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The Potential and Challenge of Creating Value from Mine Tailings

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Julie Deriaz, CanmetMINING, Natural Resources Canada

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Mine Waste Reprocessing

Problem:

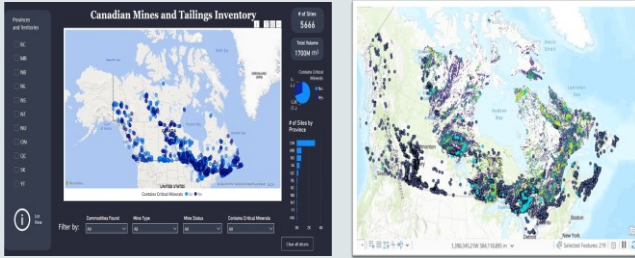
- 250 Mtpa tailings produced in Canada
- \$10B est. tailings liability in Canada
- 10,000+ sites
- Environmental and stability risks

Why Alternative Sources?

- Reduce operating cost
- Valorize waste
- Mitigate hazards, reduce risk
- Decrease footprint
- Full cycle mining- Circular economy
- New resources



Critical Minerals Potential in Mine Tailings



Canadian Mine Tailings Inventory

- Tailings characterization data for critical mineral & valorization potential
- Tools & best practices to assess resource potential
- Identify value by prioritizing sites for reprocessing, hazard mitigation, carbon capture, critical minerals from waste

Ongoing R&D:

- ✓ Standardized database to inventory & assess tailings in Canada
- ✓ 8000+ records (PoC in progress)



Tailings Sampling Program

- Determine best practises & sampling requirements in valuation of tailings
- Identify barriers & key parameters to defining tailings as potential resource
- Working to expand support to PTs

Ongoing R&D:

- ✓ Tailings Sampling Protocol report- proposed methods for sampling to define tailings as resource (i.e. NI 43-101)
- ✓ Tailings Sampling Program- systematic drill & sampling to demonstrate resource assessment from secondary sources
- ✓ Tailings sampling program completed at Stirling, NS Cu-Pb-Zn tailings (2024); advanced R&D in progress

Environmental & Economic Considerations

Objectives:

- Historically - safe containment, covers and revegetation have been the main goals
- Reduce environmental liabilities arising from AMD
- Reduce risk of dam failures
- Residual tailings - investigate benign material (silicate residuals) for valorization potential
- Minimize environmental & carbon footprint
- Encourage a more circular, full-use mining approach

Ongoing R&D:

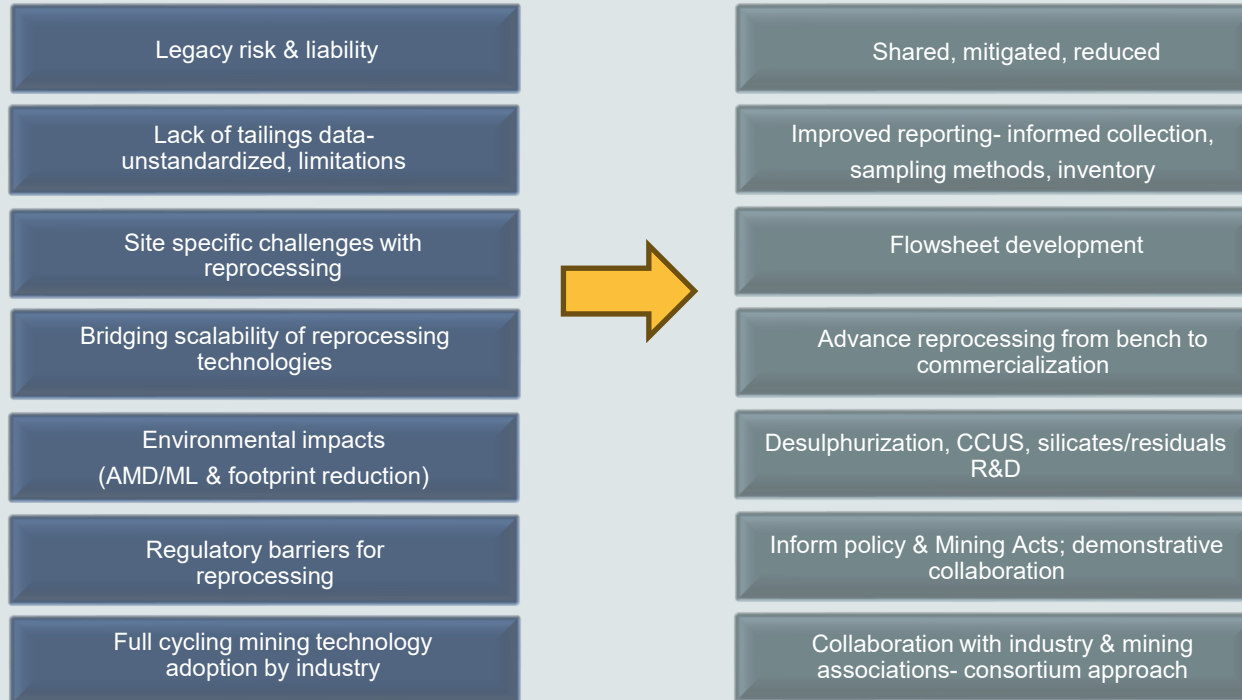
- ✓ Desulphurization & critical mineral recovery from high sulphide tailings
- ✓ Carbon capture and storage potential of tailings
- ✓ Silica intermediate product market analysis



(Biosolids cover on tailings (Courtesy of B. Tisch).

Reframe & Reimagine

Challenges or unlocking opportunity?



Julie Deriaz

Physical Scientist, Project Lead-Critical Minerals Potential in Canadian Mine Tailings

Industry Support and Critical Minerals Secretariat Division

Lands and Minerals Sector, Natural Resources Canada

Julie.Deriaz@NRCan-RNCan.gc.ca

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Panelists

- 1. John Thompson, Chief Innovation Officer- Regeneration and Olenka Forde, Senior Environmental Scientist- Regeneration**
- 2. Marie-Pierre Paquin, Head of Science and Partnerships, Closure Team, Rio Tinto**
- 3. Dr. Michael Parsons, Research Scientist, Geological Survey of Canada (Atlantic), NRCan**
- 4. Dr. Nadia Mykytczuk, President and CEO, Mining Innovation, Rehabilitation and Applied Research Corporation (MIRACO), and Executive Director, Goodman School of Mines**



Question 1

- 1. How do we form the necessary partnerships between government, industry, academia, and Indigenous communities, to be most effective in this space? What should this collaboration look like?**

Question 2

2. How do we fully understand and define value in mine tailings?

- Including characterization, weathering, technical and additional mineral recovery
- Economic, societal, liability and long-term management offset, value in reducing footprint
- Repurposing residuals, land use
- Are there any other considerations?

Question 3

- 3. What do you see as the largest challenge to overcome to consider and assess tailings for additional reprocessing or value realization?**