



# SENSING, MINING AND WATER WORKSHOP

Online

1:00 - 5:00pm AEDT

29 November 2021

Join on [Zoom](#)







## Agenda

<b>1pm Welcome</b>	Dr Susan Pond, NSSN Chair
<b>1:05 Opening address</b>	Prof Hugh Durrant-Whyte, NSW Chief Scientist and Engineer
<b>1:15 Academic Keynote</b>	Prof Alan Broadfoot, Newcastle Institute for Energy and Resources (NIER)
<b>1:25 Industry Keynote</b>	Mr John Fennel, International Copper Association
<b>1:40 Industry Led Breakout</b>	<b>Baseline Measurement</b> - Rod Naylor, GHD <b>Desalination</b> - Garth Walter, Sacry Water Australia <b>Dewatering</b> - Kevin Tasker, Xylem Water Solutions Australia <b>Operational Water Use</b> – Jord International <b>Tailings</b> - Bev Kubat, Amira Global <b>End Use and Reuse</b> - Burkhard Seifert, Oz Minerals
<b>2:25 Challenge Statements</b>	Clare Sykes, Larkin Sykes
<b>2:50 Tea break</b>	
<b>3:00 Academic Led Breakout</b>	<b>Baseline Measurement</b> - Lucy Marshall, UNSW <b>Desalination</b> - Grant Hose, MU <b>Dewatering</b> - Martijn De Sterke, USYD <b>Operational Water Use</b> - Stephen Northey, UTS <b>Tailings</b> - John Close, ANU <b>End Use and Reuse</b> - Dr Mariam Darestani, WSU
<b>3:40 Solution Statements</b>	Prof Benjamin Eggleton
<b>4:20 Facilitator Remarks</b>	Clare Sykes, Larkin Sykes
<b>4:25 Grand Challenge Announcement and Closing Remarks</b>	Prof Julien Epps, NSSN

## Outcomes

The NSSN will pursue findings coming out of the workshop as collaborative projects.

Suitable co-design ideas emerging from the workshop will be encouraged to apply for **NSSN Grand Challenge** funding support. Grants of up to \$100,000 per project will support the development of projects that link with industry or government partners and devise a smart sensing solution that has a defined pathway to genuine impact, either through commercialisation or operationalisation.

# Sensing, Mining and Water

Advanced sensing and data analytics can help improve our understanding of the relationship between mining and water

Water is critical for life; our towns and cities, farms and industrial processes require reliable sources of water. Mining is critical in providing the materials to build and power our world.

While considering traditional areas of technology development such as safety, productivity, connectivity and automation, the Workshop will explore key areas where water and mining intersect.

## Baseline Measurement

Gravity, quantum, LiDAR, hyperspectral imaging, weather data, advanced exploration, geological surveys, satellites, process optimisation.

## Desalination

Ground cover, surface water flow, ground water basin profile, dam levels, extraction data, water quality, molecular sensing.

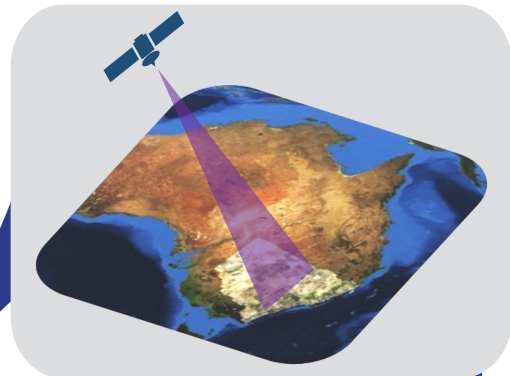


## Tailings

Underground robotics, strata management, understanding fissures and cracks, understanding uncertainty of system parameters, human and community factors.

## End use and reuse

Analysis of aerial and satellite imagery, advanced chemistry, data analytics, efficiency, economy and circularity.



## Dewatering

Process sensing, optimisation algorithms, sensing pump and cyclone wear, microscopy, quantum imaging.

## Operational water use

Level sensors, flow meters, artificial intelligence and machine learning, asset management.



As a collaboration between researchers, government and industry, this workshop aims to better understand the way in which our mines and water interact.



## Keynotes and Facilitators

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**Dr Susan Pond AM**  
**Chair of the NSSN Board**

### Biography

Dr Pond is a senior leader in business & academia, recognised for her national & international contributions in medicine, science & technology. She is a Fellow of the Royal Society of NSW (FRSN), the Australian Academy of Technology & Engineering (FTSE), and The Australian Academy of Health & Medical Sciences (FAHMS). Dr Pond has chaired the NSSN Board since its establishment in 2016.

In April 2021, Dr Pond was elected as President of the Royal Society of NSW. In this role, she leads the oldest learned society in the Southern Hemisphere and works to amplify the Society's impact as a leading, independent source of knowledge and debate.

Dr Pond was Director of The University of Sydney Nano Institute from 2017 - 2018. This multidisciplinary institute advances the University's discipline strength in quantum science, nanophotonics, nanoscale materials & molecular nanoscience while also studying the potential impacts of these technologies beyond science, medicine and engineering into the humanities and social sciences.

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**Professor Hugh Durrant-Whyte**  
**NSW Chief Scientist & Engineer and Natural Resources Commissioner**

### Biography

Professor Durrant-Whyte manages the Office of the NSW Chief Scientist & Engineer (OCSE), which has four distinct functions: Independent Advice, Research Support, Industry Development, and Science Outreach and Education.

Previously, Hugh was Chief Scientific Advisor to the UK Ministry of Defence. He was a Professor and ARC Federation Fellow at the University of Sydney, CEO of National ICT Australia (NICTA), and Director of the ARC Centre of Excellence for Autonomous Systems and of the Australian Centre for Field Robotics (ACFR).

Hugh is a world-leading authority on machine learning and robotics, and applications in areas including cargo handling, mining and defence. He has published over 300 research papers, graduated over 70 PhD students, and has won numerous awards and prizes for his work, including being named 2010 NSW Scientist of the Year and 2008 Engineers Australia NSW Engineer of the Year.

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**John James Fennell B Ec, CA, AICD**  
**CEO**  
**International Copper Association Australia**

### **Biography**

John Fennell is the CEO of the International Copper Association Australia Ltd which is the pre-eminent marketing and technology development body for the copper industry in Oceania and which is closely aligned with the global International Copper Association (ICA) and the Copper Alliance.

ICAA's members represent a majority of Australasia's copper production and the largest copper and copper alloy fabricators. ICAA's status as a not-for-profit trade association provides its members with a credible independent advocate to address challenges faced by the collective industry

Prior to his role with the ICAA, John owned and operated a mid size manufacturing company in the automotive industry and prior to that worked with Price Waterhouse in the accounting and management consulting fields.

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**Professor Alan Broadfoot**  
**Executive Director, Newcastle Institute for Energy and Resources**  
**University of Newcastle**

### **Biography**

Professor Alan Broadfoot has been the Executive Director of the Newcastle Institute for Energy and Resources (NIER) at the University of Newcastle since 2010. At NIER, Alan leads an ambitious agenda linking industry and academia for transformational research in energy, resources, food and water. Alan holds a Doctor of Philosophy, Master of Engineering and Bachelor of Electrical Engineering (Honours) from the University of Newcastle. An Electrical Engineer in various roles from 1985, Alan joined electrical design and manufacturing company, Ampcontrol in 1991 and held senior management positions, including Managing Director and CEO from 2005–2010. He is a Fellow of the Institution of Engineers Australia and was Chair of the Australian Industry Group Hunter Manufacturing Council from 2004 –2009. He is a Graduate of the Australian Institute of Company Directors, a Fellow of The Royal Society of NSW, Chair of the NSW Energy and Resources Knowledge Hub and Board member of TUNRA and CRC CARE.

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**Professor Ben Eggleton**  
**NSSN Co-Director**  
**The University of Sydney**

### **Biography**

Professor Benjamin Eggleton is the Director of The University of Sydney Nano Institute. He also serves as co-Director of the NSW Smart Sensing Network (NSSN). Eggleton was the founding Director of the Institute of Photonics and Optical Science (IPOS) at the University of Sydney and served as Director from 2009-2018. He was previously an ARC Laureate Fellow and an ARC Federation Fellow twice and was founding Director of the ARC Centre of Excellence for Ultrahigh bandwidth Devices for Optical Systems (CUDOS) from 2003-2017.

Eggleton is the author or coauthor of more than 510 journal publications, including Nature Photonics, Nature Physics, Nature Communications, Physical Review Letters and Optica and over 200 invited presentations. His journal papers have been cited 25,000 times according to webofscience with an h-number of 79 (109 in google scholar). Eggleton is a Fellow of the Australian Academy of Science (AAS), the Australian Academy of Technology and Engineering (**ATSE**), the Optical Society of America, SPIE and IEEE. He is Editor-in-Chief of APL Photonics.



**Professor Julien Epps**  
**NSSN Co-Director**  
**UNSW Sydney**

### **Biography**

Professor Julien Epps is Head of the School of Electrical Engineering and Telecommunications at UNSW Sydney and was appointed Co-Director of the NSW Smart Sensing Network (NSSN) in July 2021. Professor Epps is also a Contributed Researcher at Data61, CSIRO, and a Scientific Advisor for Sonde Health. Prior to joining UNSW, Professor Epps held research appointments with the A\*STAR Institute for Infocomm Research, National ICT Australia and Motorola Labs.

Professor Epps is the author or co-author of around 250 journal articles, conference publications and patents related to sensor signal processing. His work has been cited more than 9,000 times (Google Scholar). He has given multiple keynote and invited tutorial presentations to several major international conferences. He is currently serving as an Associate Editor for the IEEE Transactions on Affective Computing.



**Dr Don McCallum**  
**Theme Leader Industrial Futures**  
**NSSN**

### **Biography**

Don is the Theme Leader for Industrial Futures, responsible for engagement with key government and industry stakeholders. Don was one of the original employees of the NSSN and instrumental in its early development. He has led successful projects for the NSSN in water, recycling, mining and more.

Prior to the NSSN, Don spent six years in Africa and the Middle-East in project coordination, strategy and technology in extreme environments and emergencies for the NGO Medicines Sans Frontiers. Don has a wealth of experience working with manufacturing and advanced materials for mines, refineries and laboratories. He started 3D printing Braille in 1999, the topic of his PhD. He spent a few years with the high tech printing firm, Xaar, in Cambridge, UK, before moving on to bio-engineering at the University of Wollongong.



## Industry Breakout Presenters

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**Tyler Tinkler**  
**Senior Water Engineer**  
**GHD – Northern NSW**

**Baseline measurement & mass water balance**

### Biography

Tyler has six years' experience in water resources assessment, design and management, particularly in water management in mining sector. Tyler has a thorough understanding of the regulatory requirements and implications for water management infrastructure, including water security, licensing, metalliferous and tailings dams. This experience has been developed through the entire project life cycle from specialist impact assessments, feasibility studies and detailed design, through to management plans and compliance reporting.

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**Garth Walter**  
**Managing Director**  
**Sacry Water Australia**

**Desalination**

### Biography

Garth Walter is Managing Director for Sacyr Water Australia and has worked in many different aspects of the Water Industry since completing his Engineering Degree. He has more than 25 years' experience in public and private organisations and held senior roles across mining, contracting, infrastructure development and utilities. Garth is also part owner of The Walter Group Australia & Red Gully Wines; and enjoys supporting the community through the Australian Water Association, Workpower, Cottesloe Surf Club and FHWA.

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**Kevin Tasker**  
**Xylem Water Solutions Australia**

**Dewatering**

### About Xylem

Xylem, a leading global water technology company dedicated to solving the world's most challenging water issues, is the leading global provider of efficient, innovative and sustainable water technologies improving the way water is used, managed, conserved and re-used. Our international team is unified in a common purpose: creating advanced technology and other trusted solutions to solve the world's water challenges. We are committed to creating an organization of inclusion and diversity, where everyone feels involved, respected, valued and connected, and where everyone is free to bring their authentic selves and ideas.

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**Jord International**

**Operational Water Use**

### **About Jord International**

Jord International is an Australian owned company that designs, manufactures, commissions, and services custom-engineered process equipment, modular skids, and turnkey plants for the oil & gas, chemical, power, food, industrial and mining sectors.



**Bev Kubat**  
**Manager Collaborations**  
**Amira Global**

**Tailings**

### **Biography**

Bev's career as a mining engineer spans 20 years across multiple commodities and countries. Her roles have traversed from technical specialist to people leader. She has a passion for understanding the psychology that drives organisational behaviour and strives to unlock people's potential by considering the complexity of the individual in relation to the dynamics of the group. Her current involvement in the deployment of the Amira Global Tailings Program has convinced her that technical solutions only unlock one element of the challenges facing the mining industry. Taking a systemic approach to understanding organisational culture and group dynamics ensures that innovation strategies are successfully implemented.



**Dr Burkhard Seifert**  
**Oz Minerals**

**End Use and Reuse**

### **Biography**

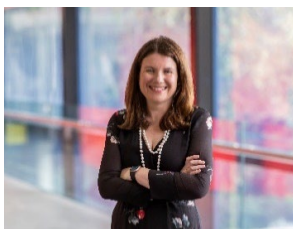
Burkhard has over 15 years' experience in working across the business development sector, specifically in the mining and energy industry. Burkhard currently works as Entrepreneur - Transformation at OZ Minerals. This role has a focus on strategic partnerships, revenue and growth, general management, international business development, and on working with start-ups. He has a passion for international collaboration, technology and business strategy.





## Academic Breakout Presenters

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**Lucy Marshall**  
**University of New South Wales**  
**Baseline Measurement**

### Biography

Professor Lucy Marshall is Director of the Water Research Centre at the University of New South Wales (UNSW) in Sydney. Lucy completed her undergraduate, Master's and PhD degrees at UNSW before moving to Montana State University in 2006, where she worked at the interface of engineering and environmental science in quantifying uncertainty in hydrologic and environmental systems. She returned to UNSW as an Australian Research Council Future Fellow in 2013. Her technical expertise is in hydrologic modelling, model optimization, and quantification of uncertainty in water resources analysis. She is a leading Australian expert on the assessment of uncertainty in water resources models, and more specifically in Bayesian methods for model inference.

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**Grant Hose**  
**Macquarie University**

**Desalination**

### Biography

Professor Grant Hose is an aquatic ecologist and ecotoxicologist at Macquarie University. His research examines the response of aquatic invertebrate and microbial communities to environmental contaminants, and uses environmental genomics for assessing change in ecosystem health and condition. He has worked on mine and mine water issues for over 20 years as a consultant, regulator and researcher, and understands the complexities of mine waters and their management.

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**Martijn De Sterke**  
**University of Sydney**

### Dewatering

Atmospheric water capture from the atmosphere (ACWA)—  
atmospheric water capture by passive means

### Biography

Martijn de Sterke received an engineering degree from the University of Delft in the Netherlands and a PhD from the University of Rochester in the USA. After a postdoctoral work at the University of Toronto in Canada, he joined the University of Sydney, where he is now a Professor in Physics. He has a background in optics and the modelling of optical materials.

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**Dr Stephen Northey**  
**University of Technology Sydney**

### **Operational Water Use**

Understanding the context and drivers of mine-site operational water use

#### **Biography**

Dr Stephen Northey is a research fellow at the University of Technology Sydney, where he focuses on environmental benchmarking of mineral production systems and developing long-term scenarios for metal supply. In prior roles at CSIRO and Monash University, Stephen developed water footprint, life cycle assessment and techno-economic assessments of technologies being developed for mineral processing and metal production, and conducted extensive work to understand the contextual water scarcity and climate risks facing mining.



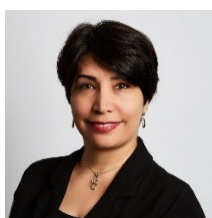
**Professor John Close**  
**Australian National University**

### **Tailings**

#### **Biography**

John completed his PhD in physics at the University of California at Berkeley in 1991. He was a postdoctoral fellow at the University of Washington in Seattle from 1992 to 1995 and an Alexander von Humboldt Fellow at the Max Planck Institute in Göttingen, Germany from 1995 to 1998. John returned to Australia and took up a position as Queen Elizabeth II Fellow at the ANU in 2000. John was promoted to Professor of Physics in 2008. He was Deputy Director of the Research School of Physics from 2012-2016, elected member of ANU council from 2012 to 2014, member of the ARC Panel of Experts from 2014-2016, and is currently Head of ANU Defence Engagement and Head of the Quantum Sensors Group in the Department of Quantum Science.

John was the 2020 recipient of the Australian Defence Industry Award for Academic of the Year, and the recipient of the 2020 Australian Defence Industry Award for Excellence for his work on quantum sensors and more generally for driving collaboration between defence and academia.



**Dr Mariam Darestani**  
**Western Sydney University**

### **End Use and Reuse**

Turning mining waste to high performance inorganic materials for construction and mining applications

#### **Biography**

Dr Darestani is a material engineer passionate about the environment and focused on developing new materials and products for sustainable use of resources, especially water. She is a fellow of Higher Education Academy (HEA) and STEM Champion of 21C program at WSU working on development of interdisciplinary specialisation courses for undergraduate students.

Dr Darestani first joined WSU in 2018 as a visiting academic from Queensland University of Technology (QUT). She has been working full time at WSU since 2020. At QUT, she was an Advance Queensland Research Fellow (2016-2020) and her research was sponsored by an industry partner and QLD Ministry of Fishery and Agriculture. Before joining QUT in 2019 in 2014, Dr. Darestani worked at University of Technology Sydney (UTS) and the University of Sydney as a postdoctoral research fellow (2012-2014). She worked as an R&D engineer before joining UTS and after finishing her PhD in Chemical Engineering at University of Sydney.

## Partners

The NSSN thanks the support of all partners in the planning and running of the Sensing, Mining and Water Workshop

Proudly funded by



## Member Universities

