Wastewater treatment

How can we improve wastewater management in remote communities?

Key messages

• Applied research to improve water and wastewater management is a strong priority for POLAR's northern and Indigenous partners.

• POLAR has led and supported several studies to understand the effectiveness of current wastewater treatment practices and to test promising technologies for use in Arctic and northern communities.

• Used water from bathing and laundry is known as **greywater**. It is less contami-nated than **blackwater** (sewage), which includes wastewater from toilets, kitchen sinks, and dishwashers. In many regions of the world where water is not plentiful, people re-use greywater for toilet flushing, irrigation, laundry, and cleaning.

Wastewater management

Many remote communities rely on water delivery with wastewater collection, which is inconvenient and costly. Truck deliveries also add to air pollution through dust and increased greenhouse gas emissions from vehicle exhaust.

In these communities, blackwater and greywater from residences and businesses are mixed in collection tanks, collected by heavy trucks, and dumped into sewage lagoons.

Over time, lagoons deal with the waste effectively but have high potential to pollute the land, local waterways, and food chain.

Polar Knowledge Canada (POLAR) supported a University of Winnipeg study to determine the extent of contamination that is close to remote communities to better understand the effectiveness of sewage lagoons and the potential impacts that effluent runoff has on the environment and food chain.

Project leader: Rob Cooke, POLAR, info@polar.gc.ca

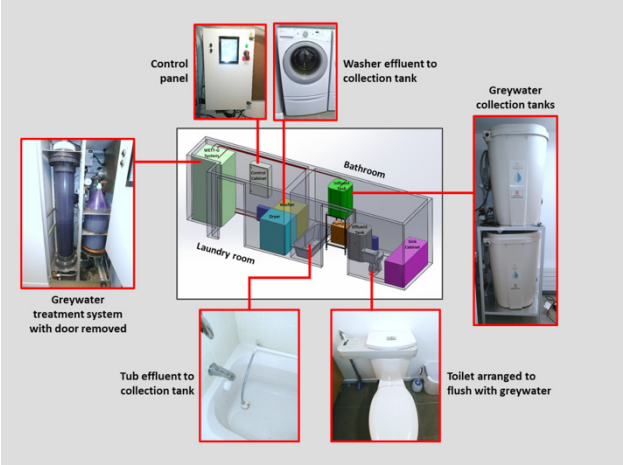
Cambridge Bay's sewage lagoon, as seen in winter: POLAR.

Greywater treatment

Keen to address these problems at their source, POLAR is also studying water conservation through greywater and blackwater treatment technologies.

In 2018, with funding from POLAR, Terragon Environmental Technologies Inc. installed a greywater treatment technology known as the WETT-G on the Canadian High Arctic Research Station (CHARS) campus in Cambridge Bay.

This greywater system relied on automated electrochem-ical technology, which does not require adding chemicals or maintenance-intensive processes. The quality of the treated greywater was comparable to treated municipal water, and the cost of treatment was significantly lower than municipal water rates. This project showed the eco-nomic feasibility and benefits of re-using water through greywater treatment.



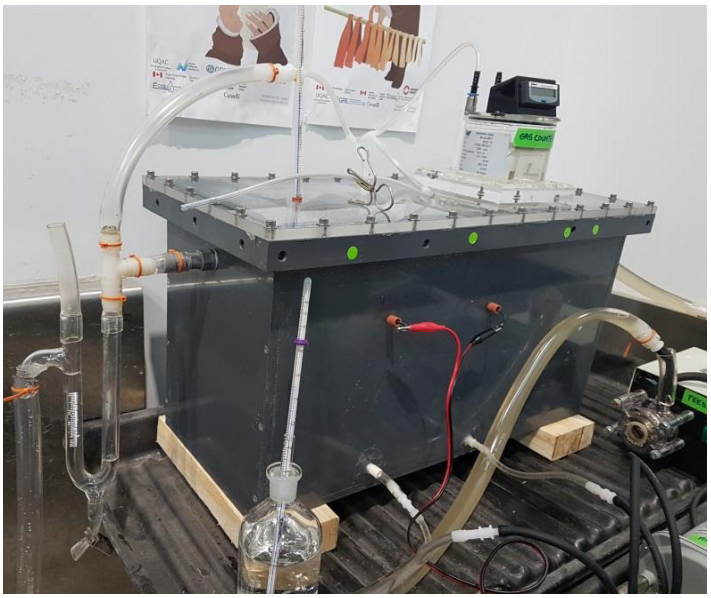
A greywater treatment system similar to the system installed at CHARS: Terragon.

Blackwater treatment: Bioelectrical Anaerobic Sewage Treatment (BeAST)

The National Research Council (NRC) has developed a sewage treatment technology that aims to clean up blackwater before it is sent to a sewage lagoon. The Bioelectrochemical Anaerobic Sewage Treatment (BeAST) system uses microbes to break down waste in a passive flow system. POLAR has partnered with NRC to test this pre-commercial technology at the CHARS campus.

Sewage samples were sent from Cambridge Bay to NRC laboratories in Quebec. Research scientists analyzed the samples and adjusted the BeAST reactor, which was then installed at CHARS. The 30-litre BeAST reactor at CHARS will run for about 12 months.

Initial tests showed that using BeAST allows for much cleaner wastewater to be discharged into sewage lagoons. If further tests are successful, NRC and POLAR will work together to develop and install a larger reactor in residential units in Cambridge Bay.



The BeAST Reactor, similar to one installed at CHARS: NRC.

Did you know? **Methane**, or biogas, is a by-product of the sewage treatment process. This gas can be captured and used for district heating, biofuel production, or to heat greenhouses. Using this gas can significantly add to the economic and environmental viability of this technology.