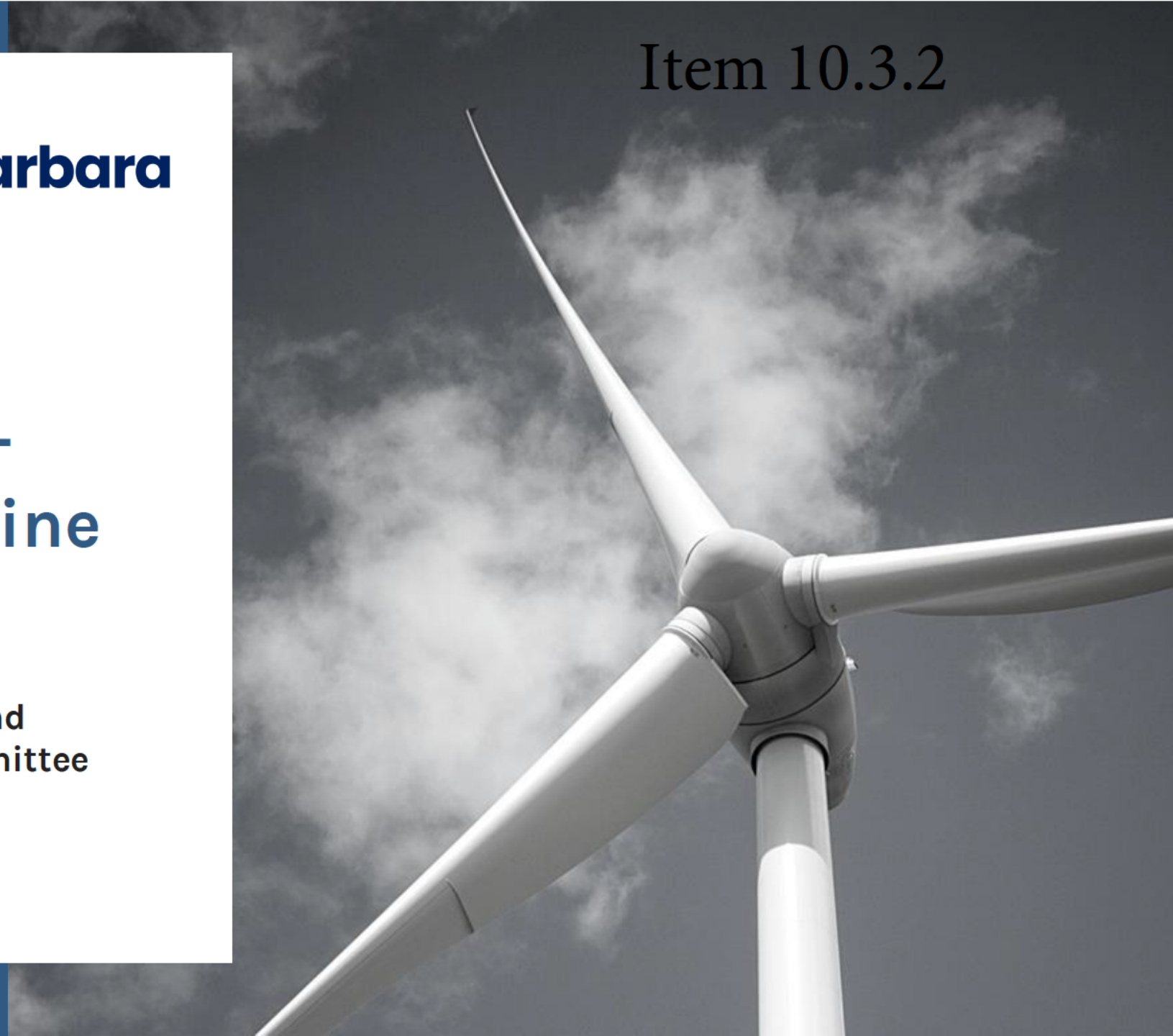
Item 10.3.2

Pumped Hydro Energy Storage - Touquoy Gold Mine

HRM Council - Environment and Sustainability Standing Committee

May 1, 2025



Agenda

1. Introduction to Natural Forces and St Barbara
2. Partnership Background
3. What is Pumped Hydro Energy Storage?
4. Nova Scotia Energy Landscape
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6. Project Overview
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Who we are – Natural Forces

- Private Independent Power Producer (IPP) based in Halifax, NS, with teams in New Brunswick, France and Ireland
- Active in the renewable energy sector since 2001
- Wind, solar, storage, and hydro projects in development and operation throughout Canada, Ireland and France
- Develop, finance, construct, operate and own renewable energy projects
- Meaningful equity partnerships with First Nations, universities, and CEDCs

Who we are – St Barbara

- St Barbara is a global gold mining company with operations in Nova Scotia and Papua New Guinea
- The Touquoy Gold Mine in Mooseland commenced operations in early 2018 and ceased operations in late 2023
- During its construction and operation phases, the mine created over $500 million in economic activity and employed over 330 Nova Scotians
- The Touquoy Mine is currently in the reclamation phase of its lifespan and the site is being returned to a natural state
- To date, over $10 million has been spent to reclaim areas of the mine site and more will be completed in the months and years ahead
- In April 2025, St Barbara completed an agreement with the Province of Nova Scotia to transfer over 200 hectares of ecologically significant land to add to the provincial stock of designated protected areas

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Partnership Background

- Natural Forces and Atlantic Mining Nova Scotia (a St Barbara company) are working together to explore the feasibility of and develop a pumped hydro energy storage (PHES) system at the Touquoy Gold Mine in Moose River, NS
- The partnership came about naturally between St Barbara and Natural Forces
    - As operations at the Touquoy Mine wound down, St Barbara was looking to identify and understand innovative reclamation approaches
    - Natural Forces was keenly aware of the need for long duration energy storage in NS and was interested in exploring Pumped Hydro Energy Storage
    - The companies got in touch, and it was clear that this project was a great fit for both
- Natural Forces and Atlantic Mining entered an MOU on May 1, 2024, to undertake a feasibility study assessing the technical, environmental, and economic viability of a closed-loop PHES system

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What is Pumped Hydro Energy Storage?

PHES System Overview

- A pumped hydro energy storage system is an energy storage technology, consisting of two reservoirs at different elevations, that uses water and gravity to store and generate energy
- During periods of increased energy demand water is released from the upper reservoir to the lower reservoir, flowing through turbines and generating energy
- During periods of low demand, the PHES system absorbs the excess energy from the grid to pump the water from the lower reservoir to the upper reservoir

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CLOSED-LOOP PUMPED HYDRO ENERGY STORAGE

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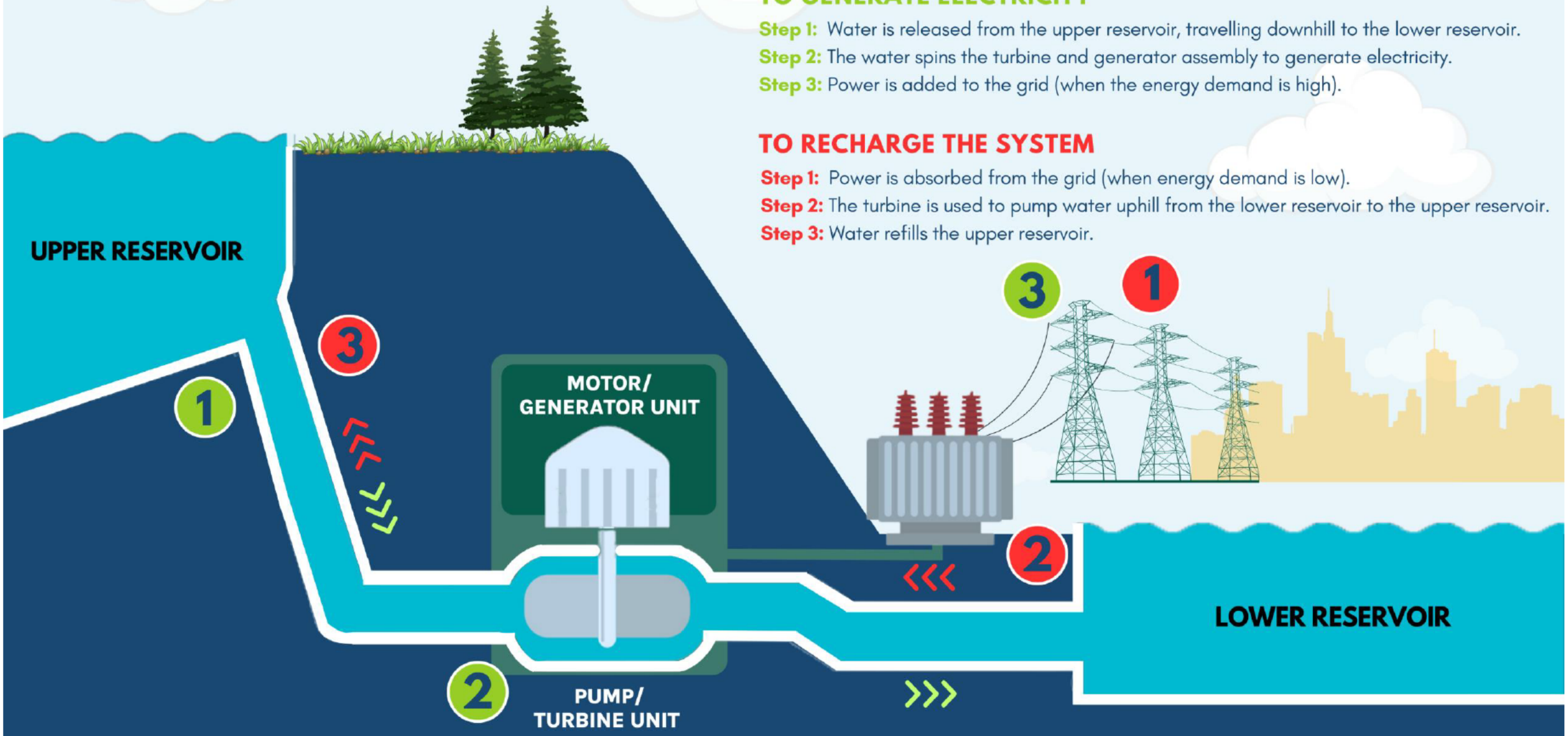
TO GENERATE ELECTRICITY

Step 1: Water is released from the upper reservoir, travelling downhill to the lower reservoir.
Step 2: The water spins the turbine and generator assembly to generate electricity.
Step 3: Power is added to the grid (when the energy demand is high).

TO RECHARGE THE SYSTEM

Step 1: Power is absorbed from the grid (when energy demand is low).
Step 2: The turbine is used to pump water uphill from the lower reservoir to the upper reservoir.
Step 3: Water refills the upper reservoir.



What is Pumped Hydro Energy Storage?

PHES as a Rechargeable Battery

- **Charging the "Battery":** PHES systems "charge" by using surplus energy to pump the water from the lower reservoir to the upper reservoir
- **Storing Energy:** Instead of chemical energy—like in a lithium-ion battery—a PHES system stores energy in the form of gravitational potential energy from the elevated water
- **Discharging the "Battery":** Water is released down to the lower reservoir flowing through turbines, converting the stored potential energy back into electricity. The discharging stage is like drawing power from a battery.
- **Rechargeable Cycle:** Like batteries can be recharged and used repeatedly, PHES systems can repeat the pump—store—release cycle again and again for decades

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Nova Scotia’s Energy Landscape

Current Energy Mix

- **Fossil fuels dominate** Nova Scotia's energy mix, with **coal** accounting for **28%** of electricity generation in 2022
- **Renewables** make up around **32%** of the energy mix, with wind contributing over **25%** of total generation
- The intermittency of renewables presents a challenge for maintaining grid reliability

Future Goals

- **Net-zero by 2050**: Nova Scotia is aiming for a **carbon-neutral** economy by mid-century, with a goal of **80% renewable electricity** by **2030**
- NS plans to **phase out coal** by **2030**, significantly increasing reliance on renewables

Need for Energy Storage

- With increasing renewable energy, storage solutions are crucial to grid stability, especially during periods of low wind or solar output

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Why PHES?

The proposed PHES project would provide **large-scale, cost-effective storage**, with the potential to store **hundreds of megawatt-hours** of energy, making it ideal for long-duration needs

Specific benefits of PHES systems include:

- **Grid Stability:** Balances supply and demand, providing backup power during peak usage and preventing grid overload
- **Long Lifespan:** Systems can operate for up to 50-100 years
- **High Efficiency:** Energy conversion efficiencies can be upwards of 80%
- **Renewable Integration:** Supports the integration of other renewable energy resources by mitigating intermittency issues
- **Low Ecological Impact:** Uses previously disturbed lands and/or natural environmental features to minimize ecological disturbance

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Project Overview - Site

- Repurposes previously disturbed lands at the Touquoy Gold Mine site
- Closed-loop PHES system using:
  - Administration complex as the upper reservoir
  - Open pit as the lower reservoir

Project Overview – Preliminary Design

System Characteristics

- 80 MW closed loop system
- Approximate generation time of 6.5 hours
- Daily generation of 513 MWh
- 84.4% roundtrip efficiency

System Components

- Upper reservoir formed by a perimeter closure dyke approximately 15 m high and 2,430 m long
- Water conveyance by two surface steel penstocks each with a diameter of 5.5 m and length of 280 m
- Powerhouse with two pump turbines located adjacent to the lower reservoir
- A lower reservoir formed by the mine pit

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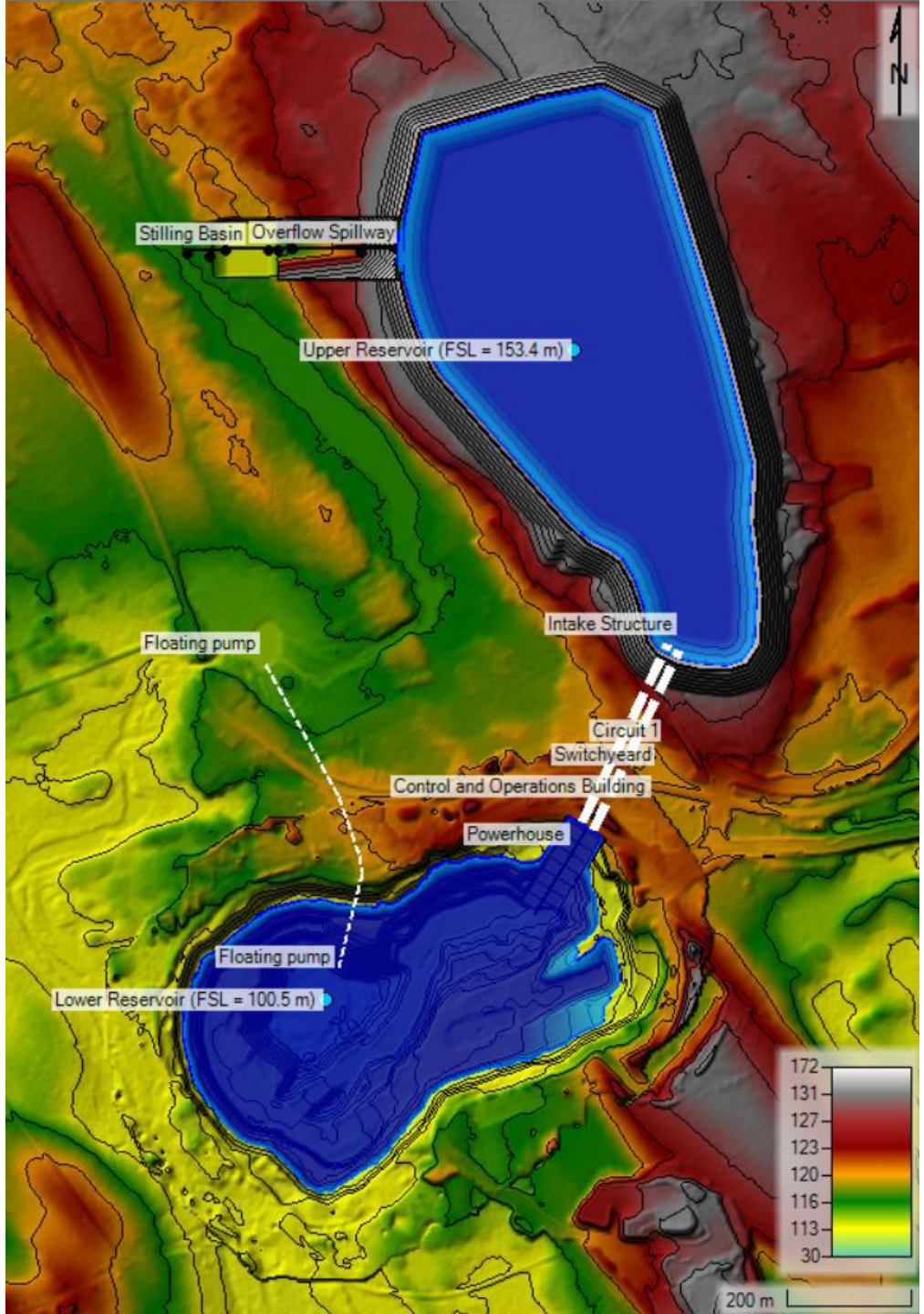
Project Overview – Conceptual Layout



Next Steps and Ongoing Work

- Continued **engineering and design** work to refine the project design
- **Consultation and engagement** with rightsholders and stakeholders including:
  - First Nations and consultation bodies
  - Municipal, Provincial, and Federal government and regulators
  - Local community members and special interest groups
- Regulatory review and preliminary **environmental scoping and studies**

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Thank you!

Please direct any questions to [redacted] *and*