

## VIRTUAL TECHNICAL COURSES PRIOR TO SUSTAINABLE MINING 2023

**FRIDAY, MAY 5**

**10:00 – 1:00 PM (UTC-4)**

**COURSE 1: “TOPICS OF CIRCULAR ECONOMY IN MINERAL PROCESSING”**

**Luis Cisternas**, Professor, **Pía Hernández**, Professor, **Mariella Rivas**, Professor and **Ricardo Jeldres**, Professor, Universidad de Antofagasta, Chile

Language: Spanish

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**MONDAY, MAY 8**

**5:00 – 7:30 PM (UTC-4)**

**COURSE 2: “PLANNING SUSTAINABLE WATER SUPPLY SYSTEMS FOR MINING TERRITORIES”**

**Doug Aitken**, SMI-ICE-Chile, General Manager; **Fran Rivero**, SMI-ICE-Chile, Deputy General Manager; **Liliana Pagliero**, SMI, Research Fellow.

Language: Spanish

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**TUESDAY, MAY 9**

**10:00 – 1:30 PM (UTC-4)**

**COURSE 3: INNOVATIVE MINE WASTE MANAGEMENT RESEARCH AT IRME-UQAT**

**Isabelle Demers**, Professor, IRME-UQAT

Language: English (Spanish interpretation)

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**TUESDAY, MAY 9**

**3:00 – 5:00 PM (UTC-4)**

**COURSE 4: TOOLS FOR AN EFFECTIVE COMMUNITY ENGAGEMENT**

**Daniela Serra**, Academic, Centro de Minería, PUCV, Chile

Language: Spanish

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## VIRTUAL TECHNICAL COURSES PROGRAMS

### Course 1: Topics of Circular Economy in Mineral Processing

**When:** Friday, May 5, 2023  
**Instructors:** **Luis Cisternas**, Professor, **Pía Hernández**, Professor, **Mariella Rivas**, Professor and **Ricardo Jeldres**, Professor, Universidad de Antofagasta, Chile  
**Language:** Spanish  
**Time:** **10:00 - 1:30 PM** (Chilean time zone).

**Description:** The seminar/course will address different aspects to consider related to moving towards sustainable mining, considering the circular economy perspective on mineral processes, including acid drainage, use of new reagents and rheology.

#### General objectives

- Objective 1 Review current research advances in acid drainage and rheology topics to be applied in mining processes as future alternatives.
- Objective 2 Examine the new trends in the development and application of new reagents (biological and organic base) in mining processes.

#### CONTENT AND PROGRAM

Time	Presentation	Presenter
10:00 -10:30	Circular economy in mineral processing	Luis Cisternas
10:30 - 11:00	Acid Mine Drainage Elimination: Desulfurization of Mine Waste	Luis Cisternas
11:00 - 11:05	Questions and discussion Module 1	
11:05 - 11:35	Use of bio-based reagents: towards a more sustainable mining	Mariella Rivas
11:35 - 11:40	Questions and discussion Module 2	
11:40 - 12:10	Towards a hydrometallurgy without water. Use of new solvents	Pía Hernández
12:10 - 12:15	Questions and discussion Module 3	

12:15-12:45	Rheological Best Practices for Sustainable Tailings Management	Ricardo Jeldres
12:45-12:50	Questions and discussion Module 4	
12:50 - 13:00	Conclusions and Closing of the Course	All presenters

## LECTURER(S) BIO

**Luis Cisternas** is a PhD in Chemical Engineering from the University of Wisconsin-Madison (United States) and full professor in the Department of Chemical Engineering and Mineral Processes at the University of Antofagasta. His lines of research include the application of the circular economy in mineral processing, the use of seawater in mining and mineral flotation. He has published extensively in the scientific literature and is a member of the Editorial Board of the scientific journals, Minerals (MDPI), Mineral Processing and Extractive Metallurgy Review (Taylor & Francis) and International Journal of Mining Science and Technology (Elsevier).

**Pía Hernández**, by profession Civil Industrial Engineer in Chemistry, with a master's degree and a doctorate in Mineral Process Engineering. She is an academic in the Department of Chemical Engineering and Mineral Processes at the University of Antofagasta, Chile. Her research areas have focused on the leaching of chalcopyrite in saline media (chlorides and nitrates) and she is currently venturing into the recovery of metals from e-wastes and tailings. She is part of the research team of the new Center for Circular Economy in Industrial Processes (CECPI) of the University of Antofagasta.

**Mariella Rivas**, marine biologist from the University of Valparaíso, and PhD in Biomedical Sciences from the University of Chile. Since 2007 she has been working as a researcher at the U. de Antofagasta. Between 2016 and 2017, she was director of the Cicitem Scientific and Technological Research Center for Mining. Within her research she has developed energy production from microalgae (biodiesel and biogas), directed projects financed by Fondef, Corfo, Fondecyt and the European Community. Since 2018 she has been an academic at the University of Antofagasta, and her research is aimed at promoting environmental sustainability through the development of biotechnological tools that have a positive impact on the environment.

**Ricardo Jeldres**, Chemical Civil Engineer and PhD in Chemical Engineering from the University of Concepción. Associate Professor of the Department of Chemical Engineering and Mineral Processes of the University of Antofagasta. His lines of research include froth flotation, tailings flocculation and thickening, and slurry rheology, with an emphasis on modern reagent analysis, the use of seawater in mining, and high clay mineral challenges. To date, he has published over 70 WOS scientific articles, participates in 5 R&D research projects, and is a technical advisor to the main mining industries in the country.

## Course 2: Virtual Technical Course Conducted by SMI-ICE-Chile, Sustainable Minerals Institute, University Of Queensland, Australia

**When:** May 8 2023  
**Presenter(s):** **Doug Aitken**, SMI-ICE-Chile, General Manager; **Fran Rivero**, SMI-ICE-Chile, Deputy General Manager; **Liliana Pagliero**, SMI, Research Fellow  
**Language:** Spanish  
**Time:** 5:00 – 7:30 PM

**Description:** SMI-ICE-Chile has been developing water supply planning software to facilitate the development of sustainable water supply systems for mining territories. Use of the tools could have a considerable positive influence on the feasibility of continuation of existing mines and the development of future mines. The workshop will focus on presenting the tools, testing the simplified tool and discussing continuation of the project.

### GENERAL OBJECTIVES

- To present the project and planning tools to the participants
- To test the simplified tool with the participants
- To discuss continuation options for the project with the participants

### CONTENT AND PROGRAMME

17:00 – 17:20	Presentation of the project	Doug Aitken
17:20 – 17:40	Presentation of the planning tools	Liliana Pagliero
17:40 – 18:10	Breakout groups: tool testing	Doug, Liliana, Fran
18:10 – 18:20	Break	
18:20 - 18:30	Presentation of options for project continuation	Doug Aitken
18:30 – 19:00	Breakout groups: options for continuation	Doug, Liliana, Fran
19:00 - 19:10	Presentation of results	Doug, Liliana, Fran

19:10 – 19:30	Conclusions and Closure of the Course	Doug Aitken
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## LECTURER(S) BIO

### Doug Aitken

Doug is a Civil and Environmental Engineer with a Ph.D from The University of Edinburgh, United Kingdom. His areas of specialisation include sustainable mining practices, bioenergy production pathways, life cycle analysis, water resource management, environmental risk and opportunity analysis, and strategy planning and implementation. He has gained academic experience through his doctoral work in the design and analysis of sustainable bioenergy systems and post-doctoral research on the sustainability and economics of water management in the mining industry, resulting in various publications in high-ranking journals. His professional experience has been in the development and management of interdisciplinary and collaborative industrial research and development projects that deliver solutions encompassing the principles of long-term sustainability.

He is currently the General Manager of the University of Queensland Sustainable Minerals Institute's International Centre of Excellence, SMI-ICE-Chile, leading the organizational units of the Centre and supporting the development and execution of research projects focussed on improving the sustainability performance of the mining industry.

### Fran Rivero

Fran is a social worker with vast experience in the public sector and in civil society organizations, in matters of social policy, overcoming poverty and sustainable development. Experience in international consultancies with multilateral organizations: WB, IDB, UNDP, GIZ and OAS. In the last 8 years she specialized in matters of sustainable development, especially in programs and initiatives of public-private-civil society dialogue on energy, access to water and climate change for Chile and Latin America. She has designed, implemented and evaluated community participation and relationship processes in the energy and forestry sector. She was Head of Public Policy of the Ministry of Justice and Human Rights. She is currently the Deputy General Manager at SMI-ICE-Chile, The University of Queensland.

### Liliana Pagliero

Liliana's research interests are watershed hydrology and hydrological modelling to support the assessment and sustainable management of water resources.

During her career, Liliana has worked in government institutions, in Chile and in the European Commission, with the role of implementing and executing hydrological models as a support tool for the management of water resources and the formulation of policies at the basin up to scale continental scale. She has worked at Universities in Chile, Belgium and Australia; investigating the different hydrological processes and their interactions, including snow processes, flooding, agriculture and irrigation, erosion, water quality and climate change.

After joining SMI-UQ, she has worked on a number of water-related projects in the mining industry from local to regional perspectives always in the context of the catchment and region they are located. Her work has evolved from considering only technical aspects for water management to a more holistic approach that includes environmental, legal and social aspects through her participation in multidisciplinary projects.

## Course 3: Innovative Mine Waste Management Research at IRME-UQAT

**When:** Tuesday, May 9, 2023  
**Instructors:** Isabelle Demers, Professor, IRME-UQAT, Canada  
**Language:** English with interpretation to Spanish  
**Time:** 10:00 - 1:30 PM

**Description:** Tailings and waste rock management evolved significantly in the past decades, moving from end-of-pipe dumping to engineered systems tailored to minimize geotechnical and geochemical risks. Research projects initiated at the Research Institute on Mines and Environment (RIME-IRME), in Université du Québec en Abitibi-Témiscamingue focus on several innovative mine waste management methods and integrated mine waste management to provide a deeper understanding of the fundamentals of each technique and their relevant applications. This course will present the most promising mine waste management methods, along with examples of research projects realized by RIME's team. The topics discussed are: tailings densification (from slurry to dry stacking); underground backfill; in-pit disposal; environmental desulfurization; co-disposal of tailings and mine waste; and mine waste valorization. Work on reuse of tailings and waste rocks as replacement of natural materials for site closure will also be discussed.

### GENERAL OBJECTIVES

- Present innovative tailings and waste rock management options
- Demonstrate the potential use of tailings and waste rock as components of mine site closure and reclamation systems
- Highlight research projects conducted at IRME-UQAT in partnership with Canadian mining companies

## CONTENT AND PROGRAMME

10:00 - 10:50	Innovative mine waste management part 1: tailings densification and backfill	Isabelle Demers
10:50 - 11:00	Questions and discussion Module 1	
11:00 - 11:10	Break 1	
11:10 - 12:00	Innovative mine waste management part 2: environmental desulfurization and co-disposal	Isabelle Demers
12:00 - 12:10	Questions and discussion Module 2	
12:10 - 12:20	Break 2	
12:20 - 13:10	Valorization of mine waste as components of mine closure scenarios	Isabelle Demers
13:10 - 13:20	Questions and discussion Module 3	
13:20 - 13:30	Conclusions and Closure of the Course	Course Coordinator

## LECTURER(S) BIO

**Isabelle Demers** is a professor at UQAT since 2013, and holder of the Canada Research Chair in integration of environment in the mine life cycle. She holds a B.Eng. and M.Eng. in metallurgical engineering from McGill University, Canada, and a Ph.D. in Environmental Sciences from UQAT. Her research work is focused on mine waste management and engineered mine closure systems, with a special emphasis on gas movement through reactive unsaturated materials. She is also involved in environmental desulfurization by flotation as a tool to prevent acid and/or contaminated mine drainage. Her recent research work aims to develop methods to better predict environmental risks and best practices in mine waste management early in the mine life cycle, using geometallurgy concepts adapted for mine waste.

## Course 4: Tools for an Effective Community Engagement

**When:** Tuesday, May 9, 2023  
**Instructors:** **Daniela Serra**, Academic, Centro de Minería, PUCV, Chile  
**Marcela Sepulveda**, Community Relations Manager, CleanTech Lithium, Chile  
**Language:** Spanish  
**Time:** 3:00 - 5:00 PM (Chilean time zone).