The Investigation of an Alternative Tailings Deposition System for Uranium Tailings

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Problem Statement

- Cigar Lake tailings properties and the tailings depositional system are resulting in inefficient use of the existing pit volume.
  - reduce the operating life of the existing TMF
  - accelerate capital expenditures to construct the various phases of optimization and/or expansion.
Tailings PSD

Cigar Lake Tailings PSD (2015-2016)
Deposition System & Considerations

- Tremie adopted to minimize tailings segregation
- Pumping capacity is limited
  - \( \sim 25\% \) solids for CL tails using the tremie method
  - \( \sim 35\% \) solids based on existing pumping system
- One point of discharge
  - sufficient capacity for deposition over winter (November to June)
  - walkway freezes-in place resulting in the inability to move the discharge point
Deposition System & Considerations

• Barge movement completed by:
  – Rigid walkway structure and manual winches
  – Wind, waves, wet conditions and safe use of walkway

• Access to deposition areas is needed to meet regulatory sampling requirements, tremie house is heated

• Quality of the reclaim may be impacted if deposition barge is too close
Tremie Deposition
Tailings Surface Development - 2014
Tailings Surface Development - 2015
Tailings Surface Development - 2016
Tailings Surface Development - May 2017
Deposition Planning – Post Modelling Comparison
Preferred Options

- Two Preferred Options
  - satellite deposition barges from the existing barge structures
  - subaqueous deposition from barge with radial pipes
## Subaqueous Deposition Trial

### Criteria for Success

<table>
<thead>
<tr>
<th>Concerns</th>
<th>Rational for Concern</th>
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<tbody>
<tr>
<td>Segregation of Deposited Tailings</td>
<td>- Any change in deposition method <strong>must not worsen segregation.</strong></td>
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<td>Prevent Blockages in the subaqueous Diffuser System</td>
<td>- Previous tremie design failed because it got stuck in tailings.</td>
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<td>- Test work will assess if the subaqueous deposition method is at risk of becoming blocked, placing additional burden on operations.</td>
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<td>Impacts to TMF volume</td>
<td>- The volume in the TMF is a resource, we need to ensure that there are no negative impacts on that resource. Ineffective use of space may impact the construction schedule.</td>
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<td>- Deposition angle</td>
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<td>- Initial placed density</td>
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Subaqueous Deposition Planning

CFD Diffuser Evaluation Assuming a Solids Content of ~25%

CFD Modelling – No Diffuser
Subaqueous Deposition Trial Monitoring

- Water Sampling
- Particle size sampling
- Bathymetric surveys
- Orthophotos
- Deposition Stream Videos

Field Trail Subaqueous Diffuser Concept
Subaqueous Deposition Trial

Trial Occurred September 24th to October 18th 2017
Subaqueous Deposition Trial - Results

Comparison of Resulting Profile at a Fixed 10 m Deposit Height Considering Compound Slopes
Subaqueous Deposition Trial - Results

Samples Collected from the Deposition Point and Thickener Underflow between October 12 and October 18, 2017

Surficial Samples Collected October 18
Subaqueous Deposition Trial - Results

Surficial Samples Collected October 18

D₅₀ of the Surficial Samples Collected October 18
Flexible Walkway
Conclusions

• Subaqueous deposition:
  – provide more flexibility with deposition points
  – allows the ability to maximize the use of the available pit capacity
  – does not compromise the tailings objectives

• System was installed fall 2018 and is currently operational
Acknowledgements
Questions?