (Executive Director Biological Sciences and Biotechnology) and Johnson & Johnson Research (Executive Director, Strategic Alliances). She founded the molecular diagnostics company SpeeDx in 2009.

Before joining industry, Liz established a substantial academic portfolio in human molecular genetics and authored more than 62 publications in high-ranking peer-reviewed journals. She holds a BSc (Hons) from the University of Aberdeen, a PhD from the University of Edinburgh and an MBA from the Australian Graduate School of Management. She is also a graduate of the Australian Institute of Company Directors.

Professor James Curran, Auckland University

Professor James Curran (PhD, MSc Hons, BSc) is Professor of Statistics and Head of Department at the University of Auckland.

James' research specialty is in statistical problems in forensic science, and especially problems relating to the statistical interpretation of evidence. James has authored over 160 publications in this area and others, including two books on forensic statistics.

James has been at the University of Auckland since 2005. Before this, he was a member of the academic staff at the University of Waikato, from 1999–2005 after a postdoctoral fellowship with Professor Bruce Weir at North Carolina State University (1997–1999).

James has considerable involvement in the forensic community. He is currently the President of the Australian and New Zealand Forensic Science Society (2020–) and is a past President of the New Zealand Forensic Science Society (2016–2020). James currently sits on the American Academy of Forensic Sciences DNA Consensus Body, and is an affiliate of the US OSAC for Human Biology. James is a Fellow of the Chartered Society of Forensic Sciences (UK), a Fellow of the American Academy of Forensic Sciences, and a Fellow of the American Statistical Association).

James is also a past President of the New Zealand Statistical Association (2011–14), past Editor-in-Chief of the *Australian and New Zealand Journal of Statistics* (2016–2019), and past co-Director of the New Zealand Bioinformatics Institute (2007–2011).

Our senior leadership team

ESR's SLT use online meeting tools during changing alert levels across the country.

ESR's senior leadership team (SLT) use their science and business expertise to provide strategic and operational advice and support to the ESR Board and its committees. The role of the Chief Executive and ESR's SLT is to manage the day-to-day operations of ESR on behalf of the Board and the shareholding Ministers. SLT members 1 July 2020 to 30 June 2021:

To view their biographies, visit ESR's website www.esr.cri.nz or LinkedIn.

Peter Lennox, Chief Executive

Dr Brett Cowan, Chief Scientist

Trish Bolger, General Manager People Culture and Communications

John Bone, General Manager Forensics

Dr Libby Harrison, Joint General Manager Health and Environment – Environment

Dr Jill Vintiner, Joint General Manager Health and Environment – Health

Amber McEwen, General Manager Business Services

Jymal Morgan, General Manager Māori Impact

Mark Ottaway, General Manager Strategy Implementation (from April 2021)

Deidre Hill, General Manager Strategy and Transformation (until January 2021)

Ngā whakatutukinga

Financial and non-financial performance indicators

MBIE core generic performance indicators

All CRIs report against the following core generic operating measures. These generic performance measures are designed to provide consistency across all Crown research institutes. We monitor our performance against these.

Our results are reported at 30 June 2021.

Government priorities	Strategic focus area	Performance measure	Purpose	Year-to-date actual	Full year 2021 target
Growing investment in research, science and innovation **Effective and efficient investment practices**	Building stronger foundations	**End-user collaboration:** Revenue per full-time employee (FTE) from commercial sources	Domestic and international commercial revenue targets for end-user collaboration (revenue per FTE from commercial sources) and the knowledge exchange indicator (commercial reports per FTE) reflect commercial research activity	$149,000	$149,000
	Building stronger foundations	**Financial indicators:** Revenue per FTE	Amount of revenue per FTE	$205,500	$196,100
		Total commercial revenue	Total commercial revenue	$69.9m	$60.3m
Increasing the diversity and quality of the research, science and innovation workforce, including growing excellence and collaboration in research activity	Shaping the future of our science	**Science quality:** impact of science publications[a]	Impact of science publications (measured using web of science citations for the previous calendar year)	4.13	3.5
	Increasing our impact	**Research collaboration:** publications with collaborators	These refer to publications we have prepared in collaboration with authors at other NZ institutes and/or international authors	70	70
	Understanding our value	**Technology and knowledge transfer:** commercial reports per scientists FTE	Technology transfer (TT) refers to the process of conveying results stemming from scientific and technological research to the marketplace along with associated skills and procedures. It is an intrinsic part of the technological innovation process	0.27	0.35

[a] *Calculated for a calendar year – although reported as at 30 June 2021, this result is calculated for a calendar year (01 January – 31 December 2020).*

Supplementary performance indicators – results at 30 June 2021

Output delivery measure	Actual 2020/21	Full year 2021 target	Actual 2019/20	Full year 2020 target
Ministry of Health time-critical turnaround times are met	100%	100%	100%	100%
Ministry of Health's satisfaction with ESR's services	Good	Good or better	Good	Good or better
Number of completed projects delivered for the NZFSSRC[a]	15	N/A	10	N/A
Number of completed projects delivered for MPI[a]	23	N/A	15	N/A
Number of territorial local authorities we provide with water quality advice	15	15	13	15
Number of publications of our water and environment research[c]	33	N/A	25	N/A
NZ Police satisfaction with ESR's timeliness and quality of service	86%	90%	>94%	90%
Fulfilment of contractual obligations under the NZ Police service level agreement[b]	55%	90%	59%a	90%
Timeliness – reports received on time for court	95%	90%	98%	90%
Total number of cases where ESR provides NZ Police with forensic evidence analysis[d]	10,840 cases	N/A	10,397 cases	N/A
Percentage of homicide investigations finalised within 12 months[b]	36%	N/A	29%	N/A
Percentage of sexual assault investigations finalised within 12 months[b]	67%	N/A	59%	N/A

[a] *Some food safety projects span more than one financial year. The figure reported is for projects completed during the reporting period.*

[b] *A large percentage of these cases can span multiple financial years before being closed. Further requests can often be made from New Zealand Police in relation to a closed case. When new exhibit submissions are made or additional analysis is requested, a case will be made active again.*

[c] *During the financial year, 52 environmental peer-reviewed publications were produced, with 33 papers relating to water research.*

[d] *Case volumes adjust throughout the year when forensic analyses are added.*

Forensic cases received by ESR in 2020/21

Our specialist forensic teams deal with a wide range of case types. Case volumes are dependent on work passed from New Zealand Police. Cases can span multiple financial years before being closed Cases can be made active again when the Police request new exhibit submissions or additional analysis. During 2020/21, our forensic scientists attended 351 crime scenes. The 2020/21 forensic case statistics do not include minor case types.

Forensic cases for the 2020/21 year

Case type	Created	Closed	Percentage closed
Serious crime cases Burglary, robbery, clandestine laboratories, homicide, suspicious death, assault against person, sexual assault, miscellaneous cases	1,515	1,062	70%
Illicit drug cases	583	513	88%
Coronial cases	2,134	1,896	89%
Land transport cases Alcohol and drugs tests reported under the Land Transport Act 1998	4,842	4,747	98%
Volume crime cases	1,713	1,667	97%

Financial performance indicators – results at 30 June 2021

	Actual 2021	Budget 2021	Actual 2020
Revenue ($000s)	**$97m**	**$79m**	**$84m**
Operating margin *Earnings before interest, tax, depreciation and amortisation (EBITDA) as a percentage of revenue*	9.5%	3.2%	10.1%
Return on equity *Net profit after taxation as a percentage of equity*	2.0%	(3.7%)	4.6%
Return on assets *Earnings before interest and tax as a percentage of total assets*	1.7%	(4.7%)	1.7%
Profit volatility *The standard deviation of EBITDA as a percentage of average EBITDA over the preceding 7 years*	26%	49%	26%
Acid test ratio *Current assets excluding prepayments and inventory to current liabilities excluding deferred revenue*	2.8	3.1	2.6
Equity ratio *Equity as a percentage of total assets*	67.6%	73.0%	71.2%
Gearing *Debt (including finance lease liabilities) as a percentage of debt and equity*	5.5%	0.9%	2.2%
Revenue per full time equivalent employee	$205,500	$193,700	$208,800
Operating margin per full time equivalent employee *Earnings before interest, tax, depreciation and amortisation, per average full time equivalent employee for the year*	$19,500	$6,300	$21,100

Ngā whakatutukinga me ngā tauāki pūtea
Financial statements

Te pūrongo a te kaitātari kaute motuhake

Independent auditor's report

To the readers of Institute of Environmental Science and Research Limited's group financial statements for the year ended 30 June 2021

The Auditor-General is the auditor of Institute of Environmental Science and Research Limited and its subsidiaries (the Group). The Auditor-General has appointed me, Christopher Ussher, using the staff and resources of PricewaterhouseCoopers, to carry out the audit of the financial statements of the Group on his behalf.

Opinion

We have audited the financial statements of the Group on pages 62 to 86, that comprise the statement of financial position as at 30 June 2021, the statement of profit or loss and other 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 2021; and
  - its financial performance and cash flows for the year then ended; and
- comply with generally accepted accounting practice in New Zealand in accordance with New Zealand Equivalents to International Financial Reporting Standards and International Financial Reporting Standards.

Our audit was completed on 21 September 2021. This is the date at which our opinion is expressed.

The basis for our opinion is explained below. In addition, we outline the responsibilities of the Board of Directors and our responsibilities relating to the financial statements, we comment on other information, and we explain our independence.

Basis for our opinion

We carried out our audit in accordance with the Auditor-General's Auditing Standards, which incorporate the Professional and Ethical Standards and the International Standards on Auditing (New Zealand) issued by the New Zealand Auditing and Assurance Standards Board. Our responsibilities under those standards are further described in the Responsibilities of the auditor section of our report.

We have fulfilled our responsibilities in accordance with the Auditor-General's Auditing Standards.

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

PricewaterhouseCoopers, PwC Centre, 10 Waterloo Quay, PO Box 243, Wellington 6140, New Zealand
T: +64 4 462 7000, pwc.co.nz

Responsibilities of the Board of Directors for the financial statements

The Board of Directors is responsible on behalf of the Group for preparing financial statements that are fairly presented and that comply with generally accepted accounting practice in New Zealand.

The Board of Directors is responsible for such internal control as it determines is necessary to enable it to prepare financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, the Board of Directors is responsible on behalf of the group for assessing the Group's ability to continue as a going concern. The Board of Directors is also responsible for disclosing, as applicable, matters related to going concern and using the going concern basis of accounting, unless there is an intention to liquidate the Group or to cease operations, or there is no realistic alternative but to do so.

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

Responsibilities of the auditor for the audit of the financial statements

Our objectives are to obtain reasonable assurance about whether the financial statements, as a whole, are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion.

Reasonable assurance is a high level of assurance, but is not a guarantee that an audit carried out in accordance with the Auditor-General's Auditing Standards will always detect a material misstatement when it exists. Misstatements are differences or omissions of amounts or disclosures, and can arise from fraud or error. Misstatements are considered material if, individually or in the aggregate, they could reasonably be expected to influence the decisions of readers taken on the basis of these financial statements.

For the budget information reported in the financial statements, our procedures were limited to checking that the information agreed to the Group's statement of corporate intent.

We did not evaluate the security and controls over the electronic publication of the financial statements.

As part of an audit in accordance with the Auditor-General's Auditing Standards, we exercise professional judgement and maintain professional scepticism throughout the audit. Also:

- We identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
- We obtain an understanding of internal control relevant to the audit 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.
- We evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by the Board of Directors.
- We conclude on the appropriateness of the use of the going concern basis of accounting by the Board of Directors and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Group's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the financial statements, or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the Group to cease to continue as a going concern.
- We evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.
- We obtain sufficient appropriate audit evidence regarding the financial statements of the entities or business activities within the Group to express an opinion on the consolidated financial statements. We are responsible for the direction, supervision and the performance of the group audit. We remain solely responsible for our audit opinion.

We communicate with the Board of Directors regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

Our responsibilities arise from the Public Audit Act 2001.

Other information

The Directors are responsible for the other information. The other information comprises the information included on pages 1 to 58, and 87 to 88, but does not include the financial statements, and our auditor's report thereon.

Our opinion on the financial statements does not cover the other information and we do not express any form of audit opinion or assurance conclusion thereon.

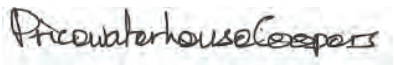
In connection with our audit of the financial statements, our responsibility is to read the other information. In doing so, we consider whether the other information is materially inconsistent with the financial statements or our knowledge obtained in the audit, or otherwise appears to be materially misstated. If, based on the work, we conclude that there is a material misstatement of this other information, we are required to report that fact. We have nothing to report in this regard.

Independence

We are independent of the Group in accordance with the independence requirements of the Auditor-General's Auditing Standards, which incorporate the independence requirements of Professional and Ethical Standard 1 International Code of Ethics for Assurance Practitioners (including International Independence Standards) (New Zealand) (PES 1) issued by the New Zealand Auditing and Assurance Standards Board and the International Code of Ethics Standards Board for Accountants (IESBA Code), and we have fulfilled our other ethical responsibilities in accordance with these requirements.

In addition to the audit our firm carried out services in the area of assurance relating to the Group's Report of Federal Awards in accordance with the OMB Uniform Guidance Program Provisions for the years ended 30 June 2019 and 30 June 2020. Other than the audit and these engagements, we have no relationship with or interests in the Group.

Christopher Ussher
On behalf of the Auditor-General
Wellington, New Zealand
21 September 2021



PricewaterhouseCoopers

Statement of profit or loss and other comprehensive Income

For the year ended 30 June 2021

Group	Note	Group Actual 2021 $'000s	Group Budget 2021 unaudited $'000s	Group Actual 2020 $'000s
Revenue				
Operating revenue	2	84,374	67,192	74,516
Strategic science investment funding		12,234	12,234	9,234
		96,608	**79,426**	**83,750**
Operating expenses				
Scientific materials		8,029	5,283	6,733
Subcontracting, commissions and royalties		10,595	8,783	8,570
Personnel		51,153	45,316	43,999
Depreciation and amortisation	5/6	7,736	6,192	7,032
Other expenses	3	17,681	17,501	16,003
		95,194	**83,075**	**82,337**
Operating profit		**1,414**	**(3,649)**	**1,413**
Interest income		542	778	876
Finance expense		(35)	(32)	(28)
Share of net loss of associate accounted for using the equity method	15	(75)	(52)	(64)
		432	**694**	**784**
Profit before income tax expense		**1,846**	**(2,955)**	**2,197**
Income tax expense/(benefit)	4	680	(842)	(447)
Profit for the period attributable to the shareholder of the parent		**1,166**	**(2,113)**	**2,644**
Other comprehensive income		–	–	–
Total profit or loss and other comprehensive income for the period attributable to the shareholder of the parent		**1,166**	**(2,113)**	**2,644**

The accompanying notes form an integral part of these financial statements

Statement of changes in equity

For the year ended 30 June 2021

Group	Share capital $'000s	Retained earnings $'000s	Total equity $'000s
Balance at 30 June 2019	**8,494**	**47,823**	**56,317**
Profit for the period	–	2,644	2,644
Other comprehensive income	–	–	–
Total comprehensive income	**–**	**2,644**	**2,644**
Transactions with owners:			
Dividend	–	–	–
Balance at 30 June 2020	**8,494**	**50,467**	**58,961**
Profit for the period	–	1,166	1,166
Other comprehensive income	–	–	–
Total comprehensive income	**–**	**1,166**	**1,166**
Transactions with owners:			
Dividend	–	–	–
Balance at 30 June 2021	**8,494**	**51,633**	**60,127**

The accompanying notes form an integral part of these financial statements

Statement of financial position

For the year ended 30 June 2021

Group	Note	Group Actual 2021 $'000s	Group Budget 2021 unaudited $'000s	Group Actual 2020 $'000s
Non-current assets				
Property, plant and equipment	5	26,840	32,087	29,047
Right-of-use assets	7	3,520	1,285	1,334
Investments accounted for using the equity method	15	–	339	228
Other investments		30	30	30
Investment cash		5,000	5,000	5,000
Intangible assets	6	6,090	7,459	7,459
Deferred taxation	12	180	–	–
		41,660	**46,200**	**43,098**
Current assets				
Cash and cash equivalents		2,182	2,880	3,333
Investment cash		32,549	17,000	24,000
Trade and other receivables	8	9,928	7,108	10,447
Contract assets	2	1,713	1,198	1,052
Inventories – scientific materials and consumables		874	1,000	889
Derivative financial instruments	18	9	–	–
		47,255	**29,186**	**39,721**
Current liabilities				
Trade and other payables	9	11,362	6,309	7,871
Contract liabilities	2	6,283	4,273	5,717
Employee benefits	10	4,586	4,171	4,441
Lease liability	7	501	182	578
Income tax payable	11	748	252	1,438
		23,480	**15,187**	**20,045**
Net current assets		**23,775**	**13,999**	**19,676**
Non-current liabilities				
Lease liability	7	3,019	304	768
Employee benefits	10	2,289	1,826	1,886
Deferred taxation	12	–	2,187	1,159
		5,308	**4,317**	**3,813**
Net assets		**60,127**	**55,882**	**58,961**
Equity				
Share capital	13	8,494	8,494	8,494
Retained earnings		51,633	47,388	50,467
Total equity		**60,127**	**55,882**	**58,961**

The Board of Directors of the Institute of Environmental Science and Research Limited authorised these financial statements for issue on 20 September 2021.

On behalf of the Board: Denise Church QSO
Chair
20 September 2021

Cristin Print
Deputy Chair
20 September 2021

The accompanying notes form an integral part of these financial statements

Statement of cash flows

For the year ended 30 June 2021

Group	Note	Group Actual 2021 $'000s	Group Budget 2021 unaudited $'000s	Group Actual 2020 $'000s
Cash flows from/(used in) operating activities				
Cash was provided from:				
Customers and strategic science investment funding		97,036	78,934	81,749
Interest received		529	778	876
		97,565	**79,712**	**82,625**
Cash was applied to:				
Suppliers and employees		(82,369)	(76,849)	(73,960)
Interest paid		(18)	–	(1)
Income tax paid	11	(2,709)	(500)	(823)
		(85,096)	**(77,349)**	**(74,784)**
Net cash inflow from operating activities	14	**12,469**	**2,363**	**7,841**
Cash flows from/(used in) investing activities				
Cash was provided from:				
Term deposit maturities		27,000	7,000	22,000
		27,000	**7,000**	**22,000**
Cash was applied to:				
Purchase of property, plant and equipment		(3,530)	(7,468)	(4,477)
Purchase of intangible assets		(943)	(1,032)	(948)
Investments in term deposits		(35,549)	–	(21,000)
		(40,022)	**(8,500)**	**(26,425)**
Net cash outflow from investing activities		**(13,022)**	**(1,500)**	**(4,425)**
Cash flows from/(used in) financing activities				
Cash was applied to:				
Repayment of finance lease liabilities		(598)	(592)	(592)
Net cash outflow from financing activities		**(598)**	**(592)**	**(592)**
Net (decrease)/increase in cash held		**(1,151)**	**271**	**2,824**
Cash and cash equivalents at the beginning of the period		3,333	2,609	509
Cash and cash equivalents at the end of the period		**2,182**	**2,880**	**3,333**

The accompanying notes form an integral part of these financial statements

Notes to the financial statements

1. Statement of significant accounting policies

Reporting entity

These financial statements of the Institute of Environmental Science and Research Limited and its subsidiaries ("ESR" and the "Group') are for the year ended 30 June 2021.

ESR is a Crown entity incorporated and based in New Zealand. Its registered office is 34 Kenepuru Drive, Porirua.

ESR is a Crown research institute that provides specialist scientific services and research to the public health, food safety, security and justice systems, and the environmental sector.

Statement of compliance

The financial statements have been prepared in accordance with the requirements of the Crown Entities Act 2004, the Crown Research Institute Act 1992, the Companies Act 1993 and the Financial Reporting Act 2013.

These financial statements have been prepared in accordance with Generally Accepted Accounting Practice in New Zealand (NZ GAAP). They comply with New Zealand equivalents to International Financial Reporting Standards (NZ IFRS), International Financial Reporting Standards and other New Zealand accounting standards and authoritative notices as appropriate for for-profit entities.

Basis of preparation

The financial statements are prepared on the basis of historical cost, except for financial instruments and long service leave as identified in the specific accounting policies and accompanying notes.

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

The budget and target figures presented in these financial statements are unaudited.

Critical accounting estimates and judgements

The preparation of financial statements requires judgements, estimates and assumptions that affect the application of policies and reported amounts of assets and liabilities, income and expenses. The estimates and associated assumptions are based on historical experience and various other factors that are believed to be reasonable under the circumstances. Actual results may differ from these estimates. The estimates and assumptions are reviewed on an ongoing basis.

The judgements that have the most significant effect on amounts recognised in the financial statements are applied in the determination of revenue, service leave accrual and investments accounted for using the equity method.

Strategic science investment funding

ESR receives strategic science investment funding from the Government in order to perform scientific research activities. Strategic science investment funding is treated as a government grant and recognised at fair value in the statement of profit or loss and other comprehensive income when the requirements under the funding agreement have been met.

Inventories

Stocks of consumables and work in progress are stated at the lower of cost and net realisable value. Cost is determined on a first in, first out basis.

Interest income

Interest income is recognised in the statement of profit or loss and other comprehensive income on a time proportion basis, using the effective interest rate method.

Foreign currency

Items included in the financial statements of each of the Group's entities are measured using the currency of the primary economic environment in which the entity operates. The Group financial statements are presented in New Zealand dollars, which is ESR's functional currency.

Foreign currency transactions are recorded at the foreign exchange rates in effect at the dates of the transactions. Monetary assets and monetary liabilities denominated in foreign currencies are translated at the rates of exchange ruling at the end of each reporting period.

Other accounting policies

Other significant accounting policies adopted in the preparation of these financial statements are provided throughout the notes to the financial statements.

Changes in accounting policies

Accounting policies have been applied on a basis consistent with the prior year.

Comparatives

When the presentation or classification of items in the financial statements is amended or accounting policies are changed voluntarily, comparative figures are restated to ensure consistency with the current period unless it is impractical to do so.

Adoption status of relevant new financial reporting standards and interpretations

The Group has elected not to early adopt any other new standards or amendments to existing standards that have been issued but are not yet effective as at 30 June 2021. It is anticipated that these standards will not significantly affect the financial statements of the Group once adopted.

2. Operating revenue

a) Total operating revenue

COVID-19

On 11 March 2020, the World Health Organization declared coronavirus (COVID-19) a pandemic. In response, the New Zealand Government put the country into Level 4 of the alert level response system (lockdown) on 25 March. The alert level was lowered in April 2020, reducing some of the restrictions on business operations and travel, enabling most of the Group's operations to recommence. Ongoing periodic changes in alert levels during the 2021 financial year have continued to affect some operations.

Since 1 July 2020, the ongoing impact of COVID-19 has largely been on commercial revenues from the sale of forensic and related science services to domestic and international customers. The revenue reduction has been offset by the increase in revenue generated from the services provided to the Ministry of Health for COVID-19 and COVID-19 Response and Recovery Funding provided by the Government.

While travel costs fell year on year, this has been more than offset by additional costs to deliver services to the Ministry of Health and COVID-19 related overhead costs.

The Group anticipates there will be a continued reduction in some revenue streams over at least the next 12 months.

Group	2021 $'000s	2020 $'000s
Revenue from contracts with customers	81,224	71,358
Other revenue	3,150	3,158
Total operating revenue	**84,374**	**74,516**

b) Revenue from contracts with customers

Revenue from contracts with customers is recognised when control of the goods or services is transferred to the customer at an amount that reflects the consideration to which the Group expects to be entitled in exchange for those goods or services.

For some contracts, revenue is recognised based on the actual service provided to the end of the reporting period as a proportion of the total services to be provided, as the customer receives and uses the benefits simultaneously or the Group has an enforceable right to payment for performance completed to date. The revenue recognised is typically determined based on actual labour hours and other costs incurred.

Estimates of revenues, cost or extent of progress toward completion are revised if circumstances change. Any resulting increases or decreases in estimated revenues or costs are reflected in profit or loss in the period in which the circumstances that give rise to the revision become known by management.

In case of fixed-price contracts, the customer pays the fixed amount based on payment schedule. If the services rendered by the Group exceed the payment schedule, a contract asset is recognised. If the payments exceed the services rendered, a contract liability is recognised.

Sale of software

The Group sells expert forensic analysis software. Contracts for the sale of this software comprise several deliverables: software license, software upgrades, training and support.

Revenue for each deliverable is recognised as the related performance obligation is satisfied, either at a point in time or over time. Revenue from software licenses and training is recognised at a point in time when, respectively, the customer has been provided with access to the software licenses and training has been delivered. Software upgrades and support revenues are recognised over time. Software upgrade revenue is recognised over time as the Group has a stand-ready obligation to provide software upgrades and enhancements as and when they are available. Software support revenue is recognised as the customer utilises the support purchased with the software license.

Invoicing or payment for software upgrades and support is generally made in advance of the satisfaction of these performance obligations. A contract liability is recognised to the extent payment received or due exceeds the services rendered by the Group.

The transaction price is allocated to each performance obligation based on the standalone selling price or estimated based on industry benchmarks.

Satisfaction of performance obligations

Revenue for contract deliverables is recognised as the related performance obligation is satisfied, either at a point in time or over time.

The Group has determined that the various deliverables included within a contract for the sale of forensic analysis software are capable of being distinct.

For the majority of other contract deliverables, the Group has concluded that the satisfaction of performance obligations occurs over time. In these circumstances, the Group has determined that an input method is most appropriate in measuring progress on a contract as there is a direct relationship between the Group's effort (i.e. labour hours and other costs incurred) and the transfer of services to the customer. In these circumstances, the Group recognises revenue on the basis of labour hours expended and other costs incurred, relative to the total expected cost to complete the service.

Revenue from the balance of commercial and research activities is recognised at a point in time. This is the point at which the Group has determined it has transferred control of the related good or service to the customer.

Grant

During the 2021 financial year, the Ministry of Health funded the purchase of items of scientific equipment to be used in relation to the response to the COVID-19 pandemic. This funding has been accounted for as a grant under NZ IAS 20: Accounting for Government Grants and Disclosure of Government Assistance. There are no conditions or other contingencies attached to this grant.

i) Disaggregated revenue information

Group – year ended 30 June 2021	Domestic $'000s	International $'000s	Total $'000s
Core government contracts	56,599	–	56,599
Research	8,832	2,467	11,299
Commercial products and services	3,829	9,497	13,326
	69,260	**11,964**	**81,224**

Group – year ended 30 June 2020	Domestic $'000s	International $'000s	Total $'000s
Core government contracts	49,686	–	49,686
Research	5,883	2,226	8,109
Commercial products and services	4,355	9,208	13,563
	59,924	**11,434**	**71,358**

Note that the overall research output of the Group includes activity funded by $12,234,000 (2020: $9,234,000) of Strategic Science Investment Funding. This funding is accounted for as a government grant and not included in the table above.

ii) Remaining performance obligations

The transaction price for bundled deliverables associated with software license sales is allocated to each performance obligation based on the standalone selling price or estimated based on industry benchmarks.

The transaction price allocated to the remaining performance obligations (unsatisfied or partially unsatisfied) was $16,896,000 as at 30 June 2021 (2020: $15,942,000), split between current and non-current as below:

	2021 $'000s	2020 $'000s
Current	11,195	8,186
Non-current	5,701	7,756
	16,896	**15,942**

The remaining performance obligations expected to be recognised in more than one year relate to multi-year research projects to be completed over the next five years, and prepaid software upgrades. All other remaining performance obligations are expected to be recognised within one year.

The balance of current remaining performance obligations does not include obligations under contracts for periods of one year or less.

iii) Contract balances

Principal versus agent considerations

The Group has concluded that it is the principal in its revenue arrangements as it controls the goods or services before they are transferred to the customer.

Variable consideration

Where the consideration in a contract includes a variable amount arising from a value-based rebate, the Group estimates the amount of consideration to which it will be entitled in exchange for transferring the goods or services to the customer. The Group applies the most likely amount method to determine the amount to which it will ultimately be entitled.

Financing components

The Group does not have any contracts where the period between the transfer of the promised goods or services to the customer and payment by the customer exceeds one year. As a consequence, the Group does not adjust any of the transaction prices for the time value of money.

Group	2021 $'000	2020 $'000
Trade receivables	8,128	8,620
Contract assets	1,713	1,052
Contract liabilities	6,283	5,717

Trade receivables are non-interest bearing and generally on terms of 30 to 90 days.

Contract assets comprise revenue due from customers and capitalised costs of obtaining contracts for software sales:

- Revenue due from customers are balances recognised for services rendered where receipt of consideration is dependent on the completion of a project milestone and acceptance by the customer. Amounts initially recognised as contract assets are reclassified as trade receivables as milestones are completed and invoicing agreed with the customer.
- Incremental costs of obtaining contracts for software sales are $357,000 as at 30 June 2021 (2020: $352,000). These costs are initially capitalised and then amortised systematically as the related performance obligation is satisfied. Amortisation recognised in 2021 was $1,716,000 (2020: $1,335,000).

Contract liabilities represent amounts relating to research projects and software sales and support where the payment received or due under the contract exceeds the satisfaction of performance obligations by the Group. Contract liabilities are recognised as revenue when these performance obligations are satisfied.

The Group recognised revenue of $2,427,000 (2020: $2,199,000) during the period that was included in contract liabilities at the beginning of the period. No revenue was recognised in the period from performance obligations partially or fully satisfied in prior periods.

3. Other expenses

Group	Note	2021 $'000	2020 $'000
Communication costs (including network charges)		662	539
Depreciation expense on right-of-use assets		582	577
Directors' expenses		23	31
Directors' fees	17	150	170
Fair value (gain)/loss on forward exchange contract		(69)	35
Fees paid to PricewaterhouseCoopers for:			
– the audit of the statutory financial statements		156	141
– other assurance services		68	–
Impairment of investment		153	150
IT systems maintenance and licence costs		2,287	1,901
Legal and consulting fees		4,536	3,641
Occupancy and insurance		3,609	3,334
Office and administration		1,457	1,325
Other operating costs		748	218
Outsourced costs		1,930	1,721
Rental and operating lease costs		217	146
Restructuring expense		316	307
(Reversal of impairment)/impairment of receivables		(33)	48
Travel		889	1,719
Total other expenses		**17,681**	**16,003**

Given the nature of ESR's principal business activities, research comprises part of ESR's everyday business operations. As such, expenses relating to research are not separately identified. The cost of research to ESR is distributed between the relevant expense items, for example, employee benefits and scientific materials used.

4. Taxation

Group	Note	2021 $'000	2020 $'000
The taxation charge has been calculated as follows:			
Profit/(loss) before income tax expense		**1,846**	**2,197**
Prima facie taxation at 28%		517	615
Plus taxation effect of:			
Net prior years under/(over) estimation		46	26
Non-deductible/(assessable) items		117	136
Re-instatement of tax depreciation		–	(1,224)
Tax/(credit) expense for the year		**680**	**(447)**
The tax expense for the year is represented by:			
Current taxation	11	2,019	1,803
Deferred taxation	12	(1,339)	(2,250)
Tax/(credit) expense for the year		**680**	**(447)**

5. Property, plant and equipment

Items of property, plant and equipment are initially recorded at cost and subsequently at cost less accumulated depreciation and impairment. The cost of property, plant and equipment includes the value of consideration given to acquire the assets and the value of other directly attributable costs that have been incurred in bringing the assets to the location and condition necessary for their intended use.

The carrying amounts of property, plant and equipment are reviewed at least annually to determine if there is any indication of impairment. Where an asset's recoverable amount is less than its carrying amount, it will be reported as its recoverable amount and an impairment loss will be recognised.

Losses resulting from impairment are reported in the statement of profit or loss and other comprehensive income.

Realised gains and losses arising from the disposal of property, plant and equipment are recognised in the profit or loss and other comprehensive income in the periods in which the transactions occur.

Depreciation is charged on a straight-line basis at rates calculated to allocate the cost of an item of property, plant and equipment, less any estimated residual value, over its estimated useful life, as follows:

Type of asset	Estimated useful life
Land	Not depreciated
Freehold buildings and building fit out	1 – 50 years
Leasehold improvements	10 years
Plant, equipment and vehicles	3 – 10 years
IT equipment	3 – 12 years

Group	Freehold land $'000s	Buildings and leasehold improvements $'000s	IT equipment	Plant, equipment and vehicles $'000s	Assets under construction $'000s	Total $'000s
At 1 July 2019						
Cost	476	32,210	8,772	36,564	396	78,418
Accumulated depreciation	–	(11,664)	(6,974)	(29,847)	–	(48,485)
Net book value at the beginning of the year	**476**	**20,546**	**1,798**	**6,717**	**396**	**29,933**
Year ended 30 June 2020						
Net book value at the beginning of the year	476	20,546	1,798	6,717	396	29,933
Additions	–	976	1,400	1,502	302	4,180
Transfers from assets under construction	–	83	257	58	(398)	–
Disposals	–	–	–	(8)	–	(8)
Depreciation for the year	–	(2,196)	(1,133)	(1,729)	–	(5,058)
Net book value at the end of the year	**476**	**19,409**	**2,322**	**6,540**	**300**	**29,047**
At 30 June 2020						
Cost	476	33,269	10,429	37,751	300	82,225
Accumulated depreciation	–	(13,860)	(8,107)	(31,211)	–	(53,178)
Net book value at the beginning of the year	**476**	**19,409**	**2,322**	**6,540**	**300**	**29,047**
Year ended 30 June 2021						
Net book value at the beginning of the year	476	19,409	2,322	6,540	300	29,047
Additions	–	277	864	2,038	112	3,291
Transfers from assets under construction	–	261	33	6	(300)	–
Disposals	–	(7)	(44)	(23)	–	(74)
Depreciation for the year	–	(2,354)	(1,331)	(1,739)	–	(5,424)
Net book value at the end of the year	**476**	**17,586**	**1,844**	**6,822**	**112**	**26,840**
At 30 June 2021						
Cost	476	33,789	7,959	37,984	112	80,320
Accumulated depreciation	–	(16,203)	(6,115)	(31,162)	–	(53,480)
Net book value at the end of the year	**476**	**17,586**	**1,844**	**6,822**	**112**	**26,840**

ESR does not have any property, plant and equipment used as security for liabilities.

During the 2021 financial year, a stocktake of plant, property and equipment assets was carried out and this resulted in a number of fully depreciated assets being removed from the asset register.

ESR has plans to redevelop the Kenepuru Science Centre. The useful life of building and plant assets at this site has been reassessed and the Group is accelerating depreciation on these assets to between one and five years.

Restriction on title

In relation to the transfer of land owned by ESR, shareholding Ministers shall have regard to the principles of Te Tiriti o Waitangi in accordance with section 10 of the Crown Research Institutes Act 1992. Properties owned by ESR in Christchurch, Wellington and Auckland have caveats on the land, as required by section 31 of the Crown Research Institutes Act 1992, which maintains the general provisions of the Public Works Act 1981. ESR complies with section 31 of the Crown Research Institutes Act 1992.

6. Intangible assets

Computer software

Items of computer software that do not comprise an integral part of the related hardware are treated as intangible assets with finite lives. Intangible assets with finite lives are recorded at cost, and subsequently recorded at cost less any accumulated amortisation and impairment losses. Amortisation is charged to the statement of profit or loss and other comprehensive income on a straight-line basis over the useful life of the net asset (between 3 and 12 years).

Customer contracts

The intangible asset customer contracts present the fair value of future revenue streams from customer contracts acquired under business combinations. Initial recognition of the intangible asset is stated at fair value. Subsequent to initial recognition, acquired intangible assets are stated at initially recognised amounts less accumulated amortisation and any impairment. Amortisation of acquired intangible assets is made according to the straight-line method over their estimated useful life, not exceeding 10 years.

Research and development costs – internally generated intangible assets

Expenditure on research is expensed when it is incurred.

Development expenditure incurred on an individual project is capitalised if the process is technically and commercially feasible, future economic benefits are probable and ESR intends to, and has sufficient resources to, complete development and to use or sell the asset.

Any expenditure capitalised is amortised over three years from the point the asset is ready to use, which is the point of expected future sales from the related project.

Impairment of non-financial assets

Intangible assets that have an indefinite useful life or intangible assets not yet ready to use are not subject to amortisation and are tested annually for impairment.

Assets that are subject to depreciation and amortisation are reviewed for impairment whenever events or changes in circumstances indicate that the carrying amount may not be recoverable. An impairment loss is recognised for the amount by which the asset's carrying amount exceeds its recoverable amount. The recoverable amount is the higher of an asset's fair value less costs to sell and its value in use. For the purposes of assessing impairment, assets are grouped at the lowest levels for which they are separately identifiable cash flows (cash-generating units).

Group	Computer software – externally purchased $'000s	Computer software – internally generated $'000s	Customer contracts $'000s	Assets under construction $'000s	Total $'000s
At 1 July 2019					
Cost	9,419	14,791	1,338	1,065	26,613
Accumulated amortisation and impairment losses	(8,299)	(8,491)	(1,338)	–	(18,128)
Net book value at the end of the year	**1,120**	**6,300**	**–**	**1,065**	**8,485**
Year ended 30 June 2020					
Net book value at the beginning of the year	1,120	6,300	–	1,065	8,485
Additions	170	482	–	296	948
Transfers from assets under construction	–	434	–	(434)	–
Disposals	–	–	–	–	–
Amortisation for the year	(543)	(1,431)	–	–	(1,974)
Net book value at the end of the year	**747**	**5,785**	**–**	**927**	**7,459**
At 30 June 2020					
Cost	9,589	15,707	1,338	927	27,561
Accumulated amortisation and impairment losses	(8,842)	(9,922)	(1,338)	–	(20,102)
Net book value at the end of the year	**747**	**5,785**	**–**	**927**	**7,459**
Year ended 30 June 2021					
Net book value at the beginning of the year	747	5,785	–	927	7,459
Additions	20	135	–	788	943
Transfers from assets under construction	–	871	–	(871)	–
Disposals	–	–	–	–	–
Amortisation for the year	(431)	(1,881)	–	–	(2,312)
Net book value at the end of the year	**336**	**4,910**	**–**	**844**	**6,090**
At 30 June 2021					
Cost	4,916	15,366	1,338	844	22,464
Accumulated amortisation and impairment losses	(4,580)	(10,456)	(1,338)	–	(16,374)
Net book value at the end of the year	**336**	**4,910**	**–**	**844**	**6,090**

During the 2021 financial year, a stocktake of computer software assets was carried out and this resulted in a number of fully amortised assets being removed from the asset register.

ESR does not have any intangible assets for which title is restricted or used as security for liabilities.

Intangible assets include ESR's laboratory operating system with a net book value of $3,183,248 (2020: $4,229,191). The laboratory operating system has an estimated remaining useful life of three years.

7. Leases

The Group assesses at contract inception whether a contract is, or contains, a lease. That is, if the contract conveys the right to control the use of an identified asset for a period of time in exchange for consideration.

The Group applies a single recognition and measurement approach for all leases, except for short-term leases and leases of low-value assets. The Group recognises lease liabilities to make lease payments and right-of-use assets representing the right to use the underlying assets.

Right-of-use assets

The Group recognises right-of-use assets at the commencement date of the lease (i.e. the date the underlying asset is available for use). Right-of-use assets are measured at cost, less any accumulated depreciation and impairment losses, and adjusted for any remeasurement of lease liabilities. The cost of right-of-use assets includes the amount of lease liabilities recognised, initial direct costs incurred and lease payments made at or before the commencement date less any incentives received. The recognised right-of-use assets are depreciated on a straight-line basis over the shorter of its estimated useful life and the lease term. Right-of-use assets are subject to impairment.

Lease liabilities

At the commencement date of the lease, the Group recognises the lease liabilities measured at the present value of lease payments to be made over the lease term.

In determining the non-cancellable term of a lease, the Group considers all relevant facts and circumstances that create an economic incentive for the lessee to either exercise an option to extend a lease or to terminate the lease.

In calculating the present value of lease payments, the Group uses the incremental borrowing rate at the lease commencement date if the interest rate implicit in the lease is not readily determinable. After the commencement date, the amount of lease liabilities is increased to reflect the accretion of interest and reduced for the lease payments made. In addition, the carrying amount of lease liabilities is remeasured if there is a modification, a change in the lease term or a change in the in-substance fixed lease payments.

Amounts recognised in the statement of financial position and statement of profit and loss and other comprehensive income

	Right-of-use assets			
	Buildings $'000s	Motor vehicles $'000s	Total $'000s	Lease liabilities $'000s
As at 1 July 2020	**1,310**	**24**	**1,334**	**1,346**
Additions and modifications to contracts	2,756	12	2,768	2,755
Depreciation expense	(552)	(30)	(582)	–
Interest expense	–	–	–	17
Payments	–	–	–	(598)
As at 30 June 2021	**3,514**	**6**	**3,520**	**3,520**

	Right-of-use assets			
	Buildings $'000s	Motor vehicles $'000s	Total $'000s	Lease liabilities $'000s
As at 1 July 2019	**1,854**	**55**	**1,909**	**1,909**
Additions	2	–	2	2
Depreciation expense	(546)	(31)	(577)	–
Interest expense	–	–	–	27
Payments	–	–	–	(592)
As at 30 June 2020	**1,310**	**24**	**1,334**	**1,346**

The maturity of the lease liabilities is as follows:

	2021 $'000s	2020 $'000s
Less than one year	501	578
One to five years	3,019	768
Total lease liabilities	**3,520**	**1,346**

8. Trade and other receivables

Trade and other receivables are recognised initially at fair value and subsequently measured at amortised cost using the effective interest method, less any provision for impairment.

Collectability of receivables is reviewed on an ongoing basis. A provision for doubtful debts is established from day one in the acknowledgement that the expected credit losses model assumes that there are very limited circumstances under which a debt has no risk (implying a nil provision is not appropriate). Bad debts are written off in the period in which they are identified.

As a result of the COVID-19 pandemic, the Group has reassessed the credit risk for all its trade receivables balance. An assessment was undertaken to identify all trade receivables that posed a higher credit risk based on the Group's understanding and experience with the customer's ability to pay its debt, given the current and forecast economic conditions. There were no trade receivables for which the Group has recorded additional provisions for expected credit losses.

Group	2021 $'000s	2020 $'000s
Trade debtors	8,201	8,722
Allowance for expected credit losses	(73)	(102)
	8,128	**8,620**
Prepayments	1,800	1,827
Total trade and other receivables	**9,928**	**10,447**

As at 30 June 2021, trade receivables of $1,711,000 (2020: $1,654,000) were past due but not impaired. These relate to a number of customers for whom there is no recent history of default. The aging analysis of these trade receivables is as follows.

Group	2021 $'000s	2020 $'000s
Past due 1 – 30 days	584	434
Past due 31 – 60 days	326	302
Past due >61 days	801	918
Total past due trade receivables	**1,711**	**1,654**

9. Trade and other payables

Trade payables are obligations to pay for goods or services that have been acquired in the ordinary course of business from suppliers. Accounts payable are classified as current liabilities if payment is due within one year or less. If not, they are presented as non-current liabilities. Trade payables are recognised initially at fair value and subsequently at amortised cost using the effective interest method.

Goods and Services Tax

Items in the statement of profit or loss and other comprehensive income and statement of cash flows are disclosed net of Goods and Services Tax (GST). All items in the statement of financial position are stated net of GST with the exception of receivables and payables, which include GST invoiced.

Group	2021 $'000s	2020 $'000s
Accrued expenses	3,843	2,009
GST payable	678	371
Trade payables	6,841	5,491
Total trade and other payables	**11,362**	**7,871**

10. Employee benefits

Wages, salaries and annual leave

Liabilities for wages and salaries including annual leave that are expected to be settled within 12 months of the reporting date are recognised in respect of employees' services up to the reporting date and are measured at the amounts expected to be paid when the liabilities are settled.

Obligations for contributions to defined contribution retirement plans are recognised as an expense in the statement of profit or loss and other comprehensive income as they fall due.

Long service leave and retirement leave

Liabilities for long service leave and retirement leave are recognised as employee benefit liabilities 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. Consideration is given to the expected future salary levels, experience of employee departures and periods of service. Expected future payments are discounted using market yields at the reporting date for government bonds with terms to maturity and currency that match, as closely as possible, the estimated future cash outflows.

Group	2021 $'000s	2020 $'000s
Annual leave accrual	4,345	4,153
Service leave accrual	230	264
Other	11	24
Total current employee benefits	**4,586**	**4,441**
Service leave accrual	2,193	1,784
Retirement leave accrual	96	102
Total non-current employee benefits	**2,289**	**1,886**

11. Income tax payable

Current tax is calculated with reference to the current period's taxable profit or loss calculated using tax rates and tax laws that have been enacted or substantially enacted by reporting date. Current tax for the current and prior periods is recognised as a liability (or asset) to the extent that it is unpaid (or refundable).

Group	2021 $'000s	2020 $'000s
Balance at the beginning of the year	1,438	479
Current year charge	1,989	1,803
Prior period adjustment	30	(21)
Provisional taxation payments	(2,709)	(823)
Total income tax payable	**748**	**1,438**

12. Deferred taxation

Deferred tax is calculated using the comprehensive balance sheet liability method in respect of temporary differences arising from differences between the carrying amount of assets and liabilities in the financial statements and the tax base for those terms.

Deferred tax assets and liabilities are not recognised if the temporary differences giving rise to them from the initial recognition of assets and liabilities (other than as a result of a business combination) affects neither taxable income nor accounting profit.

Deferred tax assets are recognised for deductible temporary differences and unused tax losses only if it is probable that future taxable amounts will be available against which deductible temporary differences or unused tax losses and tax offsets can be utilised.

Deferred tax assets and liabilities are measured at the tax rates expected to apply when the assets are recovered or liabilities settled using tax rates and tax laws that have been enacted or substantially enacted by the reporting date.

Group	2021 $'000s	2020 $'000s
Balance at the beginning of the year	1,159	3,387
Prior period adjustment	10	22
Charge to settlement of profit or loss and other comprehensive income	(1,349)	(2,250)
Total deferred taxation (asset)/liability	**(180)**	**1,159**

	Accelerated tax depreciation $'000s	Employee benefits $'000s	Provisions and other items $'000s	Total $'000s
Year ended 30 June 2020				
Balance at the beginning of the year	4,847	(1,486)	26	3,387
Over provision in prior years	–	22	–	22
Current year charge/(credit) of statement profit or loss and other comprehensive income	(1,956)	(201)	(93)	(2,250)
Total deferred taxation	**2,891**	**(1,665)**	**(67)**	**1,159**
Year ended 30 June 2021				
Balance at the beginning of the year	2,891	(1,665)	(67)	1,159
Over provision in prior years	–	10	–	10
Current year charge/(credit) of statement profit or loss and other comprehensive income	(665)	(357)	(327)	(1,349)
Total deferred taxation	**2,226**	**(2,012)**	**(394)**	**(180)**

There are no unrecognised deferred tax assets or liabilities.

In 2010, legislation was introduced to remove tax depreciation for buildings with an estimated useful life of 50 years or more with effect from 1 April 2011. As part of the Government's COVID-19: Economic Response Package released on 26 March 2020, effective immediately, depreciation deductions were reintroduced for new and existing industrial and commercial buildings. For tax purposes where buildings had previously been depreciated at 0%, the Group will now be able to claim tax depreciation on a 1.5% straight line from the 2020–21 tax year. The change in tax legislation resulted in a reduction to the deferred tax liability and tax expense of $1,224,000 in the 2020 financial year.

13. Equity

Share capital

Ordinary shares are classified as equity. Incremental costs directly attributable to the issue of new shares or options are shown as appropriate in equity as a deduction, net of tax, from the proceeds.

Dividends

A provision is made for the amount of any dividend declared on or before the end of the financial year but not distributed at balance date.

Share capital Group	2021 $'000s	2020 $'000s
8,494,000 ordinary $1 shares (issued and fully paid)	8,494	8,494

All ordinary shares rank equally with one vote attached to each fully paid ordinary share.

No dividends were proposed or declared for the 30 June 2021 year (2020: nil).

14. Reconciliation of profit/(loss) after taxation to cash flows from operating activities

Cash and cash equivalents

Cash means cash on hand, demand deposits and other highly liquid investments in which ESR has invested as part of its day-to-day cash management. The following definitions are used in the statement of cash flows:

- Investing activities are those relating to the acquisition, holding and disposal of fixed assets and investments.
- Financing activities are those activities that result in changes in the size and composition of the capital structure of ESR and this includes both equity and debt not falling within the definition of cash. Dividends paid in relation to the capital structure are included in financing activities.
- Operating activities are the principal revenue-producing activities and other activities that are not investing and financing activities.

Investment cash

Investment cash represents cash held in bank deposits with original maturities of between 3 and 12 months. Investment cash movements are included in investing activities in the statement of cash flows.

Group	Note	2021 $'000	2020 $'000
Profit for the year after taxation		**1,166**	**2,644**
Non-cash items:			
Depreciation and amortisation expense	5/6	7,736	7,032
Depreciation on right-of-use assets	7	582	577
Gain on modification of lease contracts	7	(12)	–
Equity accounted earnings from associate company investment		75	64
Impairment of associate company investment		153	150
(Decrease)/increase in allowance for expected credit losses	8	(29)	48
Decrease in deferred tax liability	12	(1,339)	(2,228)
Fair value loss on derivative financial instruments		(9)	(6)
Other non-cash items		(5)	5
		7,152	**5,642**
Changes in working capital:			
Increase in trade and other receivables and contract assets		(109)	(2,241)
Decrease in inventories		15	153
Increase/(decrease) in trade and other payables and contract liabilities		4,057	(510)
(Decrease)/increase in income tax payable		(690)	959
Increase in employment benefits		548	861
		3,821	**(778)**
Items classified as investing and financing activities:			
Loss on disposal of property, plant and equipment		73	4
Decrease in trade payables related to property, plant and equipment		239	302
Finance charge on leases		18	27
		330	**333**
Net cash inflow from operating activities		**12,469**	**7,841**

15. Investments

Subsidiaries

The consolidated financial statements incorporate the assets and liabilities of all subsidiaries of ESR as at 30 June 2021 and the results of the operations of all subsidiaries for the year then ended.

Subsidiaries are those entities controlled, directly or indirectly, by the Parent. Subsidiaries are consolidated from the date on which control is transferred to ESR. They are de-consolidated from the date that control ceases.

The acquisition method of accounting is used to account for the acquisition of business by the Group. The cost of an acquisition is measured as the fair value of the assets given, equity instruments issued and liabilities incurred or assumed at the date of exchange. Identifiable assets acquired and liabilities and contingent liabilities assumed in a business combination are measured initially at their fair values at the acquisition date, irrespective of the extent of any non-controlling interest. The excess of the cost over the fair value of the Group's share of the identifiable net assets acquired is recorded as goodwill. If the cost of acquisition is less than the Group's share of the fair value of the identifiable net assets of the subsidiary acquired, the difference is recognised directly in the profit or loss.

ESR has two wholly owned subsidiary companies.

Name	Balance date	Country of incorporation
ESR Limited	30 June	New Zealand
STRmix Limited	30 June	New Zealand

ESR's financial statements include the financial statements of ESR and entities controlled by ESR. All intra-group transactions balances, income and expenses are eliminated in full on consolidation.

No stake in any subsidiary was acquired or disposed of during the year.

Associates

An associate is an entity over which the Group has significant influence. Significant influence is the power to participate in the financial and operating policy decisions of the investee, but is not control or joint control over those policies.

The Group's investments in its associates are accounted for using the equity method. Under the equity method, the investment in an associate is initially recognised at cost and subsequently adjusted to recognise the Group's share of changes in net assets of the associate since the acquisition date. Goodwill relating to the associate is included in the carrying amount of the investment and is not tested for impairment separately.

In applying the equity method of accounting, the Group's share of the post-acquisition profits and losses of its associated companies is recognised in profit or loss and its share of post-acquisition other comprehensive income is recognised in other comprehensive income. These post-acquisition movements and distributions received from the associated companies are adjusted against the carrying amount of the investment.

Unrealised gains on transactions between the Group and its associated companies are eliminated to the extent of the Group's interest in the associated companies. Unrealised losses are also eliminated unless the transaction provides evidence of an impairment of the asset transferred.

After application of the equity method, the Group determines whether it is necessary to recognise an impairment loss on its investment in its associates. At each reporting date, the Group determines whether there is objective evidence that the investment in the associate or joint venture is impaired. If there is such evidence, the Group calculates the amount of impairment as the difference between the recoverable amount of the associate and its carrying value, and then recognises the loss within the statement of profit or loss.

When the Group's share of losses in an associated company equals or exceeds its interest in the associated company, including any other unsecured non-current receivables, the Group does not recognise further losses, unless it has obligations or has made payments on behalf of the associated company.

AuramerBio Limited, a start-up company focused on the development of DNA aptamer sensors, is classified as an associate, with ESR holding 19.5 percent of the shares of the company.

Technical issues and the impact of COVID-19 led to AuramerBio Limited missing a key development milestone that would represent the cornerstone of AuramerBio Limited's next capital raise to obtain further development funding. This led to AuramerBio going into liquidation in April 2021. Consequently, ESR has impaired its investment in AuramerBio Limited by $153,000. This impairment has been recognised in the statement of profit or loss and other comprehensive income.

The carrying amount of equity accounted investments has changed over the reporting period as below:

Group	2021 $'000s	2020 $'000s
Balance at the beginning of the year	228	442
Additions	–	–
Loss for the period	(75)	(64)
Impairment loss	(153)	(150)
Total investments	**–**	**228**

16. Commitments

Capital commitments

Group	2021 $'000s	2020 $'000s
Property, plant and equipment	641	1,058
Intangible assets – software	10	36
Total capital commitments	**651**	**1,094**

ESR leases land, buildings, equipment and vehicles. There are renewal options in respect of the land and building leases. There are no renewal options or options to purchase in respect of vehicles held under operating leases.

ESR has a number of standard operational agreements for the purchase of materials and consumables that have both fixed and variable components, some of which extend beyond one year.

17. Related party transactions and key management personnel

Related party transactions

ESR is a wholly owned entity of the Crown. ESR receives Strategic Science Investment Funding from the Government and enters into transactions with other Crown entities on a commercial basis. In the year ended 30 June 2021, revenue from commercial transactions with Crown entities amounted to 67 percent of operating revenue (30 June 2020: 67 percent).

Related parties include the entities disclosed in note 15.

The following transactions were carried out by ESR with related parties:

- Personnel and equipment were supplied to STRmix Limited to the value of $3,109,000 (30 June 2020: $3,358,000). As at balance date, STRmix Limited owed ESR $303,000 (30 June 2020: $1,264,000).
- Fees paid to directors during the year were $150,200 (30 June 2020: $170,227). There were no directors' fees payable at balance date (30 June 2020: nil).

No provision has been required, nor any expense recognised, for impairment of receivables from related parties.

Key management personnel compensation

Key management personnel comprise the Chief Executive Officer, members of the Senior Leadership Team and the directors. Key management personnel compensation is disclosed below.

Group	2021 $'000s	2020 $'000s
Salaries and other short-term employee benefits	2,765	2,170
Directors' fees	150	170
Total key management personnel compensation	**2,915**	**2,340**

The 2020 salaries and other short-term employee benefits have been restated to ensure consistency with the current period.

18. Financial instruments by category

The designation of financial assets and financial liabilities by ESR into instrument categories is determined by the business purposes of the financial instruments, policies and practices, the relationship with other instruments and the reporting costs and benefits associated with each designation.

Financial assets

The Group classifies its financial assets either at amortised cost or at fair value through profit and loss. ESR determines the classification of its financial assets at initial recognition.

Financial assets at amortised cost are non-derivative financial assets with fixed or determinable payments that are not quoted in an active market. They are included in current assets, except for maturities greater than 12 months after the reporting date, which are classified as non-current assets. ESR's financial assets at amortised cost comprise trade and other receivables, investment cash, and cash and cash equivalents in the statement of financial position.

Regular purchases and sales of financial assets are recognised on the trade-date – the date on which the Group commits to purchase or sell the asset. Financial assets are derecognised when the rights to receive cash flows from the investments have expired or have been transferred and the Group has transferred substantially all risks and rewards of ownership. Financial assets at amortised cost use the effective interest method.

The Group recognises an allowance for expected credit losses (ECLs) for all financial assets at amortised cost or for all financial assets not at fair value through profit or loss. ECLs are based on the difference between the contractual cash flows due in accordance with the contract and all the cash flows that the Group expects to receive, discounted at an approximation of the original effective interest rate.

Financial liabilities

Financial liabilities held by ESR include trade and other payables, employee benefits and lease liabilities.

Such financial liabilities are recognised initially at fair value less transaction costs and subsequently measured at amortised cost using the effective interest rate method.

Derivatives

Derivative financial instruments are recognised both initially and subsequently at fair value. They are reported as either assets or liabilities depending on whether the derivative is in a net gain or net loss position. ESR does not use hedge accounting and, as such, derivatives are classified as held-for-trading financial instruments with fair value gains or losses recognised in the statement of profit or loss and other comprehensive income. Such derivatives are entered into for risk management purposes.

Group	Note	Financial assets at amortised cost $'000	Financial assets at fair value through profit or loss $'000	Total $'000
30 June 2021				
Assets as per balance sheet				
Trade and other receivables excluding prepayments	8	8,128	–	8,128
Cash and cash equivalents		2,182	–	2,182
Investment cash		37,549	–	37,549
Derivative financial instruments		–	9	9
Total		**47,859**	**9**	**47,868**

Group	Financial liabilities at amortised cost $'000	Financial liabilities at fair value through profit or loss $'000	Total $'000
Liabilities as per balance sheet			
Employee benefits	6,875	–	6,875
Trade payables and accrued expenses 9	10,684	–	10,684
Total	**17,559**	**–**	**17,559**

Group	Note	Financial assets at amortised cost $'000	Financial assets at fair value through profit or loss $'000	Total $'000
30 June 2020				
Assets as per balance sheet				
Trade and other receivables excluding prepayments	8	8,620	–	8,620
Cash and cash equivalents		3,333	–	3,333
Investment cash		29,000	–	29,000
Total		**40,953**	**–**	**40,953**

Group	Note	Financial liabilities at amortised cost $'000	Financial liabilities at fair value through profit or loss $'000	Total $'000
Liabilities as per balance sheet				
Employee benefits		6,327	–	6,327
Trade payables, accrued expenses	9	7,500	–	7,500
Total		**13,827**	**–**	**13,827**

19. Financial risk management

ESR's activities are exposed to a variety of financial risks, market risks (including cash flow and fair value interest rate risk), credit risk and liquidity risk. ESR's overall risk management programme focuses on the unpredictability of financial markets and seeks to minimise potential adverse effects on ESR's financial performance. The policies approved and financial instruments being utilised at balance date are outlined below.

a) Market risk

In accordance with its Treasury Management Policy, ESR uses derivative financial instruments to economically hedge its exposure to foreign exchange risks from its operational, financing and investment activities. These derivatives are classified at fair value through profit or loss, and gains and losses are recognised as profit or loss in the statement of profit or loss and other comprehensive income.

i) Foreign exchange risk

Foreign exchange risk occurs as a result of transactions denominated in a currency other than ESR's functional currency of New Zealand dollars. Currencies commonly transacted in, and giving rise to, foreign exchange risk include the United States dollar, Australian dollar, Euro and the Pound sterling. ESR is subject to foreign currency risk through its trade receivables and trade payables balances.

ESR is required by its Treasury Management Policy to hedge net foreign currency exposures equivalent to greater than NZ$100,000 using approved treasury instruments.

At 30 June 2021, ESR held three (30 June 2020: nil) forward exchange contracts with notional principal amounts totalling US$750,000 (30 June 2020: nil). The gains or losses on the forward exchange contracts are recognised in the statement of profit or loss and other comprehensive income.

The carrying amounts of the Group's trade and other receivables denominated in foreign currencies are:

	2021 $'000s	2020 $'000s
US dollar	2,396	1,714
Australian dollar	17	1
Euro	85	26

The carrying amounts of the Group's trade and other payables denominated in foreign currencies are:

	2021 $'000s	2020 $'000s
US dollar	418	349
Australian dollar	88	114
Pound sterling	8	–
Euro	15	–
Swiss franc	–	1

ii) Interest rate risk

As at reporting date, ESR is subject to interest rate risk through the holding of cash and cash equivalents and investment cash. ESR uses a mixture of call and short-term deposit investment accounts to hold excess funds. Available interest rates are monitored to ensure the best return on cash.

iii) Market risk sensitivity analysis

ESR is exposed to market risk through the holding of the following financial instruments: cash, trade receivables and trade payables. ESR has analysed the sensitivities in market risk factors over a 12-month period below:

- proportional foreign exchange rate movement of -10% (depreciation of New Zealand dollar) and +10% (appreciation of New Zealand dollar) against foreign currencies
- a parallel shift of +1%/-1% in market interest rates in New Zealand.

If these movements were to occur (all other variables held constant), the impact on ESR's reported net profit after tax for the year ended 30 June 2021 would be:

- foreign currency $178,000 (30 June 2020: $131,000)
- interest rates $240,000 (30 June 2020: $212,000).

b) Credit risk

Credit risk refers to the risk that a counterparty will default on its contractual obligations, resulting in financial loss to ESR. The financial instruments that expose ESR to credit risk are, principally, cash and cash equivalents, investment cash and trade receivables.

Bank balances and short-term investments (comprising cash and cash equivalents and investment cash) are held with New Zealand registered banks in accordance with ESR's Treasury Management Policy.

The majority of high-value trade receivables comprise government entities and therefore the potential risk of default is low. ESR has a Contract Management Policy that requires assessment of the credit worthiness of potential clients, where the value of the contract is material as defined in the policy.

A provision for doubtful debts is maintained in respect of trade receivables and this is reassessed on a regular basis. No collateral is held by ESR in respect of cash and cash equivalents, investment cash and trade receivables as at 30 June 2021 (30 June 2020: nil).

The carrying amount of financial assets recognised in the statement of financial position best represents ESR's maximum exposure to credit risk at the reporting date.

As at 30 June 2021, the trade receivables balance included $3,330,268 (30 June 2020: $4,292,847) owed by entities within, or owned by, the New Zealand Government. It is not believed that there is any material risk of loss with these receivables.

c) Liquidity risk

Prudent liquidity risk management implies the availability of funding through adequate levels of committed credit facilities. Liquidity risk is monitored through the forecasting of cash flows and ensuring that the committed credit lines in place remain adequate for requirements.

The contractual undiscounted maturity analysis of financial liabilities is presented below.

Group 2021	Carrying value $'000s	Less than 1 year $'000s	1–2 years $'000s	2–5 years $'000s	Greater than 5 years $'000s
Trade payables	10,684	10,684	–	–	–
Employee benefits	6,875	4,586	152	55	2,082
	17,559	**15,270**	**152**	**55**	**2,082**

Group 2020	Carrying value $'000s	Less than 1 year $'000s	1–2 years $'000s	2–5 years $'000s	Greater than 5 years $'000s
Trade payables	7,500	7,500	–	–	–
Employee benefits	6,327	4,441	150	48	1,688
	13,827	**11,941**	**150**	**48**	**1,688**

d) Fair values

The carrying value of financial assets and liabilities recorded in the financial statements approximate their fair values.

Fair value is generally based on the contracted amount payable/receivable of financial assets and financial liabilities, being the amount for which the financial instrument is to be exchanged. Fair value includes the impact of any assessed impairment of the financial instruments – refer to the statement of significant accounting policies for details of each financial instrument and their recognition criteria.

e) Capital risk management

ESR objectives when managing capital are to maintain financial stability, achieve sustainable growth, and realise its strategic goals and targets, all within the risk appetite of its shareholder and management.

In line with government requirements, ESR monitors its capital structure through the return on equity and gearing ratios. Government provides ESR with guidelines with the expectation that an appropriate average return is achieved over time, rather than requiring that ESR meet the specified targets annually.

Each year, ESR internally sets return on equity and gearing ratio targets, bearing in mind the overall results expected by Government. The ratios are reported in the Statement of Corporate Intent.

The return on equity and gearing ratios as at 30 June 2021 and 30 June 2020 were as follows, along with the relevant annual targets set by ESR.

Group Return on equity ratio	2021 $'000s	2020 $'000s
Profit/(loss) for the year	1,166	2,644
Average equity	59,544	57,639
Actual ratio	**2.0%**	**4.6%**
Target ratio	**(3.7%)**	**0.4%**
Gearing ratio		
Net debt		
Finance lease liabilities – current	501	578
Finance lease liabilities – non-current	3,019	768
	3,520	1,346
Equity	**60,127**	**58,961**
Actual ratio	**5.5%**	**2.2%**
Target ratio	**0.9%**	**0.0%**

20. Contingent liabilities

ESR was subject to a legal claim in the United States of America which alleged patent infringement related to aspects of the Group's commercial operations in that country. ESR has successfully defended the case.

The directors are satisfied that there are no other claims outstanding that would have a material impact on ESR's financial position as at 30 June 2021 (30 June 2020: nil).

21. Subsequent events

On the 17th August 2021, the New Zealand Government put the country into COVID-19 Level 4 lockdown. ESR does not anticipate this will have an impact on the balances presented in these financial statements.

There were no other events subsequent at reporting date that require disclosure in the financial statements.

Statement of Responsibility

We certify that the Institute of Environmental Science and Research Limited (ESR) has operated in accordance with the principles of the Crown Research Institutes Act 1992 and the Companies Act 1993. ESR has also complied with all statutory environmental regulations. We acknowledge responsibility for the preparation of these financial statements and for the judgements used therein.

Internal control procedures are considered to be sufficient to provide reasonable assurance as to the integrity and reliability of the financial reports.

In our opinion these financial statements fairly reflect the financial position and operations of ESR for the year ended 30 June 2021.

Denise Church QSO
Chair

Professor Cristin Print
Deputy Chair

About us

Who we are and where we are

ESR's science centres are located in Auckland, Wallaceville and Kenepuru (Wellington region) and Christchurch

Presented to the House of Representatives pursuant to section 17 of the Crown Research Institutes Act 1992.

The Institute of Environmental Science and Research Limited (ESR) is a Crown research institute. It was incorporated in June 1992 and is wholly owned by the New Zealand Government. The two shareholding Ministers appoint a Board of Directors to govern the organisation. ESR has science facilities in Auckland, Wellington (Porirua and Wallaceville) and Christchurch.

ISSN: 1179-4418 (print version)
ISSN: 1178-8275 (online version)

Published October 2021.

Science working for New Zealand

The Crown Research Institutes (CRIs) proudly work, individually and collectively, to create a more prosperous, sustainable and innovative New Zealand

agresearch
āta mātai, mātai whetū

ESR
Science for Communities

GNS SCIENCE
TE PŪ AO

Manaaki Whenua
Landcare Research

NIWA
Taihoro Nukurangi

Plant & Food™ Research
Rangahau Ahumāra Kai

SCION™
FORESTS ▪ PRODUCTS ▪ INNOVATION

www.sciencenewzealand.org

3,800
SMART AND PASSIONATE PEOPLE

54
SITES ACROSS NEW ZEALAND

6,000
SCIENCE PROJECTS EACH YEAR

40
NATIONALLY SIGNIFICANT DATABASES & COLLECTIONS

J009342

Science centres

Kenepuru Science Centre
34 Kenepuru Drive, Kenepuru, Porirua 5022
PO Box 50348, Porirua 5240, New Zealand

Mt Albert Science Centre
120 Mount Albert Road, Sandringham, Auckland 1025
Private Bag 92021, Auckland 1142, New Zealand

Wallaceville Science Centre
66 Ward Street, Wallaceville, Upper Hutt 5018
PO Box 40158, Upper Hutt 5140, New Zealand

Christchurch Science Centre
27 Creyke Road, Ilam, Christchurch 8041
PO Box 29181, Christchurch 8540, New Zealand

ESR
He Pūtaiao, He Tāngata