Memo

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Reference: Mackay Potash Project – Shelby Tube Sampling

1. INTRODUCTION

This technical memo outlines the Shelby tube sampling work conducted at CTH and infill drill locations across Lake Mackay.

2. ON-LAKE INVESTIGATION

2.1 Purpose

To recover undisturbed sediment samples for laboratory analysis and physical property testing.

2.2 Background

Shelby tube samplers are thin-walled, hollow steel tubes, which are driven into the ground to extract a relatively undisturbed soil sample for use in laboratory tests. Lake sediments were sampled to a depth of 1.0m using a jackhammer and sampler adapter.

2.3 Shelby Tube Sampler Method

2.3.1 Equipment

- Shelby tube sampler
- Expanding plugs
- Jackhammer with tube sampler adapter
- Generator
- Scraper and rags

2.3.2 Sampling Procedure

1. A representative, undisturbed lake surface was selected to conduct test. The Shelby tubes were labelled and positioned prior to photographing (Appendix A, Figure 1).
2. The first Shelby tube was inserted into the ground, ensuring it remained vertical, to just above the adapter screw holes (0.5m) (Appendix A, Figure 2).
3. Once inserted, the expanding plug on top of sample tube was installed and tightened (Appendix A, Figure 5).
4. Two adjustable wrenches on either side of the tube were used to slowly pull up and extract the sample.
5. Excess dirt was scraped off the outside to the tube and wipe clean with a rag. It was then placed upright in box for transport.
6. Steps 1 to 5 were repeated for remaining 0.0 to 0.5m interval samples.

7. Depths of sample holes were measured and recorded in notebook.
8. For the 0.5 to 1.0m interval samples, a sample tube was attached to jackhammer tube adapter and secured with Allen bolts (Appendix A, Figure 3).
9. The tube and adapter were inserted into the existing sample hole. The jackhammer was then mounted, and the tube driven into the ground to a target depth of 1.0m (Appendix A, Figure 4).
10. To remove the sample tube, the jackhammer was slowly pulled up.
    - Negative pressure below the sample tube can cause the core to be sucked out. Pulling up slowly allows the pressure to equalize and reduces core loss.
11. With the tube upright, the jackhammer was removed from the sample tube adapter. The tube was then removed from the adapter by removing the Allen bolts and an expanding plug installed.
12. Excess dirt was scraped off the outside to the tube and wiped clean with a rag. Tube was then placed upright in box for transport.
13. Steps 8 to 12 were repeated for the remaining 0.5 to 1.0m interval samples.
14. The final depths of the sample holes were measured and recorded in the field notebook.

2.3.3 Packing Procedure

1. Samples were prepared for packing by inverting the tubes and removing 15mm of sediment from the base, wiping the inside edges of the tube clean.
2. Bees wax was melted and poured into the prepared base of sample tube. Working the wax up the sides of the tube using a rolling motion created a seal with the inside of the sample tube.
3. Once the wax had set, the sample was returned to an upright position.
4. The tube was then labeled clearly with relevant information. Both ends were wrapped with clingfilm and secured with tape to create airtight seal.
5. Tubes were then wrapped in bubble wrap in preparation for transport (Appendix A, Figure 6).
6. Steps 1 to 5 were repeated for all remaining sample tubes.

2.4 Shelby Tube Subsampling Method – (for ALS Bottle Roll Assay)

2.4.1 Equipment

- Shelby tube with core
- Steel tube, 30mm diameter
- Wooden dowel, 28mm diameter
- Plastic bucket
- Spatula
- Bucket of water and rags

2.4.2 Sampling Procedure

1. Shelby tubes were unwrapped, and the expanding plug removed.
2. A steel tube was inserted into core sample 100mm at a time (Appendix A, Figure 8).
3. Using a wooden dowel, the sample was extruded into a clean plastic bucket (Appendix A, Figure 9).
4. Steps 2 and 3 were repeated until the entire length of the core had been sampled (500mm).
5. Using a spatula, the sample was mixed in the bucket until evenly blended. It was then transferred to a sample jar.
6. All sampling equipment was cleaned prior to sampling next core sample.

2.5 Results

Results from the analysis of the undisturbed and subsampled sediments will be used for resource estimation and calibration of the hydrogeological model.

3. Comments

Sample recovery

- This technique was affected by the composition of the sediment being sampled. If a seal was unable to be achieved with the tube, core recovery was limited. Coarse grained sands and gypsum crystals were observed to result in core loss.

- The degree of saturation of the sediment affects whether it stays in the tube as it is removed.

Appendix A – Shelby Tube Sampling Equipment

Figure 1. 0.0-0.5m sample tubes prior to insertion.

Figure 2. 0.0-0.5m sample tubes after insertion.

Figure 3. Sample tube mounted to jackhammer adapter.

Figure 4. Jackhammer driving in 0.5-1.0m sample tube.

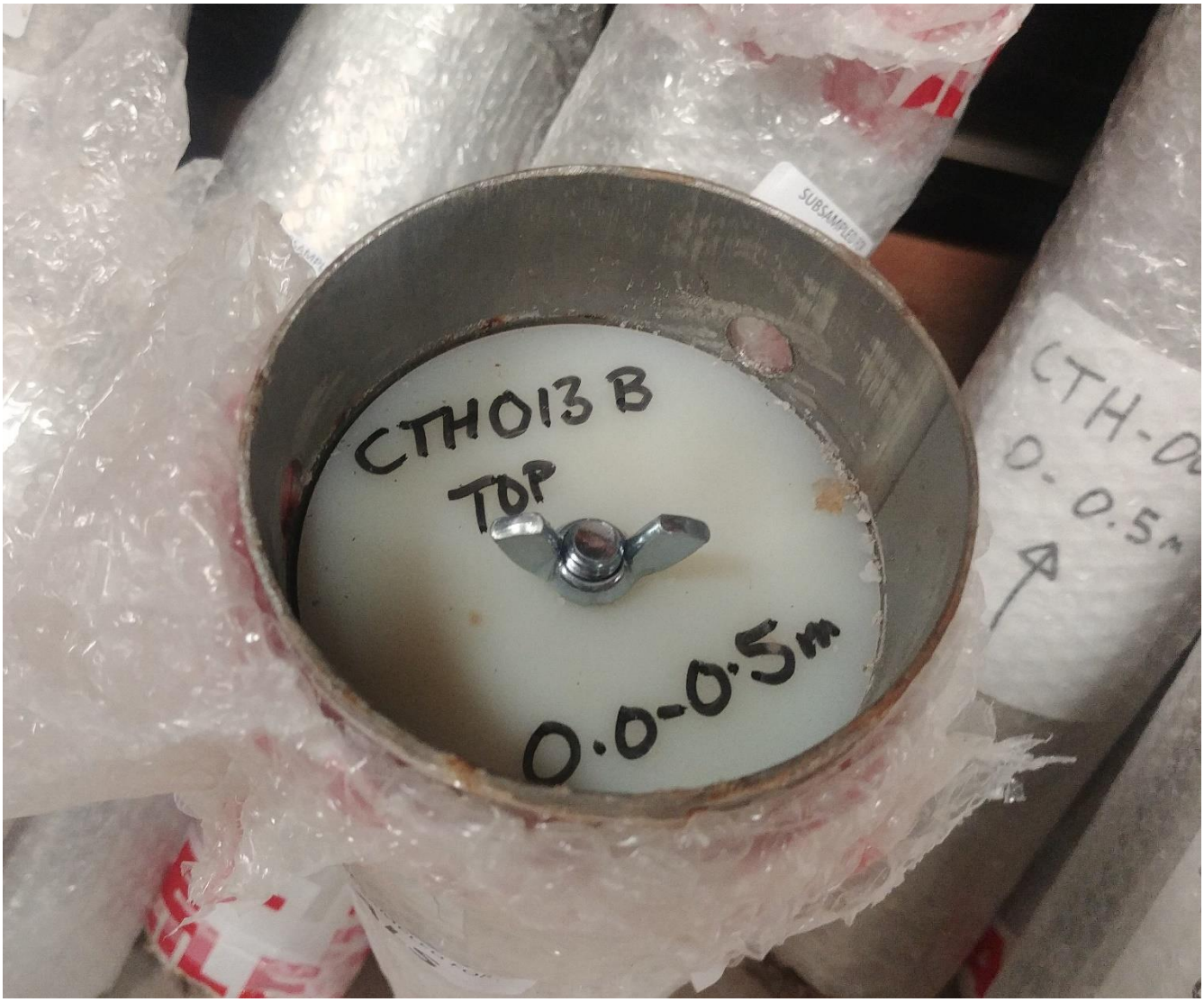

Figure 5. Shelby tube with expanding plug installed.

Figure 6. Packaged Shelby tubes.

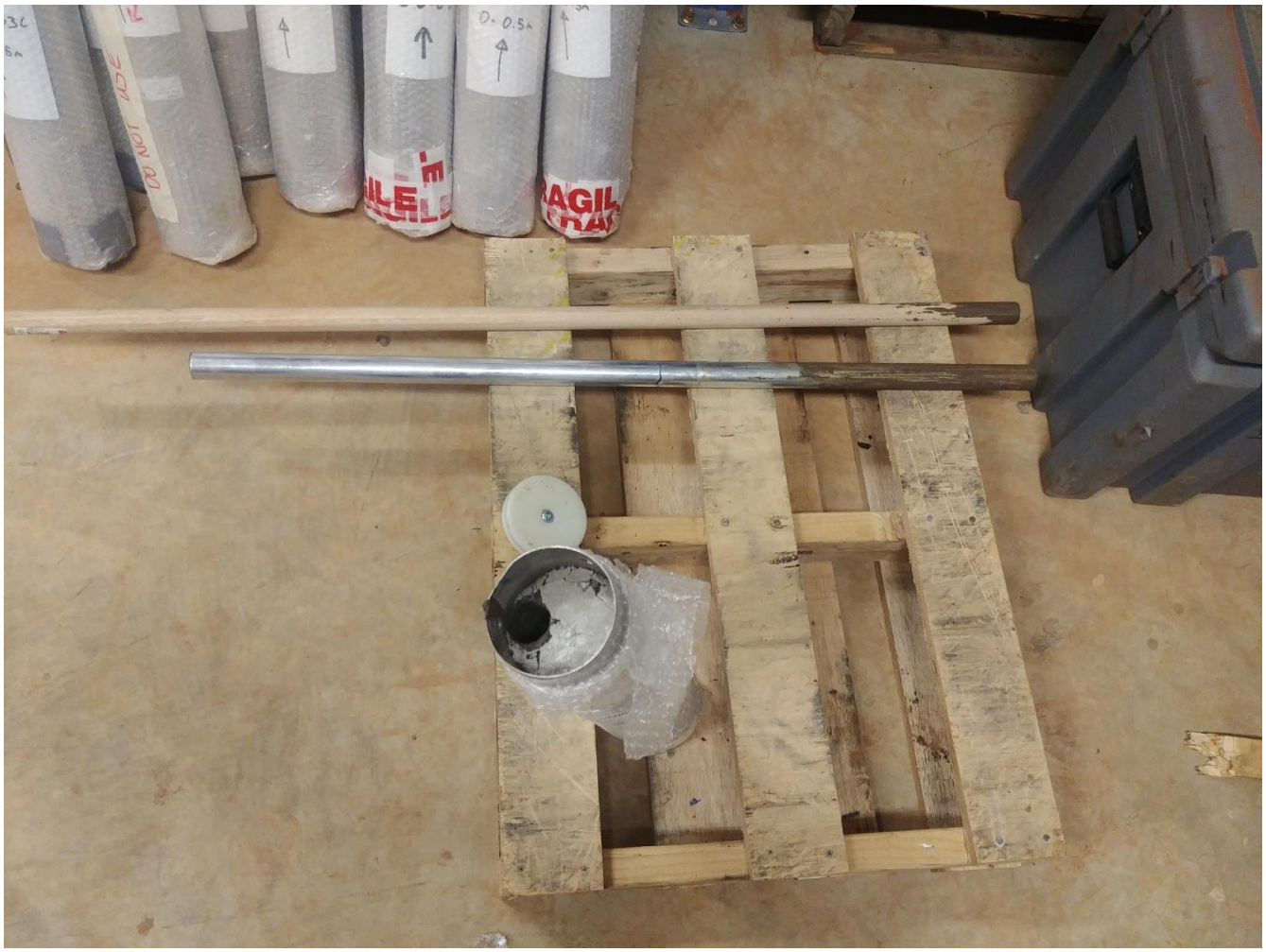

Figure 7. Subsampling equipment.

Figure 8. Subsampled Shelby tube.

Figure 9. Extruded core sample before and after mixing.