DRILLING CUTTINGS MANAGEMENT AND MONITORING

HACKETT RIVER EXPLORATION PROJECT

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GLENCORE

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Drilling Cuttings Management and Monitoring

Waste from drilling activities primarily consists of slurry, made up of one or more of the following: (rock) cuttings, muds, flocculants, salt and water (collectively referred to henceforth as cuttings). Cuttings need to be managed to prevent any impacts to the surrounding lands and water. Cuttings associated with permafrost drilling are typically saline in nature and so can be harmful to vegetation, impact soil quality and degrade permafrost locally. Pooling of cuttings around the drill, or an uncontrolled deposition of cuttings to the surrounding lands, is not permitted. Cuttings management systems are inspected as a component of the daily drill inspection conducted by the Geologist.

Implementing drilling best practices, including water recirculation and cuttings collection through either a filter box set-up or a series of settling tanks, increases the amount of water reused and decreases the amount of waste produced by each drill. The cuttings produced in this manner are a very thick and viscous mud either deposited directly into a natural dry depression area, or deposited in a megabag, which is then relocated to a sump or dry depression area and deposited. The setup is most efficient if the water recirculation system is located as close as possible to the sump to reduce sludge handling distances.

During winter drilling on ice, all cuttings are disposed of on land in an appropriate sump or dry depression area. Any accidental release of cuttings to the ice surface will be reported to the authorities. All sumps or deposition areas will be located at least 31m away from the high water mark of any body of water. All winter drilling on ice utilize a water recirculation system to avoid release of cuttings to the aquatic environment. Once deposited in a suitable sump or dry depression area, cuttings will solidify. In case of unsuitable conditions at sump sites, drilling will be stopped and appropriate corrections will be implemented. Cuttings can be deposited either into a properly constructed sump or in a dry depression area (collectively referred to as sumps henceforth). A properly constructed sump or dry depression area can consist of:

- A mega bag (temporary);
- A mud tank (temporary);
- An area surrounded by geotextile (temporary);
- A boulder field with no surface water outflow (preferred);
- Rock outcrop areas with deep voids between rocks (preferred), and
- Localized depression areas with no surface water outflow (preferred).

Figure 1 Sludge management set-up, winter.

Figure 2 Sludge management set-up, summer.

Prior to commencing drilling and depositing cuttings, a survey will be conducted under snow-free conditions to identify suitable locations to receive cuttings during both summer and winter drilling. The survey should include identification of suitable locations, an estimation of capacity, a survey proximal to freshet early June (to verify the presence of any surface water flow) and a field visit to clearly delineate the sump area in the field.

Currently, sludge pits are marked with a pink flagged post with SLUDGE written on it. Record of established sludge pits locations should be maintained into database. All locations where cuttings are deposited, need to be documented and reported to the NWB in the Annual Report.

Monitoring

The following monitoring steps apply when surface diamond drilling activities are taking place.

Following deposition of cuttings, all active (current year) sumps will be monitored to determine the integrity of the cutting deposition area and the presence of surface water at the area. Where surface water flow or effluent is detected, field pH readings will be taken. The pH values should range between 6 and 9.5. During the freshet period (approximately mid-May to mid-June), the active sumps will be monitored to ensure of the stability of cuttings. All the active deposition areas will be inspected prior to the end of the drilling campaign or freezing conditions. Sumps that are consistently dry for an entire snow-free season can be considered closed.

Where effluent pH values are outside of the 6.0-9.5 range, a water sample will be collected and submitted to commercial laboratory for analysis of routine parameters. Also, pH values will be measured in the water upstream from the sump and in nearby small streams of the same sub-watershed, to determine if pH values are within the range of 6.0 to 9.5. If field pH is outside this range, samples should be also taken and sent out for analysis. If the lab pH of the sump effluent also exceeds the range of 6.0-9.5, cuttings will be either removed and placed into different sump or encapsulated with inert bentonite. The latter is achieved by spreading bentonite chips over the surface of the sump and hydrating with water. Monitoring of these sumps will be maintained afterwards.