

## Prepared for mining in the almost perpetual ice

### Bathymetric surveys and baseline investigations in Greenland

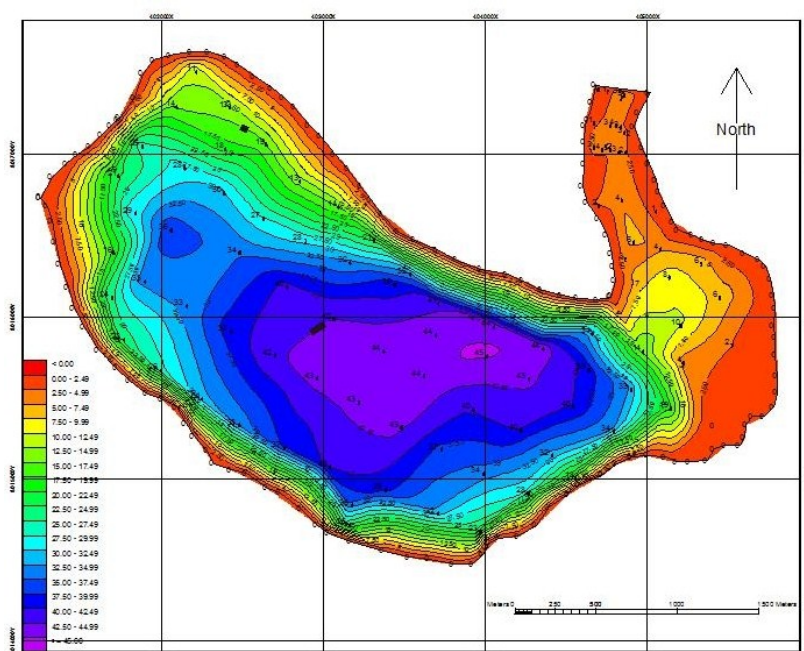


*The Malmbjerg in Greenland is well-protected: Situated in one of the world's most remote areas, shielded by two massive glaciers, it is surely one of the more inaccessible places on earth. However, the Malmbjerg also harbours a massive molybdenum deposit, making it attractive to mining companies. Therefore, and despite the harsh conditions, DHI went out there to collect the required information for obtaining a mining permit.*

Molybdenum is a mineral alloyed with steel to make it stronger and resistant to heat, to be used in rifle barrels, light bulb filaments and stainless steel equipment. In Malmbjerg in central-eastern Greenland, close to the world's largest nature reserve, lies a world-class, open-pit molybdenum deposit. Mining companies interested in exploiting this deposit needed to explore the area to plan their development and accompanying infrastructure. Thanks to our expertise and experience, we were able to assist the clients – the mineral exploration and operation companies Quadra FNX and International Molybdenum PLC - in obtaining the permit needed to start the mine. For four years, from 2005 to 2009, DHI had lent a hand to the succession of owners of this high-grade molybdenum mine project.

#### The right equipment and expertise for bathymetric surveys even in remote areas

The remote location and inaccessibility of the Malmbjerg posed a serious challenge to the clients. Any mining activity in the region requires special environmental considerations because of the sensitivity and roughness of the environment, as well as sophisticated logistics.



## SUMMARY

### Client

Quadra FNX & International Molybdenum PLC

### Challenge

Collecting the necessary information to obtain a mining permit in an inaccessible and pristine area

### Solution

Bathymetric surveys and baseline investigations provided the data for the identification of potential port sites and tailing disposal areas as well as important background information on the local marine and terrestrial environment. Investigations were carried out from the ice or from small boats using light and low-cost survey equipment.

### Value

- Approval of mining permit
- Completion of comprehensive bathymetric maps
- Info for port and tailing disposal plans
- Cost-effective investigation process
- Low-cost, reliable measure of labile metal species in water

### Location/Country

Mestersvig, Greenland

*Bathymetry of Mestersvig, East Greenland, measured from the ice. Mestersvig has been a mining location since the early 1950s and has more recently been explored for its molybdenum deposit at Malmbjerg.*





*Greenland's mountains are highly inaccessible yet highly attractive to mining operators. Malmbjerg itself is crouched between the Schuchert and the Arcturus glacier on the eastern coast on Greenland.*

DHI explored the waters surrounding the Malmbjerg through detailed bathymetric surveys. Thereby, we were able to identify potential port sites and possible tailing disposal areas. The surveys were carried out partly from the ice and partly from small boats using state-of-the-art lightweight survey equipment suitable for remote areas.

#### **DGT capsules – a reliable, low-cost monitoring tool for mining-impacted systems**

Just like the surveys, the environmental baseline investigations carried out during the project in the marine environment and on land relied on the optimal choice of equipment. To achieve a comprehensive investigation of heavy metals, for instance, DHI used DGT (Diffusive Gradient in Thin-films) capsules to capture the amount of labile metal species in water. A relatively recent technique, a DGT capsule is a small capsule containing gel and a metal-binding resin layer. The gel, covered by a filter, is exposed to the aquatic environment. With the capsule submerged in water for up to four weeks, metal ions will pass through the filter and gel and bind to the resin layer. This will then reflect the amount of metals in the water during the time the capsule has been submerged.

The use of DGT capsules provided a low-cost yet reliable measurement of heavy metal background concentration, forming the base of any further environmental impact assessment. Additionally, the range of application and ease of use made DGT a quality monitoring tool for mining-impacted systems.

#### **Instant access to comprehensive information**

Bathymetric maps as well as baseline data were compiled on the spot and handed over to the client immediately after completion of the field studies, giving them instant access to research findings necessary for planning of the mine development and operations.

Based on DHI's services, a mining permit was granted for the Malmbjerg molybdenum deposit. Despite the challenges posed by the projects setting, DHI was able to successfully carry out various operations to help the clients obtain this permit.

To date, the mining permit has not been utilised due to need for a multibillion-dollar-investment in infrastructure. For - even with all the necessary knowledge at hand - the Arctic remains to be a challenging place to work in.