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**File:**

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**Reference: Mackay Potash Project – Island Drilling, July 2019**

**Background:**

Eco-hydrogeological investigation of Lake Mackay's islands was deemed necessary by Agrimin and Stantec, to satisfactorily characterise their hydrology, stratigraphy and the ecology. In addition, understanding as much as is reasonably possible, the susceptibility to, and mitigation measures required to prevent disturbance from, proposed on-lake brine extraction.

All data is collected with the intention of supporting Agrimin's endeavors to successfully get the Lake Mackay Project through the EPA review process. Little is currently known about the ecology or stratigraphy of Lake Mackay's islands. Agrimin completed a preliminary data collection and assessment program in July 2019, through strategic drilling on 5 islands. The primary objective was to ascertain the relationship between the predominantly aeolian sands and chemically precipitated calcrete horizons "island sediments" with the underlying lakebed sediments. Additional lines of investigation include;

- Habitat characterisation and identification of dominant floral assemblages. Additional observation of any faunal activity.
- Does a discernible perched lower salinity/ freshwater body exist within the island sediments?
- What does the hydrogeologic interface look like? Is the fresher groundwater if present, confined by a clay horizon or is it perched?
- Is there prospective habitat for stygo and troglofaunal? Facilitation of future sampling.

**Completed Work:**

A vibracore drill rig was utilized to effectively penetrate the island sediments through to lakebed clay. 5 island holes were drilled LMISL1 to 3, LMISL9 and LMISL10 (see figure 2). A geologist was on-site during the drilling to log the lithology and collect core sample. It was important from a technical perspective to observe the transition from the island sediments into what can safely be identified as lake-bed clay sediments. All holes were cased with 50mm PVC to facilitate future macroinvertebrate sampling. Stantec will advise AMN when enough time has elapsed to begin a sampling program.

Stantec Perth provided Agrimin with the island locations of interest. This was based off satellite imagery interpretation to target a spread of prospective habitat for macro-invertebrates. All five locations have subtle variations in topography, geomorphology and vegetation cover.

Stantec Island characterisation forms were filled out by an attending geologist. These forms, along with the lithological logs and core photos are attached as a separate folder to this document.

One round of 2x 500ml samples has been collected from LMSIL 1-3 subsequent to purging bore volume with a submersible. Awaiting assay.

*Table 1. Island drilling locations and depth*

Hole ID	Easting	Northing	Depth (mbgl)
LMISL1	494002	7530043	12.7
LMISL2	495388	7523565	4
LMISL3	489221	7519854	4.6
LMISL9	463038	7499014	4
LMSISL10	456535	7509706	3.8

*Table 2. Bore Installation Dates.*

Bore ID	Installation Date	Invertebrate Sampling Date
LMISL1	08/07/2019	TBA
LMISL2	08/07/2019	TBA
LMISL3	08/07/2019	TBA
LMISL9	09/07/2019	TBA
LMISL10	10/07/2019	TBA

#### Construction Details:

##### LMISL1:

Initial plans called for a nested piezometer set up to selectively screen the island and lakebed sediments. The diameter of the drilled hole wasn't wide enough to allow for a nested 50mm and 25mm installation. This was realized after already installing 25mm PVC to 12.7mbgl. Gravel had been poured down the hole around the 25mm PVC to around 8.7mbgl. Then 2m of grout had been poured in. The lakebed sediment interface was grouted from 12.7mbgl to ~6.5mbgl. 50mm slotted PVC was then gravel packed to approximately 1m below ground level. All core was retained.

##### LMISL2:

Hole Depth = 4mbgl.

3.5m Slotted PVC + 1m solid PVC. 0.5m stick up. No gravel pack was installed. Hand compacted collar. Capped 50mm bore. Cored island sediments through to lakebed clay. All core was retained.

##### LMISL3:

Hole Depth = 4.6mbgl.

4.1m Slotted PVC + 1m solid PVC. 0.5m stick up. No gravel pack was installed. Cored island sediments through to lakebed clay. All core was retained.

##### LMISL9:

Hole Depth = 4mbgl.

3.5m Slotted PVC + 1m solid PVC. 0.5m stick up. No gravel pack was installed. Cored island sediments through to lakebed clay. All core was retained.

LMISL10:

Hole Depth = 3.8mbgl.

3.3m Slotted PVC + 1m solid PVC. 0.5m stick up. No gravel pack. Cored island sediments through to lakebed clay. All core was retained.

### Summary of Island Geology:

Every island hole essentially intercepted the same lithological profile. Aeolian sands, orange to red in colour are present at the surface. The sands quickly transition to a calcrete dominated lithology with increasing moisture content. The depth at which calcrete is intercepted varies depending on the thickness of the aeolian sands and in turn the physical size of the island. The lithology quickly becomes clay dominated until the hole has penetrated wholly lake-bed clay. This confirms that the island are deposit of non-lake bed material. This drilling campaign has not yielded any evidence to suggest the islands are connected to or remnant outcropping bedrock. The LiDAR derived plot of T13's island provided by Stantec (US) in figure 1, in conjunction with the drilling data, illustrates this.

*Figure 1. LiDAR derived topography of T13's Island. Blue line indicates measures static water level. Yellow line indicates interception of lakebed clay in hole T13H-010.*

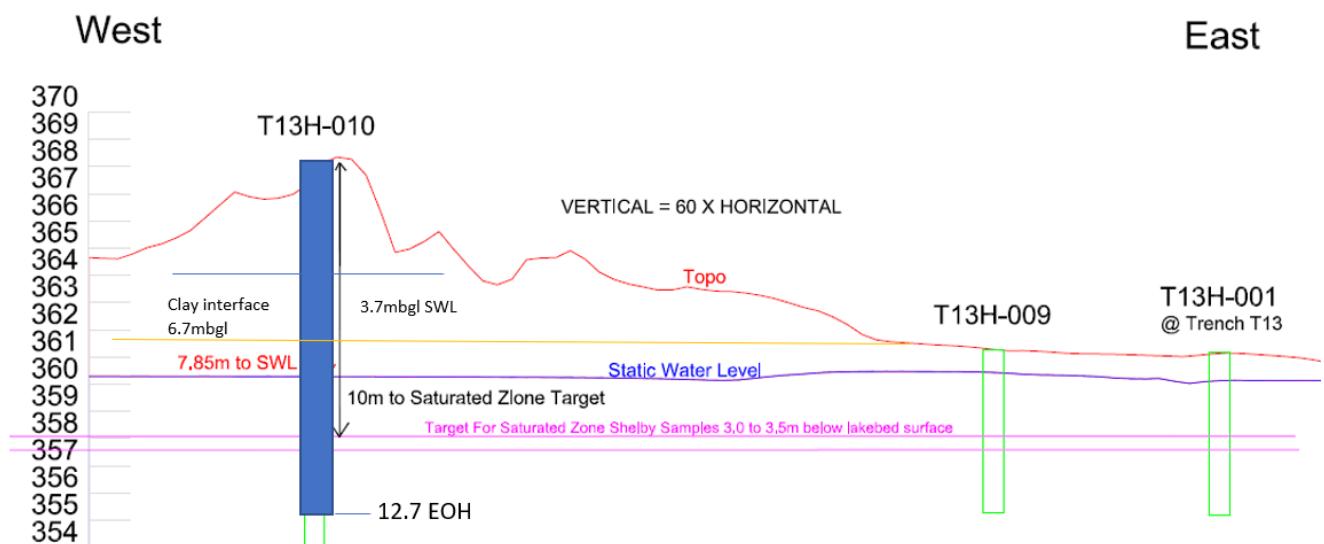


Figure 2. Map of Island drilling locations, Lake Mackay.

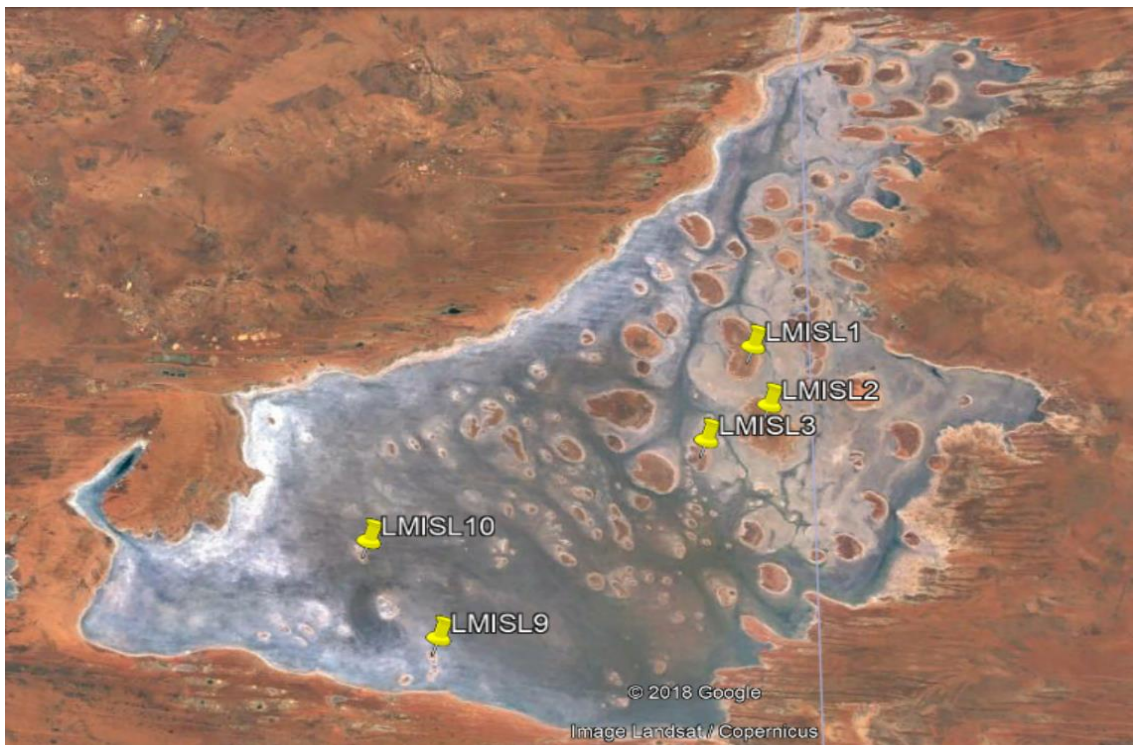


Figure 3: Island drilling in progress, T13H-010



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*Figure 4. Example of bore installation*

