Ardley Reservoir Scoping and Feasibility Study

Geophysical Surveys

Overview

Environment and Protected Areas (EPA) is exploring a potential new dam and water storage reservoir on the Red Deer River downstream of the City of Red Deer, near Ardley to reduce the impacts of flood and drought on Albertans and the economy. The Ardley Reservoir Scoping and Feasibility Study was initiated in October 2024. As part of evaluating the technical feasibility of potential dam options, EPA has engaged the Hatch Project Team to complete geophysical surveys that may require access to privately owned or leased land. No access will occur without the agreement of the property owner. A land access agreement will be completed prior to commencing any activities.

Why do geophysical surveys?

Geophysical surveys are undertaken to obtain continuous information of subsurface soils present (e.g., to distinguish sands versus clays), groundwater levels and depth to bedrock between, and beyond, a limited number of geotechnical boreholes. The ground-based geophysical surveys will consist of Seismic Refraction Test (SRT) and Electrical Resistivity Tomography (ERT).

Geophysical surveys are one part of the overall geotechnical site investigation program which will also include desktop studies, geotechnical drilling and general site reconnaissance.

What does a geophysical survey involve?

Site Access and Disturbance

- The geophysical surveys (SRT and ERT) will have minimal impact and can be carried out on foot from nearby vehicular access.
- Access will be by vehicle or all-terrain vehicle (ATV) to within 500 m of the geophysical line location.
- The geophysical surveys will be done on the ground surface. Some minimal clearing of brush may be required in vegetated areas so that cables can be laid out and the field crew can walk the line. Disturbance to mature trees will be minimized and limited to the hand removal of the occasional lower tree limb that is obstructing the line.

The geophysical survey lines will be walked prior to the fieldwork to assess:

- Access to and along the lines;
- Vegetative cover and locations requiring limited brush clearing;
- Areas with steep slopes, cliffs, and other obstructions such as minor water crossings like small creeks;
- Intersections with infrastructure such as fence lines, roads, and rail lines; and
- High noise-level locations.

Survey Methodology

The survey methodology for SRT and ERT surveys is generally executed in the following manner:

1. Laying out an initial length of cables and inserting the sensors – geophones for seismic surveys and electrodes for ERT surveys.
2. Setting up the energy source for the SRT and ERT.
3. Collection of readings.
4. Remove sensors and re-layout cables/sensors along designated line until target area is complete.

SRT Configuration

- Minimal line clearing is required to allow the field crew to walk the line and place the cable and geophones.
- The geophones are placed into the ground and marked with flags. All cables and geophones are removed after data collection.
- Three potential energy sources will be used. The selected source will depend on ground terrain and local geology.
    1. Shot gun energy source–placed about 3 ft into the ground and a firing rod with a 12-gauge blank shotgun shell.
    2. Drop weight energy source – a strike plate is placed on the ground and is struck with a drop weight system mounted on an all-terrain vehicle or truck.
    3. Hammer energy source – a strike plate is placed on the ground and is struck with a steel hammer to generate the sound.

ERT Configuration

- ERT cable layouts are like those required for seismic layouts in that they require laying out cables along cleared lines and inserting electrodes into the ground.
- After taking ERT readings, the electrodes and cables are removed, leaving minimal impact to the ground.
- The electrical source and measurement equipment is hand portable, and battery operated. It is placed at intervals along the cable layout, overlapped for continuous data and is moved as the cables are rolled out or moved.

Seismic Geophone Placement

Photo: Hatch

ERT Equipment

Photo: Hatch