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Recommends the Proponent to provide more details on the 600m deep ice drill hole, drill fluid to be used, and expected time to take before it is completely biodegraded. The information provided does not discuss biodegradability.

ESTISOL 140 has been used in ice boreholes in Greenland and Antarctica the last 10 years. We have obtained environmental permissions for the use of ESTISOL 140 from the Greenland Self Rule Expedition office and our colleagues from the Scientific Committee on Antarctic Research. There are very few liquids that can be used in boreholes as they need to be in liquid form at cold temperatures, have the same mass as the ice core material we remove from the ice boreholes, be non-reactive with ice and non-conductive of electrical currents. In past ice core drillings, people have used diesel fuel, lamp oil and n-butyl-acetate; all not very environmentally friendly. We are thus very pleased with the environmental properties of ESTISOL 140 produced by the Danish company *Esti Chem A/S, Erhvervsparken 16, DK - 4621 Gadstrup. From the* Safety data sheet according to 1907/2006/EC, Article 31 (for more information: https://icedrill.org/sites/default/files/ESTISOL-140_E_SafetyDataSheet.pdf).

10.2 Chemical stability
· Thermal decomposition / conditions to be avoided: No decomposition if used according to specifications.
10.3 Possibility of hazardous reactions No dangerous reactions known.
10.4 Conditions to avoid No further relevant information available.
10.5 Incompatible materials: No further relevant information available.
10.6 Hazardous decomposition products: No dangerous decomposition products known.
14.5 Environmental hazards: · Marine pollutant: No

We have contacted the Danish company and asked them on further information on the biodegradability and they provided us with the information found in the table at the end of this document.

ESTSOL 140 has a biodegradability of 70-75% after 28 days. As we expect the ESTISOL 140 to stay in the borehole for hundreds of years before there is any contact with water we find the biodegradability scale of months to be acceptable.

Recommends the Proponent provide information on how they intend to secure the drill hole including cap/casing on top.

The drill liquid will be kept with a top level 80 m below the surface; this way, it will only be in the part of the hole with solid ice and not in the top part of the hole where the snow is not yet compressed into ice. The drill liquid will be transferred down to 80 m below the surface with a hose to avoid any leakage of liquid into the overlying snow. Ice is impermeable, so the drill liquid will remain in the borehole. The surface temperature at the drill site on the Mueller Ice Cap in Nunavut is -20 deg C, and we estimate the basal temperature to be between -10 deg C and -5 deg C (we do not know the heat flow from the bedrock thus there is an uncertainty) and the ice is frozen to the bedrock. The drill liquid can thus not escape the bore hole from the base. We will cap the surface of the borehole using a ~2 m capped, plastic pipe, which will prevent the borehole from filling with snow and preserve it so we can return and measure the borehole in the future. (By measuring changes in the shape of the borehole over time we get to know how the ice is flowing). We and our colleagues have remeasured many boreholes in Greenland and Antarctica over periods of 30 years with the same observation: The liquid stays in the borehole. With climate warming, Mueller Ice Cap will indeed lose mass. Present observations from satellite altimeters show that the change of surface elevation is less than 10 cm/yr; even if mass loss increases by a factor of 4, the ice cap will not lose sufficient mass to allow the drill liquid to escape from the surface by flow towards the margin in the next 200 years. If some fluid leakage happens at some time in the very far future, the ESTISOL is degradable and harmless in the ocean water.

Consultation with Communities.

The communities closest are Aujuittuq (Grise Fiord, distance 440 km) and to people of *Qausuittuq* (Resolute Bay, distance 580 km). We have focused on consultations with Aujuittuq as the Mueller Ice Cap project is part of the pending CFI proposal Baffin Bay North. In the proposal the Marty Kuluguqtup, Senior Administrative Officer of the Hamlet of Grise Fiord, Stephanie Meekan, Senior Science Advisor of ICC, Kuupik Kleist, Vice Chair ICC and Joel Heath, SIKU are partners. We have had several interactions with the community before the COVID-19 pandemic including meeting in Aujuittuq and in Winnipeg. After the pandemic during autumn 2022 we had the first visit again (by Andrew Hamilton) where posters also were prepared in Inuit and English. We will have consultation both in spring and autumn 2023 together with the full research group interested in the area (i.e. including oceanographers from the University of Manitoba and others interested in contaminants in the area) as partners in Aujuittuq have asked that we form one group. We are very excited about building this collaboration, and the CFI Baffin Bay North includes significant funding for community-lead research.

Product	ESTISOL 140
Description	Synthetic ester.
Application	ESTISOL 140 is applied as an alternative to hydrocarbons and other solvents in production of formulated chemical products such as cleaners , lubricants and drilling fluids.
Biodegradability	75% / 28 days according to Marine BODIS test. 70% / 28 days according to OECD 301B.
Mobility	ESTISOL 140 is non-water miscible. The mobility is low. Log Pow = 3.36 according to OECD 117.
Toxicity	<u>Marine toxicity:</u> Fish toxicity, juvenile sheepshead minnow: LC50 (72 h) >3000 mg/litre. NOEC (96 h): 1000 mg/litre according to OSPAR guidelines. Algae toxicity, Skeletonema costatum: EC50 (72 h): 400 mg/l. NOEC (72 h): 319 mg/litre according to OSPAR guidelines. Marine copepod toxicity, Acartia tonsa: LC50 (48 h): >2203 mg/l. NOEC (48 h): 2203 mg/l according to OSPAR guidelines. Sediment reworker toxicity, Corophium Volutator: LC50 (10 days): 5013 mg/kg according to OSPAR guidelines. <u>Fresh water toxicity:</u> Fish toxicity, Oncorhynchus mykiss: LC50 (96 h): 8.27 mg/l, OECD Guideline 203; ISO 7346; 84/449/EØF. Daphnia magna: EC50 (48 h) 22.9 mg/l, OECD Guideline 202. Algae, Selenastrum capricornutum: EC50 (72 h) >21.9 mg/l, OECD Guideline 201. NOEC (72 h), Selenastrum capricornutum: 10.3 mg/l, OECD Guideline 201. Microorganisms / effect on household active sludge: EC20 (180 min) >1000 mg/l, OECD Guideline 209 (aquatic).