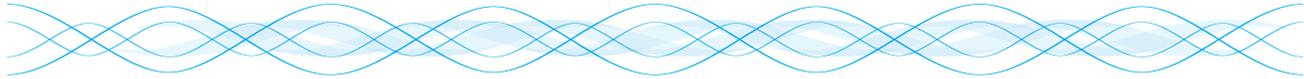




Science for Communities

STATEMENT OF CORPORATE INTENT  
2018-2023





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

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.

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## Executive summary

*We are pleased to present ESR's 2018–2023 Statement of Corporate Intent (SCI). This document sets out our operating environment, strategy and the science activities we will undertake to keep communities safe, healthy and prosperous.*

**We have been reviewing our strategy to take account of future trends in science and technology, changes in our operating environment and the long term outlook for ESR's science products and services.**

Our refreshed strategy *ESR Into the Future* identifies four priorities that will ensure our science has positive impacts on the lives of all New Zealanders. Our strategic priorities are to:

- harness the latest advances in science and technology
- drive growth for reinvestment in our science
- make a greater difference for New Zealand, and
- strengthen our organisational resilience.

Rapid advances in science and technology offer remarkable new prospects for ESR and the range of services we deliver. Developments in genomics, data science, miniaturised science equipment, networked sensors and artificial intelligence are some examples of evolving trends that have the potential to significantly change the ways we do things and serve the New Zealand community. Our work is vital for New Zealand's health, safety and prosperity including the role we can and do play in nationally critical events such as drinking water contamination, food contamination threats and major disease outbreaks.

Seizing the many opportunities these advancements offer us will make us an even stronger contributor to our clients and our communities. We will continue to grow our capabilities in genomics, using the richer genetic data to deliver greatly enhanced forensic, health and environmental science services. We will increasingly leverage big data to provide our clients with deeper insights to inform their decision making, and develop our data science to enable us to become a leading provider of data science to the wider public sector. We will grow the research that underpins our future services and develop new science products that have commercial potential. Our research will help New Zealand achieve several National Science Challenges (Healthier Lives, Our Land and Water, New Zealand's Biological Heritage and the Deep South).

As the CRI entrusted with serving public health, justice, food safety and environmental and water quality, via research and science based services, we need to maintain a critical mass of core and essential capacity across those areas that is fit for the future. Having the capacity to renew and reinvent is critical in the face of rapidly changing technologies and needs. Fundamental to this is building the financial sustainability of the core services we provide to partner agencies. Financial sustainability relies on both adequate margins in service areas and sustainable scale.

Over the past three years ESR has steadily improved its financial performance and the level of stakeholder satisfaction. However, the ambitious strategy we have planned is dependent on us being financially successful in the future and having the resources to invest. Currently the majority of ESR's revenue is made up of what we earn from our core contracts from government agencies. The revenue for these has been flat over the last five years, and together with the relatively low level of Strategic Science Investment Fund (SSIF) investment our current model is not sustainable.

In response, ESR has taken a number of actions to improve its financial viability. We have been very successful at generating international revenue from our forensic software, but we now need to set this funding aside to replace our ageing science facilities and to invest in the science capabilities we need to be successful in the future. We have increased the efficiency of the services we deliver, kept a tight control on expenditure, and offered additional high value services to our clients. There are encouraging developments in discussions with partner agencies to identify ways in which new science and science services can add high value for NZ Inc. Successful negotiations of these contracts will allow us to increase the revenue and margin on the critical and new services we could provide. If we are not able to build and sustain the financial sustainability of the core services we provide to partner agencies over the long term, then over time our capacity to provide these services will diminish.

If ESR is able to negotiate contracts on a sustainable basis, we will grow ESR and reinvest the profits in our science to keep ESR at the leading edge of our areas of expertise. We will also accelerate growth of our world leading forensic software STRmix™, continually develop the product, and increase our presence in new and existing markets. We will continue to diversify our revenue base, actively pursuing other opportunities for international growth, such as those in China, the Pacific, South East Asia and the USA. We will develop a continual stream of new products and services through our active commercialisation programme and invest in innovative science through our Pioneer investment fund. We will grow ESR's visibility and brand to ensure we are front of mind for potential new clients and research collaborators.

The ultimate aim of our strategy is to use our science capabilities to make a greater difference for New Zealand. We will generate additional intelligence that informs nationally important decisions and actions of our strategic partners.

- We will use the latest developments in genomics to conduct increased surveillance of infectious diseases, detect disease outbreaks earlier and study antibiotic resistance superbugs



- Our “Border to Grave” drug surveillance activities will be expanded, using what we find through Customs and Police data and testing of Unknown Substance use in Emergency Departments (USED) to reveal potent new synthetic recreational drugs as they hit the drug scene, and to help agencies tackle them faster
- We will work with local authorities to reduce waterborne diseases in drinking water, rivers and streams and reduce nitrate levels in groundwater. ESR will continue to lead the Centre for Integrated Biowaste Research which develops new treatment options that reduce the amount of biowaste disposed in landfill and the ocean. Our work in this area supports an important government priority – supporting a rich and protected environment
- We will develop enhanced technologies that minimise infectious diseases in food and accurately identify the source and composition of food products. This will enhance New Zealand’s reputation as a high end food producer, contributing to another government priority - sustaining economic development and supporting the regions
- We will build on our increased research aligned with Vision Mātauranga. We will develop long-term relationships with iwi and use our science capabilities to co-innovate with and improve outcomes for Māori
- We will use an evidence based research and enhanced forensic intelligence to identify ways to detect, prevent and disrupt crime.

Supporting our science with the best people, modern equipment and adaptable facilities is critical to our future success. We will create a collaborative workplace culture which encourages innovation and agility, and is based on trust and empowerment. We will ensure our science facilities encourage collaboration and innovation, are flexible enough to meet our future needs, and are more financially and operationally resilient. Our first priority is to invest in a science facility in the Wellington region, replacing the ageing Kenepuru Science Centre by 2022.

We can see the opportunities presented by the developments in science and technology, and by working with our government and other partners to overcome some significant challenges, we will be able to make advances in keeping New Zealanders safe, healthy and prosperous.

**Denise Church** QSO  
Chair

**Dr Keith McLea**  
Chief Executive





## ESR's purpose

*ESR is a Crown Research Institute (CRI) that uses the power of science to tackle critical challenges facing New Zealand in the areas of public health, serious crime, food safety and water quality.*

**Our point of difference is that we deliver science services and research that keep communities safe, healthy and prosperous.**

ESR's science capabilities include health science, forensic science, food and water science, radiation science, social systems and workplace drug testing. Our high calibre teams provide independent, authoritative and trusted science solutions. We are especially known for our advanced science capabilities in microbiology, DNA and our ability to solve complex problems.

We maintain nationally critical science capabilities that are used when responding to matters of national significance such as food contamination threats and major disease outbreaks.

### Statement of Core Purpose

ESR's purpose is to deliver enhanced scientific and research services to the public health, food safety, security and justice systems, and the environmental sector to improve the safety of, and contribute to the economic, environmental and social well-being of people and communities in New Zealand.

ESR provides research and scientific services and knowledge transfer in partnership with key stakeholders including government, industry and Māori to:

- Safeguard the health of New Zealanders through improvements in the management of biosecurity and threats to public health
- Increase the effectiveness of forensic science services applied to safety, security and justice investigations and processes
- Enhance protection of New Zealand's food based economy through the management of food safety risks associated with traded goods
- Improve the safety of freshwater and groundwater resources for human use and the safer use of biowastes.





# Operating environment

*ESR will continually scan the horizon and actively respond to the opportunities and challenges in our operating environment.*

## Challenges facing New Zealand

New Zealand faces many complex challenges that ESR's science can be used to address. These challenges include the threat of pandemics, antibiotic resistant superbugs, proliferation of illicit drugs, violent crime, family violence, threats to New Zealand's reputation as an exporter of quality food, and contamination of our waterways.

## Science trends

Science and technology are progressing rapidly. Whole genome sequencing is already providing much richer genetic information on humans and infectious diseases, and will drive a shift for ESR from wet labs to dry labs. Many of the drivers for change are external to ESR and beyond our control, so understanding what is coming and preparing the organisation to respond to them is essential to our long term sustainability. Our Future Trends Working Group have been reviewing the trends likely to affect ESR we need to be ready for. Technological shifts ahead include increased automation, development of miniaturised portable DNA equipment, artificial intelligence and machine learning, big data and data analytics. Scientific developments ahead include metagenomic testing to analyse all genetic material in a sample, remote monitoring using networked sensors, and the growth of data science.

## Our core government clients

We maintain strong client relationships at operational and strategic levels which helps us develop a deeper understanding of the outcomes and impacts that our core government clients are focussed on. This informs our longer term collaborative planning, service delivery and future product development. We will continue to investigate new and innovative ways of configuring products and services to suit our clients. The newly formed Evidenced Based Policing Centre is a good model for working more closely with our clients to better meet their needs.

Our government clients remain financially constrained and this has a significant effect on the sustainability of some of our key research and science services. With the exception of new additional services we have introduced, the revenue on our core services has been relatively flat. If we cannot increase the revenue and margin on these services, then we will need to look at reducing services and capability. If this is not addressed over time, we will no longer be able to maintain the capability needed to respond to some of our business as usual activities and critical events such as drinking water contamination, food contamination threats and major disease outbreaks.

## New Zealand's science system

New Zealand has a small and relatively fragmented science system, requiring effective collaboration between key players to get the best results for New Zealand. We will continue to actively partner with CRIs, District Health Boards, Universities, Regional Councils, Government Agencies and International Agencies such as the Centers for Disease Control and Prevention. Our Social Systems scientists will continue to investigate and analyse complex social issues with partners to find solutions to issues that face our society, such as family violence.

## Commercial expertise

We are embedding our commercial capability in order to successfully expand our commercial products and expert advisory services to new clients as well as focussing on taking new products to market. As we build our commercial expertise we will continue to work with trusted partners such as KiwiNet to benefit from additional commercial expertise to create value from our intellectual property.

## International growth

ESR will continue to explore opportunities to increase our presence in overseas markets. We are already working in the United States, Europe, the Middle East, Asia, Australia, the Pacific and we are developing strong relationships with potential partners and clients in China.



# Strategy

*Our refreshed strategy ESR into the future is our plan to invest in high value science that delivers better outcomes for New Zealand and improves our financial sustainability.*

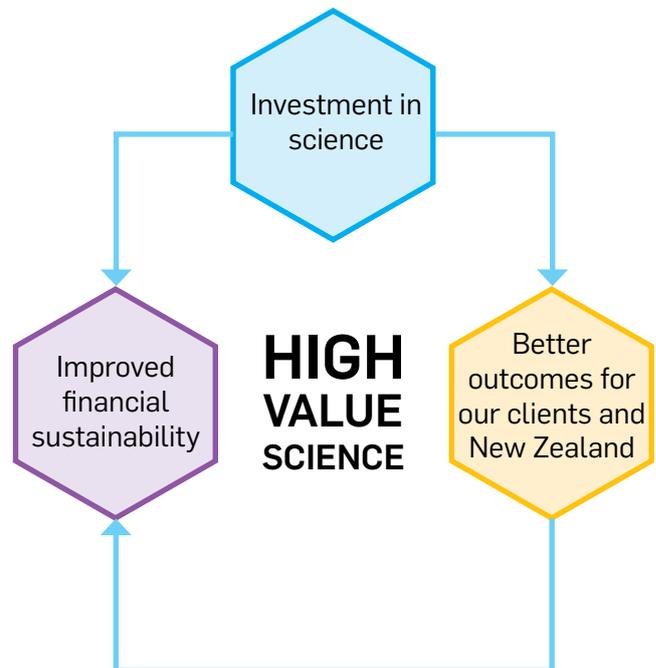
**To build on the momentum of the improved financial results and stakeholder satisfaction achieved in recent years, ESR has been reviewing its strategy to take account of future trends, our environment and the long term outlook for each of our main products and services.**

ESR is looking forward to a period of unprecedented change driven by rapid advances in science and technology. We will need to take advantage of these opportunities through our experience, knowledge, research and a desire to be an increasingly agile organisation.

Our challenge is to examine the big breakthroughs in science and technology and work out how we best leverage these advances to enhance or even disrupt the work we do to support the community.

To ensure we are in a good position to reinvest in our science, we need to generate sustainable margins on our core services and grow our revenue from STRmix™ and other commercial products and services. We will need to be innovative and agile, developing innovative new products and services and moving rapidly when we identify new commercial opportunities for our science products and services.

Investing in our science capabilities and infrastructure will ensure we are well placed to deliver better outcomes for our clients and New Zealand.





## ESR Into the Future

*ESR Into the Future* outlines four strategic priorities that will position ESR as a leader in the science that keeps people safe, healthy and prosperous. These four strategic priorities will guide ESR's investment and decision making:

- Harness advances in science and technology to drive greater value

- Drive growth for reinvestment
- Make a greater difference for New Zealand
- Strengthen ESR's organisational resilience

The table below shows what success will look like in five years' time and the initiatives we will implement in 2018/19.

	<b>What success will look like in 2023</b>	<b>ESR Into the Future initiatives we will implement in 2018/19</b>
<b>Harness advances in science and technology</b>	Build a virtual human data hub and become a leading provider of human data science to the public sector Provide our clients with real-time intelligence Provide routine metagenomic testing within 5 years Increase research revenue & FTEs	<b>Become a leading provider of data science</b> <b>Embrace transformational technology</b> <b>Refresh and expand our science capabilities</b> <b>Grow our research</b>
<b>Drive growth for investment</b>	Grow total revenue to \$100m by 2022 Increase investment in our products, services and capabilities by 30% over 5 years	<b>Drive international growth</b> <b>Develop innovative products &amp; services</b> <b>Enhance our products and services</b> <b>Grow ESR's brand and visibility</b>
<b>Make a greater difference for New Zealand</b>	Sustainable margins in place for the research and science services provided to government and other clients Demonstrable case studies where our science improves New Zealanders' lives	<b>Develop deeper strategic partnerships to deliver greater value</b> <b>Vision Mātauranga and te taumatua</b>
<b>Strengthen our organisational resilience</b>	An organisational culture of innovation, creativity, agility, trust and empowerment Fit for purpose science facilities	<b>Develop our culture and people capabilities</b> <b>Embed our next operating model</b> <b>Create science facilities that fit our future needs</b>



## Harnessing advances in science and technology

We will be a fast follower of emerging science and technology, adapting it to meet New Zealand's challenges and cementing our position as a leader in the science that keeps people safe and healthy. Over the next five years we will use advances in data science to become a leading provider of human data expertise to New Zealand government agencies. We will also adopt metagenomic analysis, adapt point of use testing for a New Zealand context, provide our clients with real-time intelligence, and adopt networked sensors that drive automated action.

### *Becoming a leading provider of data science*

The explosion of data and the ability to build relationships between disparate data sources will enable ESR to deliver new insights that inform decision-making and responses to community risks. We will use data science to unlock the power of our existing data assets for both operational and science gains. At the same time, we will create new value for New Zealand by building on our core data to generate new intelligence that serves the wellbeing of communities. Democratised data sources will increasingly add value to our own data sets, so we will develop the capability to capture, manage and integrate new data sources including unstructured data.

We will make a significant investment in data science, enabling ESR to employ additional data science staff, prepare our data science strategy and fund the cost of new technology via proof of concepts. Our data science strategy will reveal what our customers will value, the data sets we require, the technologies we will need and potential commercial opportunities. We will progressively select and then build the required data platform and provide access to the relevant tools, build capability and establish the relationships necessary to become a leading provider of human data expertise to the New Zealand public sector in the health, social welfare, justice, environment and education areas. We will start in the health domain, extending our public health surveillance service with new externally sourced data and enriching our existing data with genomic reference data.

In parallel to this, ESR will introduce a new fast start technology programme that targets the rapid adoption of technology based projects that exploit our data via artificial intelligence and machine learning. This new programme will be supported by the Pioneer Fund and SSIF. We will work on a drug intelligence platform to inform health, first responders and emergency services. We will expand our public health surveillance to incorporate genomics and social media data analysis.

Our data science capability will have three parts: client-centric design; a virtual data network; and client-focused interpretation and presentation. Our virtual data platform will leverage the data sets available in the public and private sectors and through open data.



## Embracing transformational technology

### Artificial Intelligence and early warning systems

Artificial Intelligence and machine learning will underpin our data-led services. In the near term, this technology presents a good opportunity to support genomic and bioinformatics analysis in new software products we are developing. In the medium term, we will use machine learning to develop early warning systems to provide information for rapid intervention, using real-time automated data. We will develop ways to obtain real-time intelligence from a range of sources to disrupt disease and crime, including through sources of information such as Google and social media. We will use predictive modelling and machine learning to develop smart algorithms that identify when action is required by our clients.

### Digital workflows

Artificial intelligence also provides a practical opportunity to streamline instrument outputs in more traditional laboratory operations, reducing labour and specialist effort by automating manual assessments. Further opportunity exists to take this output and provide it to end users faster as the workflow increasingly becomes digitised. Machine learning is expected to enhance performance of low cost instruments, reducing operating costs and processing times.

### Point-of-use testing

Miniaturised portable devices will facilitate real-time point-of-use testing. Such devices will allow swift diagnosis and treatment of patients, test the environment for contaminants and rapidly test evidence collected at crime scenes. New DNA technologies will rapidly identify pathogens in patients and the environment through metagenomics. ESR will identify which devices provide the right functionality, accuracy and value for money for our clients. We will be actively involved in the calibration and management of point-of-use testing devices.



### **Networked sensors**

ESR will identify opportunities to use networked sensors to download information in environmental, health and crime settings. This will include chemical sensors, aptamers for health monitoring and sensors to detect contaminants such as bacteria and viruses in water. We will partner with sensor developers, such as developers of real-time environmental monitoring sensors for waterways and drinking water.

### **Refreshing and expanding our science capabilities**

We will refresh and expand our science capabilities to incorporate new developments in science and technology. Our priorities for investment are 'omics capabilities, data science, statistics and social science.

'Omics technologies are fast-moving fields of science that explore the roles, relationships and actions of various types of molecules that make up the cells of an organism. They reveal rich information on life's basic building blocks. All facets of ESR's work and our ability to deliver greater value for our clients will depend on our 'omics capability – whether genomics, transcriptomics, metagenomics or proteomics. This is a nascent but growing area for ESR and we have the expertise and experience to adopt and adapt as technology changes. We will build on our skills in Next Generation Sequencing and bioinformatics and extend into the other 'omics fields. We will use metagenomics – the sequencing of all the DNA within a sample – for the rapid identification of pathogens in diagnostic and environmental samples and to interpret and contextualise metagenomic data.

### **Growing our research**

Research underpins our future service delivery and how we can more effectively meet our client needs. We research problems facing our clients, develop innovative solutions and build them into our science services. Research also acts as a catalyst for innovative ideas with commercial potential, such as our world-leading forensic software. Leading-edge and published science research builds ESR's international reputation, generates inquiries from new clients and leads to new collaboration opportunities.

ESR receives \$9.2m each year in SSIF funding, which is only 11% of total revenue – a much smaller proportion than other CRIs. In recent years, increased research funding has enabled us to grow our research and we will actively seek funding opportunities to grow it further. A good example is groundwater mitigation research which contributes to government's priority of 'supporting a rich and protected environment'. We will also conduct food safety research through the New Zealand Food Safety Science Research Centre.

Our scientists' reputations and publication records are important determinants of success for research grants. We will develop our scientists' capabilities and recruit new senior scientists who have the potential to expand our research into

new areas aligned with our core purpose. We will provide the necessary resources and capability to support our scientists to develop successful research bids.

### **Driving growth for reinvestment**

**We will seek out global opportunities for growth and reinvest the profits we generate in our science products, services and capabilities. Our ambitious growth plan will deliver total revenue of \$100m by 2022. To drive innovation and growth, over the next 5 years we will increase our investment in our science by 30% (FY17 \$10.7m, FY22 \$14.0m).**

### **Growing international revenue**

ESR will implement the revised STRmix™ business plan to accelerate growth and further develop the product to achieve and retain market dominance.

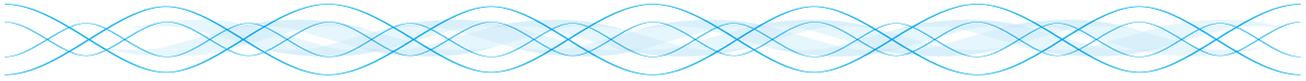
We will also focus on other opportunities as they arise, such as those in China, the Pacific, South East Asia and the USA. ESR will boost revenue growth and increase our international connectivity to enhance our science and technology and ensure our global competitiveness. We will extend ESR's international reach and create an international presence. We will leverage off our current base and prioritise opportunities. Internationalisation will embed across the whole of ESR. To ensure the long-term success of international growth we will ensure that the right structures are in place.

International growth will enable us to diversify our revenue base and generate greater profits to reinvest in science.

### **Developing innovative products and services**

A continual flow of new products and services coming on stream is important to refresh our science services and achieve our growth aspirations. We will invest in new and innovative ideas through our Pioneer Fund, which is awarded to staff to explore bright ideas that will ultimately benefit our customers and provide future revenue to ESR. Our Pioneer Fund is used to develop new products and services, including proofs of concept and prototypes. All commercialisation projects will follow a stage-gate process and we will supplement our own investment with co-funding wherever possible.

We will also seek to take advantage of partnership opportunities relevant to our strategic direction. In some of the sectors we work in, such as the food sector, are multiple, complementary sources of expertise. This means that the best value for NZ Inc will be delivered to clients through multilateral partnerships with other CRIs, universities, local authorities, health authorities and others. We will build collaborative partnerships to deliver better and apply commercial assessments to all new work.



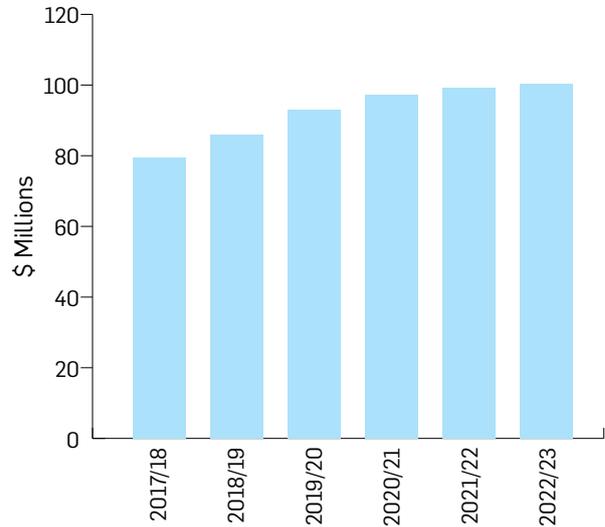
**Enhancing our productivity**

Our prices need to be competitive when bidding for new work to achieve our growth targets and reinvest in our science. We will continue our strong cost focus to ensure our laboratories and support functions are operating efficiently. We will continue to focus on achieving additional savings through smarter procurement.

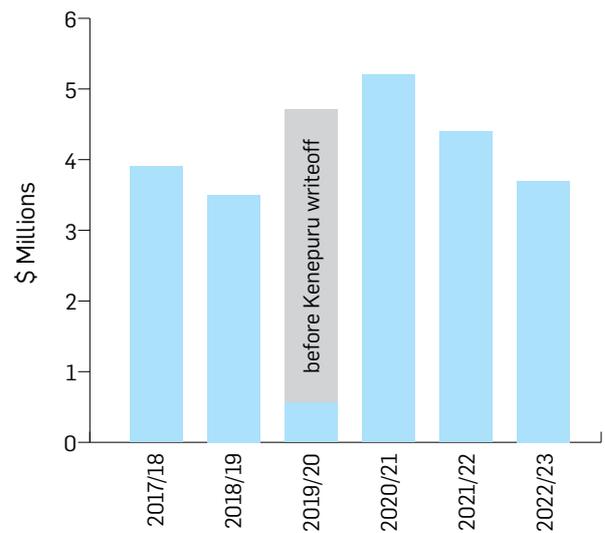
**Growing ESR's visibility and brand**

ESR is well known publicly for its work in forensic science, but less well known for the impact it makes in public health and environmental science. We will grow our brand, profile and visibility to ensure we are front of mind for potential new clients and collaborators and to drive new business opportunities. Awareness of the ESR brand will be improved through a comprehensive communications programme and better telling our story to our many audiences.

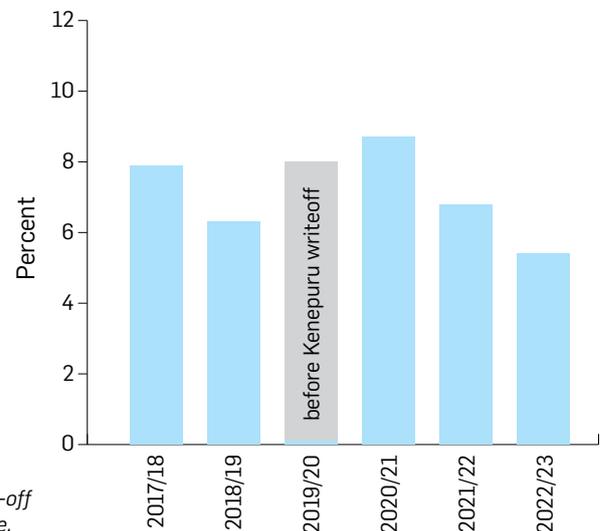
**REVENUE**



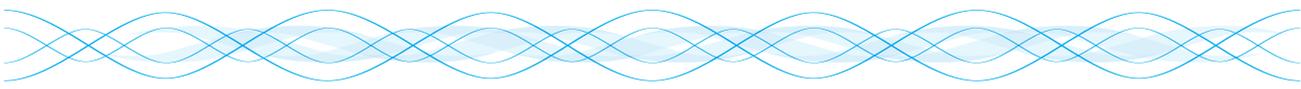
**NET PROFIT AFTER TAX**



**NET PROFIT AFTER TAX**



**NB.** The financial results in 2019/20 reflect a one-off \$5.7m writedown of the Kenepuru Science Centre.



## Making a greater difference for New Zealand

The ultimate goal of our strategy is to increase the impact our science makes for New Zealand. Areas where we can significantly improve outcomes for New Zealand are providing the science to inform crime prevention strategies, reducing the spread of communicable diseases, cleaning up our waterways and improving food safety in New Zealand and overseas. Key to achieving this will be using our data science capabilities to provide actionable intelligence in real-time for our clients.

### *Developing deeper strategic partnerships*

Strong, mutually beneficial strategic partnerships are the best way for ESR to make a greater impact for New Zealand.

We will partner with government agencies to help achieve their strategic goals and continually adapt our services to deliver greater value. A good example is the Evidence Based Policing Centre, which will use an evidence-based problem solving approach to identify ways to detect, prevent and disrupt crime.

We will maintain open, trusted dialogue at multiple levels between ESR and our client's organisation. Our services will be underpinned and advanced using whole of organisation coordinated strategic partnerships management approach. Our client relationships often depend on one-to-one relationships, personal contacts, involvement, discussion and development. We will build strong relationships on a peer to peer basis with all stakeholders in our partner organisations.

A key focus in the short term is to ensure the research and science services we provide are achieving sustainable margins. We are currently in interim discussions, or about to be in discussions, with a number of our key government clients.

As well as strong strategic partnerships with our government partners, our future success relies on partnerships with research collaborators, commercial organisations, innovation hubs and new relationships with other government agencies where we can work together to solve complex problems.

### *Vision Mātauranga and te taumatua*

ESR will partner with Māori to create a better future through Vision Mātauranga.

We will identify areas of mutual interest, growth and co-innovation to support Māori, leveraging science as a key ingredient to ongoing social, cultural and economic development. We will strengthen our relationships with Māori, iwi, hapū, businesses, Māori territorial authorities, government agencies, industry and Māori research communities.

We will focus on the establishment of internal infrastructure and initiatives to support the following:

- **engage** with Māori to understand the challenges of primary concern and identify opportunities for co-innovation
- **promote** the utilisation of ESR's existing science based solutions and technologies, and support the development of new technologies, information and research to add value to Māori assets
- **facilitate** internal organisational collaboration, as well as external organisational relationships to maximise opportunities to partner and collaborate on work in key areas of interest to Māori
- **coordinate** Māori engagement across ESR
- **invest** and allocate internal resources to develop meaningful relationships with Māori partners

Recent successes with MBIE Vision Mātauranga research funding applications have enhanced our partnerships and collaborations. We will continue to prioritise Vision Mātauranga research applications that benefit Māori and New Zealand.



## **Strengthening our organisational resilience**

**We will ensure our science products, services and research are backed up by a strong and resilient organisation.**

### ***Developing our culture and people capability***

ESR will build a culture that empowers and enables our people to work effectively in a rapidly changing environment and be agile in changing service deliverables to a range of clients with different needs. We will develop a culture that is highly collaborative, agile, innovative, and based on trust and empowerment.

To support a successful culture shift, we will define the culture we aspire to, identify the gap between the current state, identify the most effective business levers to drive the culture change towards the desired future state, and develop and implement a defined roadmap for culture change.

We will ensure ESR has the right skills in the right place at the right time through high quality recruitment, capability development and people management practices. To develop the capabilities our people need to thrive in a rapidly changing environment we will provide the right development opportunities and adopt different approaches in order to:

- meet the needs of a diverse, yet highly specialised workforce
- support staff to take responsibility for their own development
- expand the way development occurs within the work environment
- support effective application of learnt knowledge and skills across ESR.

### ***Embedding our next operating model***

Our operating model will be reviewed to ensure we are configured for future success. Development of our genomics capabilities will be a key driver of this, as it will change the mix of traditional laboratories and office-based analytics. Our next operating model will reflect increasingly shared capabilities, resources, equipment and facilities across ESR. Our Forensic, Health and Environment scientists will work in an environment where they engage, collaborate and support each other, making the best use of technology and laboratory space.

### ***Creating modern science facilities***

A wide range of options for replacing the ageing Kenepuru Science Centre will be explored. The options will incorporate modern design principles that include more shared laboratories and activity-based workplaces will be interoperable across systems. The design principles will provide an innovative high-end science facility, fully utilise our most expensive assets and allow ESR to flex and adapt in an adjustable environment.

In ESR's core science areas, there is a decreasing need for 'wet labs' as techniques evolve and become automated, particularly around genomics. ESR is aware that technology will continue to evolve rapidly, and its labs and facilities need to be adaptable in order to respond to these changes.

ESR's buildings are also aging, with maintenance costs increasing every year. Facilities such as air conditioning are expensive to upgrade, yet play a crucial role in maintaining the integrity of biological samples at ESR. There are high risks to business continuity associated with failure.

ESR is moving to address the deteriorating facilities at Kenepuru, which it sees as an opportunity to develop facilities that encourage collaboration and innovation, are flexible enough to meet future needs, and are more financially and operationally resilient.



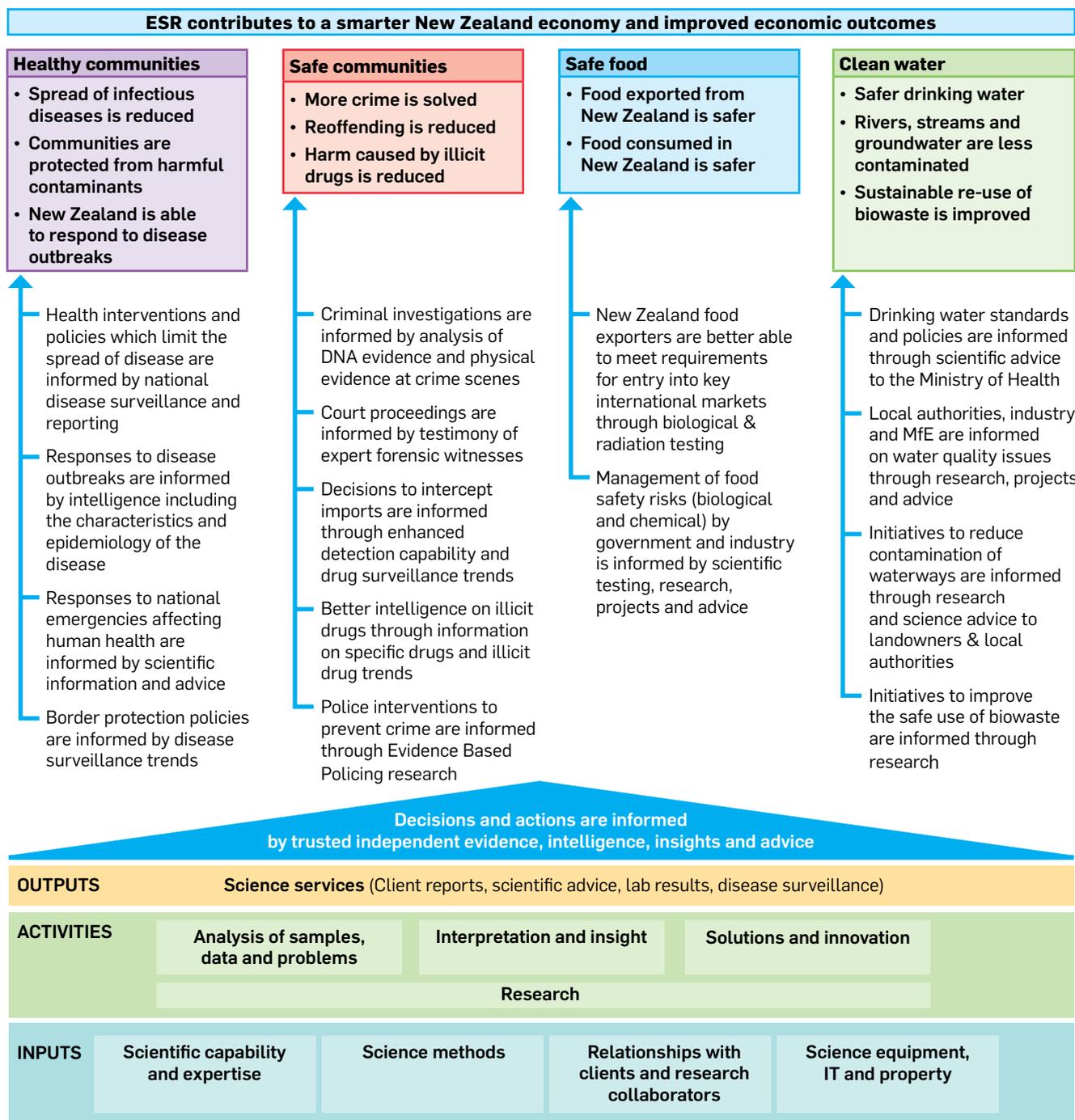


# Our performance

*Our scientists provide trusted independent evidence, intelligence, insights and advice that informs the decisions and actions of local authorities, government agencies and industry.*

**Examples of the major decisions and actions that ESR's science informs are shown below. These range from management of disease outbreaks to criminal investigations and initiatives to reduce contamination of waterways.**

Ultimately our science contributes to reduced spread of infectious diseases, more serious crimes solved, reduced harm from illicit drugs, food is safer to eat, and cleaner freshwater and drinking water. Our research and innovation contributes to improved economic outcomes and a smarter New Zealand economy.





The outcome measures below have been developed to capture the difference our science makes for our government partner's critical decisions and actions. For Healthy Communities and Safe Communities, the measures focus on the science services we provide for Ministry of Health and

Police. For Safe Food and Clean Water and the Environment, the measures focus on our innovative research and advice to MPI and local authorities. Output measures which indicate the quality and timeliness of our science are shown below.

	Outcome measures	What the measures indicate	Output delivery measures
<b>Healthy communities</b>	<ul style="list-style-type: none"> <li>Ministry of Health's satisfaction with ESR support for outbreak responses (target 'good' or higher)</li> <li>Disease surveillance information is distributed to all key decision makers (target 100%)</li> <li>Impact case studies</li> </ul>	<ul style="list-style-type: none"> <li>Ministry of Health's satisfaction with support for outbreak responses shows the value of ESR's science and advice to the management of outbreaks</li> <li>Distribution of surveillance information to key decision makers (MoH, DHBs, etc) is critical for limiting the spread of infectious diseases</li> <li>Impact case studies illustrate the qualitative impacts made by ESR's science</li> </ul>	<ul style="list-style-type: none"> <li>100% of time-critical turnaround times are met</li> <li>Ministry of Health satisfaction with ESR services rates as 'Good' or better</li> <li>&gt;95% of Ministry of Health's project brief milestones and deliverables are consistently met</li> </ul>
<b>Safe communities</b>	<ul style="list-style-type: none"> <li>Percentage of DNA samples linked to a person (target 70%)</li> <li>Total number of cases where ESR provides Police with analysis of forensic evidence</li> <li>Number of research projects undertaken by ESR for the Evidence Based Policing Centre</li> <li>Impact case studies</li> </ul>	<ul style="list-style-type: none"> <li>The hit rate for linking DNA samples to a person shows the proportion of cases where a clear suspect is identified</li> <li>Total cases shows the number of criminal investigations informed by ESR's forensic analysis</li> <li>Evidence Based Policing research is used to drive tactics and decision making that reduce crime, enhance policing and redirect police resources to where they are needed most</li> </ul>	<ul style="list-style-type: none"> <li>90% fulfilment of contractual obligations under the service level agreement</li> <li>90% Police satisfaction with ESR's timeliness and quality of service</li> </ul>
<b>Safe food</b>	<ul style="list-style-type: none"> <li>Number of food science projects delivered to MPI and the New Zealand Food Safety Science Research Centre</li> <li>Impact case studies</li> </ul>	<ul style="list-style-type: none"> <li>Examples of the specific impacts of our work, which vary from project to project, are provided in the ESR Annual Report</li> </ul>	<ul style="list-style-type: none"> <li>% of MPI and NZFSSRC projects delivered on time</li> </ul>
<b>Clean water and the environment</b>	<ul style="list-style-type: none"> <li>Number of territorial local authorities and interest groups to whom ESR provides water quality advice</li> <li>Number of publications of ESR's water and environment research</li> <li>Impact case studies</li> </ul>	<ul style="list-style-type: none"> <li>The number of local authorities and interest groups indicates the nationwide spread of our advice on how to clean up waterways</li> <li>Research which is accepted for publication and cited by other researchers indicates that innovative approaches were used or important findings made</li> </ul>	<ul style="list-style-type: none"> <li>Number of SSIF funded water projects delivered</li> </ul>



**We also monitor performance of our science using the following generic CRI measures.**

<b>Key result area</b>	<b>Measure</b>	<b>2017/18 Forecast</b>	<b>2018/19 Target</b>
Research collaboration	Publications with collaborators	60	65
Technology and knowledge transfer	Commercial reports per scientist FTE	0.45	0.45
Science quality	Impact of scientific publications (measured using Web of Science citations for the previous calendar year)	3.1	3.2
End user collaboration	Revenue per FTE from commercial sources	\$51,168	\$55,509
Financial indicators	Revenue per FTE	\$202,806	\$204,708
	Commercial revenue	\$20.0m	\$23.3m



# Healthy communities

*Safeguard the health of New Zealanders through improvements in the management of human biosecurity and threats to public health.*



## Impacts

Our work improves public health by reducing the harm and costs of infectious diseases. Using our reference laboratory information, the Notifiable Diseases Database and information collected from laboratories, our scientists and clinicians collect, collate and analyse data and intelligence on infectious diseases present in New Zealand, including influenza, gastroenteritis and hepatitis. Our clinicians provide advice, support and recommendations to public health clinicians, District Health Boards (DHBs) and primary care health professionals to support their local and regional health care interventions.

Our extensive health surveillance and data collation networks allow us to identify and characterise individual strains and cases of disease, track any changes in incidence, prevalence or spread, detect, analyse and alert public health authorities to pathogen outbreaks and assess the effectiveness of control measures including the use of vaccines. With early detection, hazards and diseases can be mitigated and sometimes prevented altogether.

ESR also provides the clinical and scientific capability and expertise necessary for New Zealand to respond effectively to disease outbreaks, pandemics and contamination events.

## Our work is focused on the following impacts:

- Reducing the burden of infectious diseases
- Improving the ability to respond to infectious disease outbreaks
- Improving human biosecurity
- Mitigating risks to human health from radiation
- Improving the safety of medicines
- Improving the understanding of complex and challenging public and environmental health issues.

### Health Science Vision

ESR will ensure New Zealand's scientific and clinical response capability, with regard to human health, remains effective, on par with international standards and is enhanced to take account of new emerging threats. Insights and solutions will be provided to counter the spread of antimicrobial resistance, informing public health policy and response measures.



## To achieve these impacts our scientists:

- Operate New Zealand's notifiable disease surveillance system (EpiSurv)
- Study the epidemiology of infectious diseases
- Track and report on trends in notifiable diseases
- Conduct microbial identification and characterisation, including genomic analysis
- Maintain New Zealand's nationally significant Reference Culture Collection of medically important bacteria
- Provide accredited reference laboratory services
- Coordinate national and regional outbreak investigations on behalf of the Ministry of Health and local authorities
- Conduct research into faecal source tracking (FST) and use FST to support local authority resource management and outbreak investigations
- Plan for surge capability and capacity in the event of a major outbreak crisis
- Test the safety of medicines and other therapeutic products against international quality and safety standards, including testing to identify counterfeit and adulterated medicines
- Assist decision-makers to address challenging problems that involve high levels of complexity and uncertainty
- Provide scientific advice and services to the Ministry of Health's Office of Radiation Safety
- Operate six monitoring stations that measure radiation levels as part of the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO)
- Monitor the National Data Centre for nuclear and radiation monitoring on behalf of the Ministry of Foreign Affairs and Trade
- Provide radiation testing, advice, training, calibration, regulatory support and dosimetry services.

We provide public health science services to central government under contracts with key government health and biosecurity agencies. Through these contracts we deliver core health science services at local and community levels to district health boards (DHBs), public health services and local government. Our partnerships are centred on the DHB-based public health units, university collaborators, research partners in primary care, the Health Research Council and the United States Centers for Disease Control and Prevention. In the future we will strengthen and broaden our partnerships with DHBs, the primary care sector and provider partners.

## Planned initiatives

To improve public health outcomes we will:

- Implement new technologies for the detection and characterisation of microorganisms, including new, re-emerging, and rare infectious agents
- Enhance and extend our bioinformatics capabilities relating to microbial pathogens including outbreak investigation, antimicrobial resistance and population analysis
- Enhance and extend our health informatics and bioinformatics capabilities
- Develop expertise and understanding of all aspects of antimicrobial resistance
- Adopt a One Health approach to addressing public health issues by integrating information from human health surveillance, environmental and veterinary sources to provide a unified approach to infectious disease detection, characterisation and mitigation
- Develop clinical, science and technological services to support advanced research, data analysis, visualisation, and information processing
- Evaluate and compare point-of-care testing (POCT) devices as existing diagnostic technologies become miniaturised and connected to the internet. ESR will combine its national-level surveillance capability with real time high resolution data collected from POCTs
- Underpin our service delivery with a sound scientific research and clinical base.

Initiatives relating to health information systems include:

- Developing and maintaining a fully integrated notifiable disease surveillance system with health sector clinical information systems
- Enhancing our laboratory information management system (STARLIMS Health), including mobility, new tests, analytics and improved reporting
- Phasing the introduction of genomic technology to identify and test human pathogens. The use of this technology will dramatically improve our ability to analyse, map and respond to the impact of human pathogens in our food chain and in community, hospital and population health settings. Targeted investment of SSIF funding in our genomics and informatics capabilities will maximise the impact our scientists and clinicians make on health outcomes.



## Safe communities

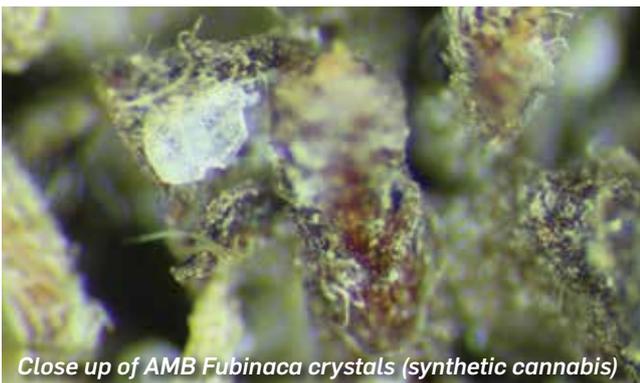
*Increase the effectiveness of forensic science services applied to safety, security and justice investigations and processes.*



### Impacts

Our forensic science services improve justice outcomes by playing an important part in reducing crime, delivering a trusted and internationally respected justice system, protecting New Zealand's security and providing a more responsive, effective and efficient justice system. We provide a wide range of forensic services from crime prevention to crime scene investigation and providing expert evidence in court.

Our work helps achieve our partners' goals to reduce total crime, violent crime, youth crime, reoffending and assaults on children.



*Close up of AMB Fubinaca crystals (synthetic cannabis)*

### The impacts of our work are:

- Criminal investigations are informed by highly reliable, independent evidence
- Early elimination of the innocent and the inclusion of suspects
- Better forensically informed court decisions
- Reduced drug and alcohol abuse of offenders
- Inquiries by Coroners are informed by reliable toxicology
- Improved crime prevention through the Evidence Based Policing Centre.

### Forensic Science Vision

Forensic intelligence, the art of using science and technology to understand and predict patterns of behaviour and crime, will be embedded in our science allowing us to better utilise forensic science to prevent, detect and solve crime. In partnership with our stakeholders, rapid, point of care solutions will be deployed, together with high end science consultancy. ESR will provide a responsive and flexible approach to crime scene science. ESR's forensic services and expertise will be in demand worldwide.

## Activities

We provide forensic services to the justice sector including New Zealand Police, courts, the New Zealand Customs Service, Coroners, pathologists and prisons.

### To achieve these impacts our scientists:

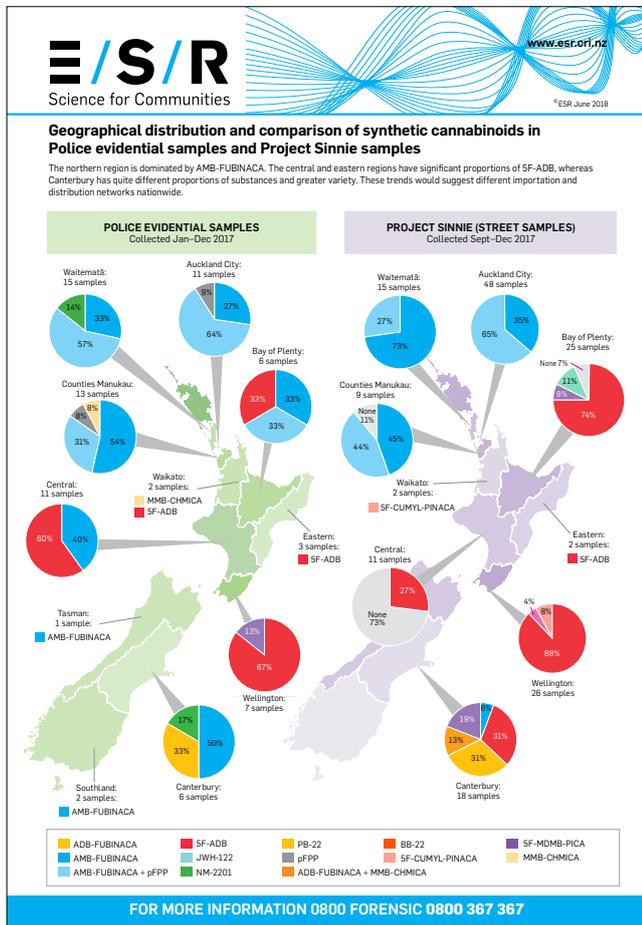
- Identify, interpret and collect evidence from crime scenes, including clandestine methamphetamine laboratories and firearms scenes
- Provide analytical expertise in DNA, trace evidence, toxicology and drugs
- Maintain New Zealand's DNA Profile Databank
- Provide expert evidence in court
- Test offenders participating in the Alcohol and Other Drug Treatment Court pilot scheme for alcohol and drugs
- Prevent drugs coming across our border by working closely with the New Zealand Customs Service.

Our forensic services are compliant with the international quality accreditation requirements of the Laboratory Accreditation Board of the American Society of Crime Laboratory Directors (ASCLD/LAB).

## Planned initiatives

Initiatives to improve justice outcomes include:

- Developing forensic DNA capabilities and specialist expertise in DNA interpretation, particularly in the interpretation of mixed DNA samples obtained from crime scenes. As a result we are better able to support criminal investigations by identifying up to four individual DNA profiles from a mixed sample
- Building a drug intelligence platform that will provide trends and patterns in the use of illicit drugs allowing government agencies better insights into intervention tactics, as well as supporting Emergency Departments and first responders with advice on risks and responses
- Identifying tissue sources of biological fluids and cells with sensitive new technologies such as RNA analysis and cell-specific fluorescent labelling methods, enabling both the definitive identification of cell types of forensic significance and the separation of specific cell types in mixed case samples prior to DNA profiling. We will evaluate the use of microfluidics technology to improve speed of this technique
- Exploring opportunities in the area of massively parallel DNA sequencing techniques to maintain our position as a world leader in forensic DNA analysis, including the prediction of physical characteristics of alleged offenders based on the DNA sequences obtained from case samples, leading to faster identification of alleged offenders
- Examining ESR's case data to identify system constraints that if removed would allow us to improve turnaround times for forensic evidence
- Developing advanced crime scene recording and expert evidence presentation tools. The tools apply scene-scanning technology to record locations of evidence in a way that allows people (such as jurors) to visit a virtual crime scene and clearly see the relationships between items of evidence, and make complex forensic evidence easier to understand. These technologies will lead to faster crime scene investigations, a simplified capture of accurate data, better presentations of key issues to the jurors, and a more efficient delivery of evidence at trial, saving time and cost. This technology is also being used to create virtual crime scenes to support Detective training at the Royal NZ Police College
- Researching as part of the Evidence Based Policing Centre potential interventions that may prevent or disrupt crime.



Left: Geographical distribution and comparison of synthetic cannabinoids in Police evidential samples and Project Sinnie samples.



## Food safety

*Enhance protection of New Zealand's food-based economy through the management of food safety risks associated with traded goods.*



### Impacts

ESR's food science work plays an important role in maintaining the reputation of New Zealand food exports and contributes to government priorities (sustaining economic development and supporting the regions).

We provide research, advisory, monitoring and diagnostic services to the Ministry for Primary Industries, the Ministry of Health and the food industry. We develop interventions to avoid, detect, mitigate and respond to foodborne hazards.

Our expertise spans bacterial, viral, chemical, physical and radiological hazards in food. We have extensive national and international collaborative networks and access to a suite of tests accredited against international standards to help find out how, where and when food contamination has happened, as well as identify the type of contaminant and its source.

### The impacts of our work are:

- Improved integrity and reputation of New Zealand's food exports
- Reduced risks to human health from contaminated food
- Episodes of illness and outbreaks caused by contaminated food are rapidly diagnosed and mitigated.

### Food Science Vision

ESR will develop enhanced technologies and scientific knowledge which reduce risks from chemical and microbiological hazards in food.



## Activities

To achieve these impacts our scientists:

- Develop methods specifically to meet food safety requirements for overseas market access for New Zealand's primary product exports
- Develop new methods to improve the identification and detection time and allow for better mitigation of food safety risks and spoilage
- Conduct research and provide consultancy services to mitigate on-farm and in-plant sources of food contamination
- Detect foodborne pathogens and chemical hazards including radiological hazards present in foods and clinical samples
- Provide an effective emergency response to foodborne illness outbreaks
- Use human health surveillance to understand the epidemiology of foodborne illnesses
- Develop early warning systems to identify emerging foodborne hazards
- Provide information on levels of essential nutrients, trace elements and contaminants in New Zealand's food supply by assisting the Ministry for Primary Industries to conduct the New Zealand Total Diet Survey
- Assist regulatory and emergency decision making with sound, independent scientific evidence
- Provide information for better national, regional and global food safety policy development.

We will deliver solutions through science and research to New Zealand's food regulators, producers, manufacturers and exporters. In particular, we will continue to support the Ministry for Primary Industries and the Ministry of Health. In addition, as full partners in the New Zealand Food Safety Science Research Centre (NZFSSRC) we provide expert food safety research services to New Zealand's food industry. We collaborate actively with other research organisations including Massey University, AgResearch,ASUREQuality, Plant & Food Research and the Cawthron Institute (as partners in the NZFSSRC) and also with Massey and Otago Universities through One Health Aotearoa. We will continue to develop relationships with leading food science organisations around the world.

## Planned initiatives

To improve food safety outcomes we will:

- Develop more sensitive, rapid and informative tools for the detection and characterisation of foodborne hazards and food components
- Develop and implement new risk assessment, risk modelling and risk mitigation tools
- Develop capability in meta-'omics of foods and food production environments
- Develop skills in economics relating to the burden of diseases including the cost/benefit of interventions
- Expand our bio-control tools beyond bacteriophages to tackle a wider range of pathogenic and spoilage microorganisms
- Develop our understanding of the impact of climate change on food safety and security
- Incorporate a One Health perspective into food safety issues, integrating information from human health surveillance, environmental and veterinary sources to provide a unified approach to risk detection and mitigation
- Collaborate with the NZ Food Safety & Science Research Centre to ensure ESR's work is aligned to their goals.



*Right: ESR's science is critical for informing responses to disease outbreaks – a hepatitis A outbreak resulted in a nationwide product recall of frozen berries.*



# Clean water and the environment

*Improve the safety of surface water and groundwater resources for human use and the safer use of biowastes.*



## Impacts

ESR's science services improve water quality in New Zealand and reduce the amount of biowaste disposed in landfill. We provide health authorities, local and central government, industry and communities with scientific advice and expertise on the management of drinking water, surface water, groundwater, wastewater and biowaste. Our work includes the surveillance and reporting of drinking-water quality, information systems management, scientific advice on health and environmental public policy, research on water quality issues related to drinking water and recreational waters through source tracking of contaminants.

Our scientists lead and collaborate in the Centre for Integrated Biowaste Research (CIBR) to improve the sustainable management of the biowaste component of waste sent to landfills in New Zealand.

## The impacts of our work are:

- New Zealanders have assurance that drinking water is safe
- The water quality of rivers, streams and groundwater is improved
- Reduced biowaste volumes going to landfill through safer use of biowastes
- Environmental threats to human health from chemicals, microbes and physical contaminants are identified and mitigated
- Reduced burden of waterborne illness outbreaks.

## Water Science Vision

ESR will develop enhanced technologies which improve the quality of drinking water, rivers, streams and groundwater. New treatment options will be developed for wastewater, effluent, greywater, biosolids and sewage sludge with a focus on land application and re-use.



## Activities

To achieve these impacts our scientists:

- Support the surveillance and reporting of drinking-water quality by the Ministry of Health
- Provide the Ministry of Health and DHBs with analysis, advice and risk assessments in relation to environmental, water, wastewater and hazardous substance issues
- Conduct research into faecal source tracking (FST) and use FST to support local authority resource management with food and water borne illness outbreak investigations
- Use internationally recognised approaches for public health risk assessments of microbial (bacterial and viral) and chemical hazards in water
- Develop and use new, internationally recognised methods for the detection of human pathogens and chemical hazards present in water, sediment, soil, biowastes and wastewater
- Conduct research to characterise contaminant pathways from land into and through groundwater and surface water systems, and the connections between these systems
- Conduct research to manage the safe and sustainable use of biowastes, such as biosolids and grey-water resources
- Research the impacts of hazards in the environment on human health (including air quality, contaminated land and common chemicals)
- We lead and participate in several groundwater research projects in collaboration with other CRIs and universities, and we are an active participant in work to fully integrate surface water research in New Zealand in partnership with iwi and Māori.

We play a leadership role in the 'Our Land and Water' and 'Biological Heritage' National Science Challenges and support the 'Deep South' National Science Challenge.

## Planned initiatives

To improve outcomes relating to water and the environment we will continue to:

- Assess measures of groundwater assimilation capacity for the key water contaminants of nitrates and microbial pathogens. These measures are used in water management by regional councils and district councils to evaluate options for the disposal of water and waste. We will increasingly partner with engineering firms to provide solutions to, and options for, issues that local authorities face in this area. This requires a wide range of interdisciplinary skills to explore the safe and sustainable application of biowastes to land
- Develop a ground water health index for rapidly assessing groundwater health and identifying of potential contaminant causes
- Develop a low-cost molecular method for targeting microbial identification in mixed samples such as groundwater and surface water, wastewater and food
- Analyse and report data from the monitoring of drinking-water supplies in New Zealand in the form of an annual report for the Ministry of Health
- Provide advice to DHBs and local authorities on the investigation and management of issues related to air, land and water quality
- Collaborate with Pacific Island nations' governments to support improved local water and sanitation services and infrastructure
- Develop our skills in environmental genomics, including metagenomics-based approaches, to understand microbial communities in water, determine sources of contamination, and identify potential associated health risks
- Work with the University of Canterbury, Environment Canterbury, Christchurch City Council and other clients to aid the recovery of water quality and safety in Canterbury.





## Our people

*A continued focus on our people and ESR culture is a critical success factor for us. ESR is focused on building a culture that is highly collaborative, agile, innovative, and based on trust and empowerment.*



### **Organisational culture**

Organisational culture continues to be a major driver of performance. ESR will build a culture that empowers and enables our people to work effectively in a rapidly changing environment and be agile in changing service deliverables to a range of clients with different needs.

Driving culture change requires more than just focusing on changing the behaviours of individuals or the organisation. We will back this up with visible support and modelling from leadership and the right systems and processes to support the desired behaviour. Initiatives will be designed to support and communicate with managers and staff to assist in the transition to ESR's next operating model, promoting a sustainable, collaborative, integrated and connected work environment.

### **Workforce planning and capability development**

Our people are fundamental to the delivery of our strategic priorities. We will focus on shaping our workforce to ensure that we plan for and build capabilities that align with future needs. We will create more integrated initiatives and approaches to drive people capability development in a diverse, yet highly specialised, workforce. This includes implementing a framework that identifies and nurtures key talent and supports organisational succession planning for key leadership and specialist roles.

We will continue to invest in the development of our leaders to ensure they are equipped to build the capability of their teams, lead our culture, and facilitate growth, change and innovation.

### **Science capability**

The Chief Scientist and the Strategic Science Team will continue to conduct regular capability reviews to ensure ESR has the science capabilities and skill-base to meet current and future needs. Science capabilities we will grow include data science, genomics and informatics, statistics and social science.

We maintain relationships with universities, other CRIs and scientific research societies and will promote new collaborations that support our outcomes. We fund post-graduate studentship opportunities, encourage active participation in national and international conferences and encourage staff to undertake meaningfully aligned PhD studies. We encourage and support scientists who have new innovative ideas for science, particularly those at earlier stages of their careers, by funding their research through our Pioneer Fund.



# Resources

## Information technology

The successful delivery of our science services has become inextricably linked with technology as science continues to evolve. The evolution from the workbench to the workstation, combined with the exponential increase in the storage space required to support genomics science, will require significant change within our IT systems, information management and their governance. In response we have adopted the All of Government Infrastructure as a Service offering to provide on demand access to high capacity, high performance IT resources. We will build the IT platform to support our data science capability, starting with strengthening ESR's national public health virtual data network.

We will also continue to modernise our corporate systems and enhance IT service levels, supporting open data research initiatives and encouraging efficiencies and collaboration. Our IT Strategy explains in more detail how we will enhance our five key technology platforms:

- Laboratory Information Management Systems Platform
- Forensic Platform
- Surveillance Platform
- Informatics Platform
- Core Business Systems.

## Property and facilities

ESR continues to focus on maximising the efficiency and utility of its science facilities in Auckland, Wellington and Christchurch. The property strategy will take account of the future operating model, proximity to major clients, access to skilled staff, ability to support growth into international markets, the potential for using hubs and co-locating with other science organisations, business continuity and financial considerations. A broad range of options are being considered for addressing the ageing facilities in Kenepuru, including rebuilding on the current site and subdividing surplus land, shifting elsewhere within the region, or potentially co-locating with other CRIs.

The overarching goals of our property strategy are to:

- determine the most efficient and effective site use to meet business needs
- ensure that facilities support the specialised scientific capabilities required for excellent service to clients
- apply whole-of-life asset management practices to ensure that the assets remain robust and reliable to support our core business functions and long-term strategic science goals.

## Intellectual property

We have policies and procedures in place relating to the access, use, maintenance, enhancement, exploitation and transfer of intellectual property and know-how. These policies and procedures ensure effective product and service development and the effective management of intellectual property. They also maximise the application of the results of research and technological developments, including transfers to end users and other third parties for the benefit of New Zealand. General principles and procedures relating to the intellectual property, research and benefits of research held by ESR meet the requirements of the Transfer Agreement between ESR and the Crown.

## National reference collections

We maintain the New Zealand Reference Culture Collection (Medical section). We also assist other CRIs, universities and laboratories by providing access to the cultures in the collection on a cost-recovery basis. We will provide access to the reference collection except where access is clearly not to the benefit of New Zealand. The costs of collection, archiving and maintenance will be recovered only to the extent that they have not been paid for from public funding. Costs for retrieval of information from databases and reference collections will be recovered where a third party wishes to obtain large portions of information from a database or reference collection for direct commercial use.

In this case we reserve the right to negotiate a copyright, royalty or licence fee. We will not dispose of any national database or reference collection without the prior written consent of shareholding Ministers, and will immediately notify shareholding Ministers if, in the Board's view, we cannot reasonably maintain the integrity, security and quality of any national database or reference collection. We will remain responsible for the reference collection until after shareholding Ministers have notified the Board of their determination regarding the future maintenance of, or access to, the database or reference collection.

We will advise shareholding Ministers in a timely manner of any disputes over access to, or the use of, the reference collection held by us. Under the terms of the Transfer Agreement, shareholding Ministers can appoint a person with relevant expertise to decide the matter.



# Financial performance

## Key assumptions

ESR's five-year financial forecasts are based on the following assumptions:

- strong growth from our commercial products
- significant investment in new science capabilities eg data science and genomics
- Kenepuru Science Centre will be replaced by 2022.

The expected decline in profitability and return on equity from 2021/22 will need to be addressed by either agreeing sustainable margins on core contracts with government clients or by reducing the capability and cost of these services.

## Revenue

Revenue is forecast to grow from \$79.5m in 2017/18 to \$100.2m in 2022/23 as a result of continued strong growth in STRmix™ and moderate growth in other revenue.

## Operating expenditure

Operating expenditure is budgeted to increase from \$69.0m in 2017/18 to \$86.8m in 2022/23 reflecting increasing salary costs to keep pace with the market and increased investment in our science capabilities and other activities needed to drive revenue growth.

## Profitability

NPAT will be reduced in 2019/20 due to the one-off writedown of the existing Kenepuru Science Centre. Return on equity is expected to be in a range between 5.4% and 8.7%, except for 2019/20 when the writedown occurs.

## Balance sheet management

The major items of capital expenditure reflect our property strategy, including replacing the ageing facilities in Kenepuru and upgrading Christchurch and replacement of some of our ageing and critical laboratory instrumentation. No debt is required as ESR's capital program will be funded out of accumulated capital. ESR maintains sufficient cash to withstand short term cash flow shocks such as lower commercial revenue levels or higher than expected capital costs.

## Risks

ESR faces three main financial risks:

- if revenue from our partner agencies does not keep pace with the inflation and the cost of additional services being provided, we may need to reduce capability and / or the cost of these services
- if revenue growth from STRmix™ is less than expected, this will affect affordability of our property strategy and investment in the science capabilities that we need to be successful in the future
- if the actual cost of the property strategy is greater than expected we will need to identify potential cost savings to remain within the capital budget.

## Dividend

It is not anticipated that ESR will be in a financial position to have funds available for distribution due to the planned reinvestment in infrastructure and science capabilities.



## Financial performance indicators

	Actual 2017	Forecast FY18	Plan 18/19	Plan 19/20	Plan 20/21	Plan 21/22	Plan 22/23
Revenue (\$000s)	75,511	79,536	86,074	92,920	97,379	99,086	100,224
Revenue Growth			8.2%	8.0%	4.8%	1.8%	1.1%
<b>Operating Results (\$000s)</b>							
Operating Expenses	63,204	68,885	75,313	79,577	83,202	85,092	86,842
EBITDAF	12,307	10,652	10,762	13,343	14,177	13,994	13,383
Depreciation and Amortisation	5,525	5,726	6,429	12,949	7,456	8,184	8,342
EBIT	7,081	4,926	4,333	395	6,722	5,810	5,041
Net Profit after Tax*	5,010	3,926	3,523	56	5,212	4,394	3,758
Total Assets	70,741	74,531	78,309	78,415	83,577	88,021	91,729
Closing Shareholders Funds	50,000	53,926	57,449	57,504	62,717	67,111	70,869
Capital Expenditure	3,218	7,041	7,813	12,950	23,902	18,302	12,750
Capital Expenditure % to revenue	4.3%	8.9%	9.1%	13.9%	24.5%	18.5%	12.7%
<b>Liquidity</b>							
Current Ratio	2.0	2.3	2.4	2.4	1.7	1.3	1.2
Quick Ratio (Acid Test)	1.9	2.1	2.2	2.2	1.5	1.2	1.1
<b>Profitability</b>							
Return on Equity	11.0%	7.9%	6.3%	0.1%	8.7%	6.8%	5.4%
Rolling Return on Equity (3 years)	8.7%	8.4%	8.2%	4.7%	5.1%	5.3%	6.9%
Return on Total Assets	20.0%	6.8%	5.7%	0.5%	8.3%	6.8%	5.6%
Operating Margin	16.3%	13.4%	12.5%	14.4%	14.6%	14.1%	13.4%
Operating Margin per FTE (\$)	33,443	27,172	25,594	29,913	31,409	30,936	29,583
<b>Operational Risk</b>							
	10%	7%	6%	0%	8%	7%	5%
Profit Volatility	8.6%	7.9%	0.7%	13.1%	14.7%	13.9%	10.5%
<b>Coverage</b>							
Interest Cover	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<b>Growth/Investment</b>							
Capital Renewal	0.6	1.2	1.2	1.0	3.2	2.2	1.5
Dividend	-	-	-	-	-	-	-
<b>Financial Strength</b>							
Gearing (Debt/Debt Equity) %	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Equity Ratio (Equity/Total Assets) %	71%	72%	73%	73%	74%	76%	77%
Cash and short term deposits (\$Ms)	22.8	25.5	27.8	27.9	16.6	10.9	10.2
Debt (\$Ms)	-	-	-	-	-	-	-

\*includes Kenepuru writedown in 2019/20



# Appendix 1

## **Business policies**

We operate in accordance with the purpose and principles as stated in the Crown Research Institutes Act 1992 and have statutory obligations under other acts, including the Companies Act 1993 and Crown Entities Act 2004. Significant services are performed for New Zealand Police under the Land Transport Act 1998 and the Misuse of Drugs Act 1975.

Policies and procedures are in place to ensure we meet all of our statutory obligations.

Our business policies include:

Risk management

Shareholder consent for significant transactions

Dividends

Information to be disclosed

Databases and collections

Health and safety

Intellectual property

Information management.

# Appendix 2

## Statement of significant accounting policies

### **Reporting entity**

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 Institutes 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 International Financial Reporting Standards (IFRS) and other applicable financial reporting standards as appropriate for for-profit entities.

The Group has adopted External Reporting Board Standard A1 Accounting Standards Framework (For-profit Entities Update) (XRB A1). XRB A1 establishes a for-profit tier structure and outlines which suite of accounting standards entities in different tiers must follow. The Group is a Tier 1 entity.

### **Basis of preparation**

The financial statements are prepared on the basis of historical cost, except for financial instruments, certain leased assets 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.

### **Changes in accounting policies**

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

### **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 on-going basis.

The judgements that have the most significant effect on amounts recognised in the financial statements are applied in the determination of revenue.

### **Revenue**

The Group uses the stage of completion method in accounting for its fixed price contracts to deliver scientific services.

The use of the stage of completion method requires management to estimate the services performed to date as a proportion of the total services to be performed. The stage of completion is calculated and reviewed monthly, and significant variances are investigated to ensure that the stage of completion estimate is reasonable, in line with the overall project plan, estimated completion date and prior measurements of progress.

### **Principles of consolidation**

#### **Subsidiaries**

The consolidated financial statements incorporate the assets and liabilities and the results of the operations of all subsidiaries of ESR.

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 businesses 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 statement of profit or loss and other comprehensive income.

#### **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 at 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 statement of 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:

<b>Type of Asset</b>	<b>Estimated useful life</b>
Land	Not depreciated
Freehold buildings	20 – 50 years
Leasehold improvements	10 years
Plant, equipment and vehicles	3 – 10 years
IT equipment and internal software	3 – 12 years

### **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 asset (between 3 and 12 years).

#### **Customer contracts**

The intangible asset customer contracts represents 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 ten 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 the period of expected future sales from the related project from the point the asset is ready for use.

#### **Impairment of non-financial assets**

Assets that are subject to 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 value in use. For the purposes of assessing impairment, assets are grouped at the lowest levels for which there are separately identifiable cash flows (cash-generating units).

### **Taxation**

#### **Current tax**

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).

#### **Deferred tax**

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 items.

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 reporting date.

#### **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 activities 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 or 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.

### **Trade and other receivables**

Trade receivables are stated at their estimated realisable value after providing against debts where collection is doubtful. An estimate of the value of doubtful debts is made based on a review of debts at year end. Bad debts are written off in the period in which they are identified.

### **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.

### **Trade and other payables**

These amounts represent the best estimate of the expenditure required to settle an obligation arising from goods or services provided to ESR prior to period end. These amounts are unsecured and are usually paid within 30 days of recognition. Liabilities and provisions to be settled beyond 12 months are recorded at their present value.

### **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 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 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.

### **Leases**

Finance leases transfer to ESR, as lessee, substantially all the risks and rewards incidental to ownership of a leased asset. Initial recognition of a finance lease results in an asset and liability being recognised at amounts equal to the lower of the fair value of the leased asset or the present value of the minimum lease payments. Each lease payment is allocated

between the liability and finance charges so as to achieve a constant rate of finance charge over the term of the lease. Property, plant and equipment acquired under a finance lease is depreciated over the shorter of the useful life and lease term of the asset.

Leases in which a significant portion of the risks and rewards of ownership are retained by the lessor are classified as operating leases. Payments made under operating leases (net of any incentives received from the lessor) are charged to the statement of profit or loss and other comprehensive income on a straight-line basis over the period of the lease.

### **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.

### **Revenue**

#### **Sales of goods and services**

Revenue is earned by ESR in exchange for the provision of outputs (services) to third parties.

Revenue from the supply of services is measured at the fair value of consideration received. Revenue from the supply of services is recognised in the accounting period in which the services are rendered, by reference to the stage of completion of the specific transaction assessed on the basis of the actual service provided as a proportion of the total services to be provided.

Any revenue for which services have not been supplied as at the reporting date but for which payment has been received is deferred within the statement of financial position as revenue in advance.

#### **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 recognised in the statement of profit or loss and other comprehensive income when the requirements under the funding agreement have been met.

#### **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. Non-monetary assets and non-monetary liabilities denominated in foreign currencies that are measured at fair value are translated to the functional currency at the exchange rate at the date that the fair value was determined.

### **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.

### **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.

### **Financial instruments**

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 of management, the relationship with other instruments and the reporting costs and benefits associated with each designation. The designations applied by ESR are reflected in the financial statements.

#### **Financial assets**

The Group classifies its financial assets as loans and receivables and at fair value through profit and loss. Management determines the classification of its financial assets at initial recognition.

Loans and receivables 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 loans and receivables 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. Loans and receivables are carried at amortised cost using the effective interest method.

The Group assesses at each reporting date whether there is objective evidence that a financial asset or a group of financial assets is impaired.

#### **Financial liabilities**

Financial liabilities held by ESR include trade and other payables, employee benefits and finance 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. Financial liabilities entered into with durations less than 12 months are recognised at their nominal value.

#### **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.

### **Adoption status of relevant new financial reporting standards and interpretations**

The Group has elected not to early adopt any of the new standards and amendments to existing standards which have been issued as at 30 June 2017 but not yet effective. It is not anticipated that standards not yet effective will significantly impact the financial statements of the Group with the exception of NZ IFRS 15 and NZ IFRS 16.

#### **NZ IFRS 15, Revenue from contracts with customers (effective for annual periods beginning on or after 1 January 2018)**

NZ IFRS 15 addresses recognition of revenue from contracts with customers. It replaces the current revenue recognition guidance in NZ IAS 18 Revenue and NZ IAS 11 Construction Contracts and is applicable to all entities with revenue. It sets out a 5 step model for revenue recognition to depict the transfer of promised goods or services to customers in an amount that reflects the consideration to which the entity expects to be entitled in exchange for those goods or services. The Group has yet to assess the full impact of NZ IFRS 15. The Group will apply this standard from 1 July 2018.

#### **NZ IFRS 16, Leases (effective for annual periods beginning on or after 1 January 2019)**

NZ IFRS 16 introduces a single lessee accounting model and requires a lessee to recognise right-of-use assets and liabilities for all leases with a term of more than 12 months, unless the underlying asset is of low value. The Group has yet to assess the full impact of NZ IFRS 15. The Group will apply this standard from 1 July 2019.



## Appendix 3

### **Directory**

#### ***Directors***

Denise Church QSO – Chair  
Marion Cowden – Deputy Chair  
Dr Helen Darling  
Richard Gill  
Quentin Hix  
Dr Andy Shenk  
Professor Cristin Print

#### ***Chief Executive***

Dr Keith McLea

#### ***Senior Leadership Team***

John Bone, General Manager, Forensic  
Dr Libby Harrison, General Manager, Health and Environment  
Hamish Findlay, General Manager, Commercial & International  
Trish Bolger, General Manager, People  
Steve Pyne, Chief Information Officer  
Bryan Lau Young, General Manager, Finance and Business Performance

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#### **Auditor**

Chris Ussher of PricewaterhouseCoopers on behalf of the Auditor-General

#### **Banker**

ANZ Bank New Zealand Limited



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